

No heroes, no villains: uncovering the mundanity of gender in the mathematics classroom

Trine Foyn

OsloMet Avhandling 2021 nr 17



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OSLOMET

Dissertation for the degree of philosophiae doctor (PhD)
Program for Educational Sciences for Teacher Education
Faculty of Education and International Studies and
Department of Product Design
OsloMet – Oslo Metropolitan University

Spring 2021

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OsloMet Avhandling 2021 nr 17

ISSN 2535-471X (trykt)

ISSN 2535-5414 (online)

ISBN 978-82-8364-309-1 (trykt)

ISBN 978-82-8364-409-8 (online)

OsloMet – storbyuniversitetet

Universitetsbiblioteket

Skriftserien

St. Olavs plass 4,

0130 Oslo,

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Postboks 4, St. Olavs plass

0130 Oslo

Trykket hos Byråservice

Trykket på Scandia 2000 white, 80 gram på materiesider/200 gram på coveret

Acknowledgements

Doing a PhD was never on my 'to do' list, but entering and travelling along this path has become an invaluable experience for me. As in the Norwegian fairytale of Espen Askeladd, I would not have managed without the good helpers I met along the way.

First of all, and most important: my deepest gratitude to my first supervisor, Professor Yvette Solomon. Thank you for travelling with me, from the beginning to the very end. For introducing me to your world, leading me on and sharing the joy of this journey. For all of your time, your patience, your motivation, your sharing of experience and insight and for never stopping believing in me. For your energy, your thoughtfulness and your humour. I have deeply appreciated our conversations, which always turned out to be interesting. You motivated me to put the gum shield in and to soldier on. Thanks to you, this experience has become world changing for me.

A warm thank you to my second supervisor, Professor Bodil Kleve, for suggesting that I do a PhD and convincing me it was a good idea. Thank you for your open door, your support and your encouragement along the way.

I will also express my gratitude to Associate Professor Lisa Boistrup Bjørklund and Professor Julian Williams, who engaged in my work at crucial moments: Lisa Boistrup Bjørklund for her useful comments in the midway seminar and for motivating me to be brave and to express my agency as a researcher; and Julian Williams for well-considered feedback in the last phase that combined a focus on details with the overall picture. This helped me to realise the need for being explicit about what was implicit.

I would also like to thank the PhD administration at OsloMet for my time on the program and my fellow students for sharing their experiences. Moreover, thank you to my colleagues in 'matematikkseksjonen' for your support. A special thanks to Sigrun Holmedal. I am so happy that you suddenly appeared on this path and joined me and that you became my friend. I know we will keep walking together. I would also like to thank Trude Sundtjønn for sharing the last leg with me.

The students in Class A deserve special thanks, for welcoming me in their classroom and letting me be a part of your world and for sharing your stories with me. My deepest gratitude to Miss A, who opened the door to her classroom and her professional life. Thank you for never being tired of me; without you, this journey wouldn't have been possible!

To my closest friends, thank you for reminding me that there is another world too, with a lot of fun, travel and conversation. Because of you I was inspired to enter an unknown field, and to be brave enough to be afraid.

A warm thank you to my family. Especially to my sister for all the listening and the conversations, and to my parents for the unconditional support. Most of all, thank you Harald, for being rock solid when the world was shaking. To have you steadily by my side has made it possible for me to travel this long way and to benefit from qualities I don't possess myself. And last, but absolutely not least, my children, Sondre and Vilja. Thank you for the unmasked critique and for never a boring day.

Sammendrag

I den pågående debatten om skole og kjønn i Norge uttrykkes det bekymring om gutters skoleprestasjoner. Gutter presterer lavere enn jenter i nesten alle fag. Matematikkfaget avviker fra dette mønsteret; gutter presterer bedre på nasjonale prøver i klasse 5, 8 og 9, mens på slutten av 10. trinn, siste året på ungdomsskolen, presterer jentene noe bedre enn guttene. Samtidig er situasjonen i Norge når det gjelder rekruttering til realfagstudier at jenter er i mindretall, og det arrangeres rekrutteringskampanjer for å motivere jenter til å velge en karrierevei innenfor realfag. Jeg argumenterer for at debatten om kjønn og matematikk i Norge ikke er nyansert nok for å forstå eller adressere disse mønstrene. I denne avhandlingen utforsker jeg hva som skjer i ett matematikklasserom gjennom ungdomsskoletiden, fra elevene går i 8. klasse og til 10. klasse; det siste året før elevene tar valg for videre utdanning.

Dette er bakgrunnen for at jeg i denne etnografisk-inspirerte studien har fokusert på hvordan kjønn, (gender), utspilles i et matematikklasserom. Gjennom bruk av det teoretiske rammeverket - *Figured Worlds* - av Holland, Lachicotte, Skinner & Cain (1998), utforsker jeg de ulike måtene elevene danner et bilde av seg selv (self-fashioning) som matematikkelev i denne klassen. Jeg har vært deltakende observatør i matematikktimer fra 8. til 10. trinn, gjennomført fokusgruppeintervjuer, samlet og studert blant annet elevenes egenvurderinger og kopier av lærerens notater. Videre har jeg gjennomført individuelle dybdeintervjuer med 19 elever i siste halvår av 10.klasse.

I avhandlingen presenteres først en analyse av den sosiale og kollektive konteksten elevene opererer i, 'the figured world' til denne klassen, her omtalt som 'A-klassen'. Det identifiseres motstridende diskurser knyttet til omsorg og konkurranse - eller dannelse 'bildung' versus prestasjoner - hvor styrkeforholdet mellom disse endres over tid. I tillegg identifiseres en gruppe elever, en gruppe med gutter, som har en fremtredende posisjon i klasserommet, både når det gjelder å signalisere 'å være smart' og til en maktposisjon i klasserommet som helhet. Deretter følger en analyse av seks av elevenes fortellinger om seg selv, ordnet i par: to høypresterende gutter, to høypresterende jenter og to elever, en jente og en gutt, som sliter med matematikk. Søkelyset settes på hvordan elevene forhandler agentskap (negotiate agency) i sin måte å fortelle om seg selv (self-authoring) på, som matematikkelev. I tillegg utforskes hvordan de som tilsynelatende ser ut til å være en del av de samme undergruppene i klassen, faktisk utvikler seg og posisjonerer seg ulikt i 'A-klassen'.

I studien utforskes det komplekse samspillet mellom den sosiale konteksten, med dens diskurser som matematikkdiskursen, 'role of figures', kulturelle mønstre, det elevene har med seg av individuelle erfaringer i deres 'self-authoring' og hvordan elevene opererer og posisjonerer seg i relasjon til hverandre. Dette betraktes som en respons på den sosiale konteksten som de er en del av. Det avdekkes hvordan kjønn blir knyttet til den kulturelle modellen av å være smart, signalisert gjennom 'uanstrengt arbeid' med matematikkfaget. Dette skjer i det hverdagslige arbeidet med faget, og det foregår ubemerket for deltakerne i dette klasserommet. Vi ser blant annet at jentene er aldri i en posisjon som gjør at de kan utfordre de kjønnsmessige aspektene ved matematikken i dette klasserommet. Imidlertid argumenterer jeg for at dette ikke nødvendigvis betyr at gutter er i en mer fordelaktig situasjon enn jenter. En nøye analyse av elevenes agentskap indikerer en mer kompleks situasjon enn at det er utelukkende en fordel å være i en posisjon knyttet til makt og privilegier, som å være en av de 'smarte guttene', det gir ikke automatisk fordeler.

Denne studien tar ikke sikte på å plassere skyld, snarere tar den sikte på å rette oppmerksomheten mot de skjulte aspektene ved kjønn og matematikk i et norsk klasserom. Gjennom bruken av det teoretiske rammeverket 'Figured Worlds', argumenterer jeg for at hvis man skal ha en endring i en situasjon hvor det er ikke er lik fordeling av makt, privilegier og muligheter, så krever dette en kollektiv bevissthet som går utover individuelle handlinger. Uten dette vil det ikke være mulig å få til endringer som skal til for å skape et mer inkluderende miljø for alle elever i et klasserom.

Abstract

Current domestic debate about school and gender in Norway focuses on concerns about boys' underperformance in comparison to girls, and its relation to their higher drop-out rate from upper secondary school. In general, girls perform at a higher level than boys. However, mathematics is an exception to this picture; boys perform better in national tests in grades 5, 8 and 9, while at the end of grade 10, the final year of lower secondary school, girls perform slightly better than boys. At the same time, Norway struggles to recruit female students to the STEM field, despite national campaigns designed to convince girls that there is a career pathway for them in within the STEM. Arguing that the debate about gender and mathematics in Norway is insufficiently nuanced to understand or address these patterns, this thesis explores what happens in one mathematics classroom as its students move from grade 8, when they start lower secondary school, to grade 10, the final year before they choose the educational pathway that they will follow.

Thus, the main research question of this ethnographically- inspired study asks how gender is played out in a mathematics classroom. Using the theoretical lens of Figured Worlds offered by Holland, Lachicotte, Skinner & Cain (1998), I explore the ways in which students fashion their sense of self as mathematics learners within this class. Acting as a participant observer I observed lessons over the three years from 8th to 10th grade, conducted focus group interviews, collected artefacts such as students' diary notes and copies of the teacher's records, and carried out final in-depth interviews with 19 students at the end of grade 10.

The thesis first presents an analysis of the figured world of "Class A", the social context in which the students live out being mathematics students. It identifies conflicting discourses of care and competition – 'bildung' versus achievement - which fluctuate in their relative strength over time. It also establishes the presence of a group of boys who hold a prominent position in the classroom which is connected to 'smartness' and a position of power in the classroom as a whole. This is followed by an analysis of six of the students' narratives of self, arranged in pairs: two high achieving boys, two high achieving girls and two students, a girl and a boy, who struggle with mathematics. Focusing on how the students negotiate agency in their self-authoring as mathematics students, I explore how those who are apparently positioned in identical subgroups in the class are in fact on different trajectories in Class A.

The thesis explores the complex interplay of social context, discourses of mathematics and learning, the role of figures and cultural models and their own history in person in the ways in

which students author themselves as a response to the figured world of Class A. It reveals how gender is refracted through the cultural models of 'smartness' and effortless work and the hidden nature of this aspect of gender and mathematics. It is unconsciously played out by the actors in this classroom, and position becomes disposition; the girls are never positioned in ways that might challenge the gendered nature of mathematics in Class A. However, I argue that these hidden and gendered aspects of the classroom do not necessarily mean that boys are in a more advantageous situation than girls. A close analysis of students' agency indicates a more complex situation in which occupation of a space that seems to be connected to power and privilege such as being one of the 'smart boys' does not automatically confer benefits.

This study does not aim to identify heroes or villains. Rather, it aims to draw attention to the hidden nature of gender and mathematics in a Norwegian classroom. Following the theoretical framework of Figured Worlds, I argue that changing a situation of uneven distribution of power, privilege and opportunities requires collective awareness which goes beyond individual actions. Without this, it is not possible to redirect actions towards a more inclusive environment, for all students in a classroom.

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Chapter 1: Introduction

Being a woman in a man's world

Charlotte is competing in the unofficial Norwegian national road bike championships in August 2020, being one out of 110 athletes, 15 girls and 95 boys. It's the most important race this year. She has trained hard and her goal is to be in the top three. Normally there are separate fields for men and women, but this year all competitors will start in the same field, due to economic considerations. The track is around 9.5 km, and the girls race for 6 laps, the boys for 8. The normal rules are that anyone who is lapped must end their race, but because the boys have a physical advantage, an exception was made this time: it was agreed that the girls should not be stopped and prevented from completing the race if they are lapped by the boys.

The race is on, Charlotte is working hard, and she is in a good position. But, after 20km she is stopped by an official and is told to end the race, to make way for the boys who are coming from behind. This happens to 14 girls in all; they are not only disappointed but also have a sense of 'not belonging': they are deprived of the opportunity to complete the race of the year. Just one girl is allowed to finish, but her joy in being the first girl to cross the line is stopped short - her victory is cancelled. Charlotte's mother is surprised and disappointed that the girls were not allowed to complete the race, contrary to what they were promised, and she confronts the management. The spokesman argues: "*The boys were sweating blood and tears behind, while the girls were just skimming along in the field and laughing and chatting together*"¹(Godø & Hagen, 2020). The episode reached the papers, and the management of the race apologised to the girls.

Charlotte's story could be an isolated event, but it's not. In February 2020, a Norwegian 16-year-olds female football team suggested to its board that they be allowed to replace the club's regular shorts, which were white and almost transparent when wet. The board voted down the suggestion. Tradition was more important than the discomfort the girls felt in shorts made for men (Gelius, 2020). The episode reached the papers, and the board changed its mind. In Norwegian ice hockey, boys are allowed to 'body check' (make physical contact when tackling) from the age of 12, while girls and women are sent off the ice if they exercise this physical feature of ice hockey, *at any age*. As a female hockey player says, "It's a shame, because we've got used to this now. We probably don't notice differences we should see"² (Avlesen-Østli,

1 «Guttene blodkjørte bak, mens jentene kjørte rolig i feltet og smilte og snakket sammen.»

2 «Det er synd, for vi er blitt vant til det nå. Vi ser kanskje ikke de forskjellene vi burde se.»

2020). Female athletes in male-dominated sports like football and ice hockey tell stories of being given less, or less beneficial, times for training at the field or at the rink. Just a remark: these stories are not about differences in physical strength; rather, they shed light on structural issues that leave girls and women in male-dominated sports on the margins. The list of examples could be longer, adding in the women's national football and ski jumping teams. These stories indicate that there is more to the common story of Norway as a country that has achieved gender equity, than meets the eye.

Turning the spotlight from sport to educational pathways and professional careers, it makes sense to take a closer look at gender in the STEM (science, technology, engineering and mathematics) field in Norway. Mathematics is a significant subject within STEM, being an entry requirement for many STEM subjects at university level. A recent report by The Confederation of Norwegian Enterprise (NHO, 2018), claimed that 1 out of 3 STEM graduates in Norway are women. Table 1 shows that even though female students are a majority within the Norwegian universities, this is not reflected in STEM subjects. Figure 1 shows that the percentage of women in Norway studying within the STEM field is the lowest in Scandinavia.

Percentage of female students in general and in selected educational pathways	2017	2012	2007
Study programme			
All programmes	59.6	60.4	61
Technology	32.5	30.1	26.8
Mathematics and science	38.6	37.7	41.5
Engineering	19.9	17.9	17.4

Table 1. Percentage of female students in higher education pathways (adapted from Khrono (2018), my translation)

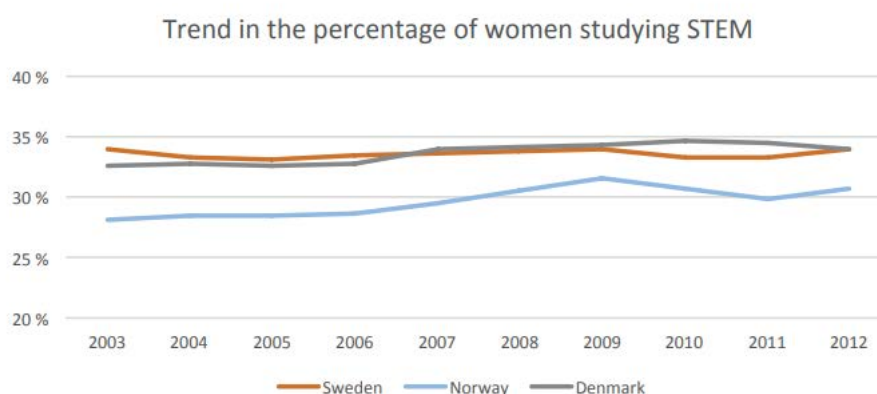


Figure 1. Trend in the percentage of women studying STEM, taken from Talks, Edvinsson and Birchall (2018)

When looking at these trends in the percentage of women studying in the STEM field in Scandinavia, it is worth noting that Scandinavian countries are not a ‘beacon’ concerning female participation in the STEM. For example, the report from Plan International Norway (Talks, Edvinsson & Birchall, 2018) suggests that part of the problem of gender equity in the technology field in Scandinavia is “the widespread perception that Norway, Sweden and Denmark have already reached peak gender equality” (Talks, Edvinsson & Birchall, 2018, p. 10).

Continuing to mathematics and young people: every year in Norway, ‘The Abel competition’³ is held. Figure 2 shows the first names of those who qualified for the final in 2019 and 2018. Male first names are in white, while female names are in yellow.

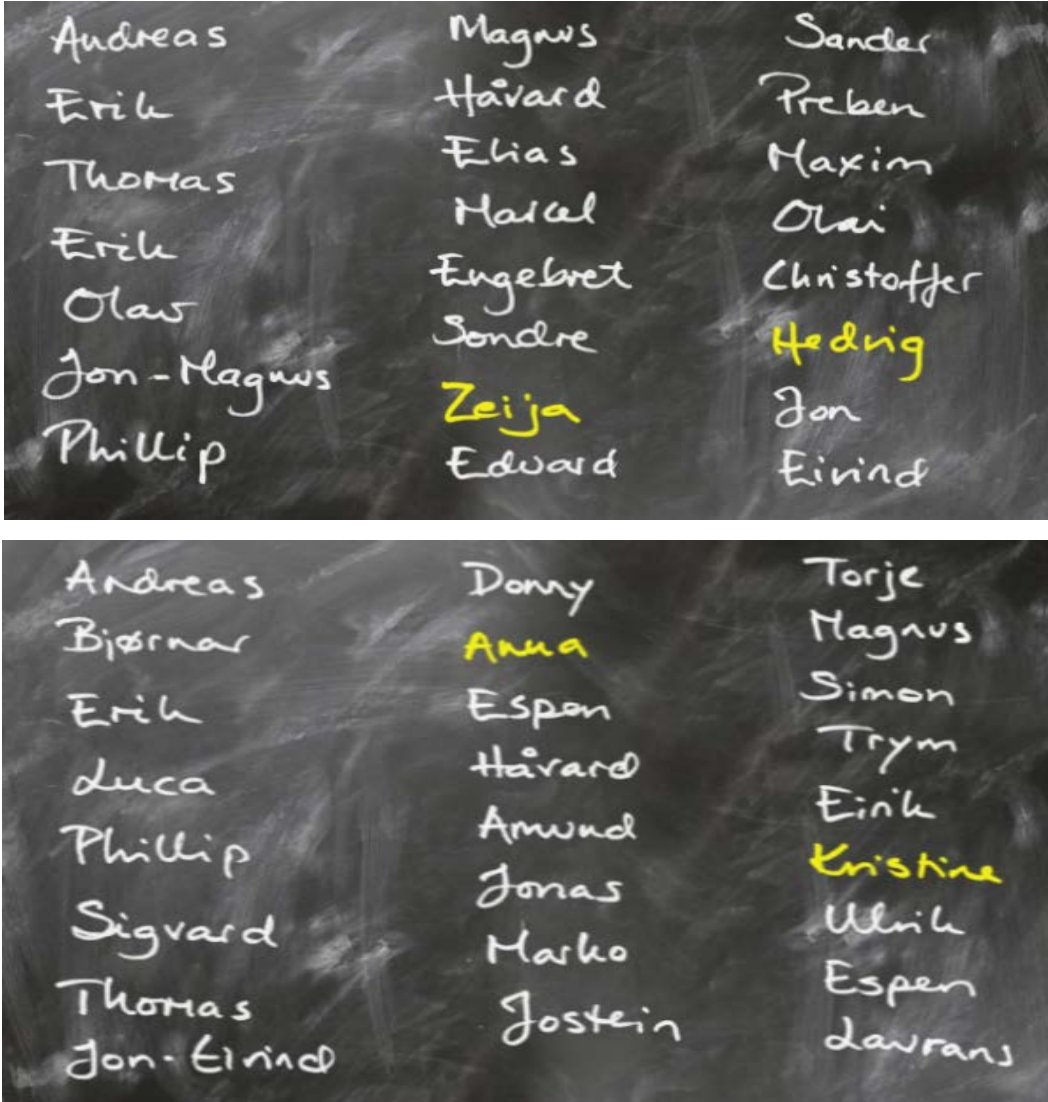


Figure 2. First names from the Abel competition 2019 (top) and 2018 (bottom)

³ The Norwegian Mathematical Olympiad, the Abel competition (national contest in mathematics for upper secondary school pupils)

This pattern of very few girls among the finalists in this competition is the same, year after year. As a teacher for many years in mathematics, I can't say I am surprised; my classroom experience and discussions with parents have made me aware that the combination of social structures and classroom structures in mathematics seems to work differently for boys and girls, and yet these differences are hardly ever discussed in public.

Given this introduction, it might be a surprise that exploring gender in mathematics was not the driving force at the beginning of this study. Rather, it was an emerging issue. In order to explain this, I next present the rationale for this study and how this developed.

The rationale for the study

I have taught mathematics in lower secondary school for many years, and this has given me a rich experience of how students relate to mathematics. I can't tell a story about being the most successful teacher, enabling all my students to improve their grades even when they started poorly. However, I can tell a much more nuanced story, covering the good, bad and in-between stories of students' trajectories through lower secondary school as mathematics learners. Being part of their everyday life and being in a position to listen to their stories, made me aware that being a student in mathematics is not always an easy ride. The most interesting experiences for me have been witnessing unexpected change in students, and my years as a teacher in lower secondary school have taught me that unexpected things tend to happen during these school years. This was my initial motivation for this research project; my working title was "A crucial time for making choices in mathematics - the development of mathematics identities in lower secondary school". Thus, the vantage point of this study was to investigate how students evolve as mathematics learners, in order to understand why some change their attitude to mathematics during lower secondary school.

Performance in Mathematics

As a teacher, I have followed educational debate in Norway over the last 20 years. Particular attention has been given to mathematics education because Norwegian students' performance in international studies such as PISA and TIMSS has for several years not been as good as the school authorities in Norway expected. The "PISA-shock" hit Norwegian school authorities in 2000. Norwegian students' overall level of performance in mathematics was not as high as anticipated in comparison to other countries. This triggered major policy-level attention on the quality of mathematics teaching and the introduction of National Tests in 2001, which led to a stronger focus on performance in mathematics with special intensive programmes aiming to

improve results. From 2006, the curriculum (LK 06) was more strongly focused on achievement and more oriented to setting goals in every subject.⁴ Furthermore, in 2019, a national report, led by Camilla Stoltenberg (NOU, 2019), concluded that we should be worried about boys being left behind by girls, who were more successful in the Norwegian school system. This national report was published during this study and focussed on gender in a way that didn't match my experience in the classroom I was researching. I realised that public debate on gender and education focussed solely on performance, leaving students' experiences on the margins of the discussion.

From my perspective, it made sense to investigate the particular characteristics of mathematics education in Norway which relate to gender, but these are not about test performance; if we go beyond grades and look at post-compulsory study including higher studies within the STEM field, we see that, as I noted above, girls are in a minority. This is a concern for educationalists and policy makers, and various campaigns designed to motivate young women to enter the STEM field have been initiated, but without any particular evidence of success, as Figure 1 and Table 1 suggests. Investigating the different ways in which students relate to mathematics seemed interesting and could shed light on the different participation rates of female and male students within the STEM field, even though their grades are almost the same. Combined with my experiences in the classroom this study took place in, this issue prompted me to focus on gender and mathematics in this study, setting the spotlight on students' experience in the years prior to the target age range of recruitment campaigns designed to motivate young women to enter the STEM field. Rather than worrying about boys, I was still concerned about girls not choosing mathematics, even though they are good at it. As Talks, Edvinsson and Birchall (2018) emphasises; "involvement in STEM gives people literacy, empowerment and economic freedom to shape their world and everyday life, (...) women and other under-represented groups need STEM to be empowered to influence their own lives and the development of the world" (Talks, Edvinsson & Birchall, 2018, p.10).

The Norwegian Educational System, with particular attention to mathematics

This study takes place in a Norwegian mathematics classroom, and I include some notes here for the reader who is not familiar with the Norwegian school system.

⁴ A new curriculum was launched in autumn 2020. The students in this study were taught according to the previous LK 06 curriculum

The Norwegian public unitary school system⁵ of comprehensive education is an essential feature all over the country. There are very few private schools. This means that students from all levels of society can meet at both school and class level.

Children start primary school⁶ at age 6, moving through grades 1-7. In grade 8 they start lower secondary school⁷, through to grade 10. After these 10 years, they have finished ‘Grunnskolen’ which is free and mandatory for all children from 6-16 years old in Norway, and they move on to upper secondary school, for grades 11 to 13. Teachers most commonly follow a group of students over several years, and they may have one teacher from year 1-4, a new teacher from 5-7, and again a new teacher from 8-10. Mostly, teachers in primary school teach several subjects in the class, and the class is a key unit in students’ lives in school. Students are not assessed with grades in primary school, and this only begins in lower secondary school. In lower secondary school, teachers, mostly teach subjects they have specialised in as part of their teacher education, for example the combination of mathematics and science or Norwegian and social science. However, those teachers are likely to follow the class from grade 8 to grade 10.

As ‘Grunnskolen’, upper secondary school is free and mandatory, but students choose between pathways in upper secondary school, taking either a Vocational Education Programme⁸ or the Education Programme for Specialization in General Studies⁹. If they choose the first programme, they will have a mandatory course in mathematics in grade 11. For those who choose the latter, mathematics is mandatory in grades 11 and 12, however they must choose which type of mathematics they will study. Theoretical mathematics (‘T-mathematics’ in year 11) leads to either mathematics for science (‘R-mathematics’) or mathematics for social science (‘S-mathematics’) in grades 12, and in grade 13 mathematics is voluntary. The other choice is practical mathematics, P-mathematics, which is studied in grades 11 and 12. It is possible to make a crossover to S-mathematics after the first year with P-mathematics, but not to R-mathematics. Students who choose R or S mathematics may finish mathematics after grade 12, or continue into grade 13, the last year of upper secondary school.

Turning to the assessment rules for ‘Grunnskolen’, years 1-10. As already mentioned, students are not assessed by grades before grade 8. However, teachers assess students in primary school by ‘assessment without marks’ twice a year, recording their levels of curriculum goal

⁵ Enhetsskolen

⁶ Barneskolen

⁷ Ungdomsskolen

⁸ Yrkesfag

⁹ Studiespesialisering

attainment. Students do national tests in reading, numeracy and calculation in grades 5, 8 and 9, and they receive levels scores for these tests.

In lower secondary school, teachers assess the students by grades every semester, mostly in January and June. In mathematics, Norwegian and English, assessment is usually based on the semester test, at the end of every semester. Students take final national examinations at the end of year 10, one oral and one written. The students are allocated to subjects randomly: the written examination is in one of Norwegian, English or Mathematics, and the oral examination is in one of Norwegian, English, Mathematics, Science, Religion; Foreign Language or Social Science. In addition, the teachers assess their students in every subject they teach leading to overall achievement grades¹⁰. Entrance to upper secondary school is based on these grades, in addition to the examination grades¹¹. For the students in this study, entrance to upper secondary school is solely dependent on their grades in these examinations, but this varies across the country. In some counties both grades and a student's geographical location are taken into account.

The grade system goes from 1-6, where 6 is the best. Grades 1 and 2 are labelled 'low level of goal achievement', grades 3 and 4 are labelled 'medium level of goal achievement', while 5 and 6 are labelled as 'high level of goal achievement'. Grades awarded correspond with the goals set for each grade, so a student might achieve grade 5 every year, indicating that their learning is consistently meeting a high level of goal achievement in each year. This system is the same in both lower secondary and upper secondary school.

My thesis

This thesis explores how the students within one lower secondary classroom develop their sense of self as mathematics students from grades 8 to 10. It explores the complex interplay between their own personal histories and circulating discourses of mathematics and achievement, cultural models and figures. Employing Holland, Lachicotte, Skinner Cain's (1998) framework of figured worlds, this thesis focuses on the ways in which students craft their response to the classroom they are a part of, and its domination by a particular group of boys. I argue that despite this domination, there are no heroes or villains in this class, and that understanding its dynamics provides important insights into the mundanity of gender in the classroom.

¹⁰Standpunktkarakter

¹¹ Eksamenskarakter

The structure of this thesis

The thesis has ten chapters, as follows:

Chapter 2: The research field of gender and mathematics: through four phases

In this chapter I trace the development of research on gender and mathematics over the last thirty years, focusing on how the field has developed in terms of its conceptualisation of ‘the problem’. I recognise four broad ‘phases’ that illustrate the moving nature of the research field. The review is organised in terms of these phases, beginning with Walkerdine’s (1989/1998) ‘Counting girls out’. I argue that this represents a paradigm shift away from blaming girls for their underperformance/anxiety/non-participation to an examination of their experiences in mathematics classes. The second phase focuses on a shift towards understanding girls as excluded from the discourse of mathematics teaching and learning, while the third concerns research which focuses on the identity work that girls need to do in order to function within the discourses of mathematics teaching and learning. Finally, the fourth phase attempts to understand how it might be possible to be recognised as a mathematics student in different ways from those set out by hegemonic masculinities. The review ends with a discussion of where we are today, and an emphasis on the need to research local contexts and avoid gender essentialism. This leads to the presentation of my research questions, which are:

RQ1: What are the dynamics of mathematical identities in a classroom?

RQ2: What is the nature of students’ agency in their employment of identities?

RQ3: How is gender played out?

Chapter 3: Theoretical framework

In this chapter I present the theoretical framework for this study, Holland et al.’s (1998) work on identity and agency in cultural worlds. I present the overarching structure of the theoretical framework and its aims, and I focus on the key concepts that build an account of identity and agency and how we can understand them. I follow the structure of Holland et al.’s (1998) own explanation of the development of ‘identity in practice’, through four contexts – the figured world, positionality, self-authoring and world making. For this thesis, the first three contexts of identity are most important, enabling an understanding of how individuals within the same context develop different senses of self, and more particularly, how mathematics students in the same class develop different types of identity as mathematics learners. The fourth context is not without importance, however, and I return to it in Chapter 10, when I summarise the study’s contribution to knowledge and implications for practice and policy.

Chapter 4: Methodology

In this chapter I give an account for the methodological questions and choices of this study, beginning with the implications of the framework of figured worlds for my methodological approach. Next, I present the basic choices I made in conducting this study. I highlight how, in this ethnographically inspired study, I was concerned to keep an ‘door open strategy’ as I developed an evolving picture of the classroom culture. In particular, I describe how I made a major decision to focus on gender. This chapter also explains my data analysis and discusses my own position as the author of this thesis and its multiple narratives.

A vignette

The analysis chapters are launched by a vignette of a visit in Class A, the classroom in which this study takes place. It presents how an imaginary observer could have experienced its classroom culture, and highlights how first impressions may conceal tensions which go unnoticed in the course of everyday life.

Chapter 5: The figured world of Class A

In this chapter I present the analysis of the figured world of Class A, the first context of identity. I present excerpts from narrative interviews and focus groups, together with the teacher’s story of Class A. This analysis reveals the discourses which operate in Class A, and the values, norms and rules that underpin how the actors in this classroom interpret acts and choose to act. It also reveals discursive tensions in the self-presentation of Class A, and an important discursive change over time. It also reveals the presence of a group of boys, ‘the smart boys’, who become central to the narrative.

Chapter 6-8: Analysis of the students’ stories

In this chapter I present the analysis of six students’ stories of themselves as mathematics learners. The analysis is presented in pairs, starting with an introduction of the two students constituting the pair, through my eyes, before I present the analysis of the students’ stories of themselves. I start to present two high performing boys, before I turn to two girls who also perform at a high level. Finally, I present two students who struggle with mathematics. I explore how each student navigates their way in Class A, noting differences both within and between each pair.

Chapter 9: Discussion – the mechanics of mundanity in the figured world of Class A

In this chapter I bring the analysis of the three pairs of students back to their location in Class A, presented in the analysis in Chapter 5, and I address the research questions through the lens of figured worlds and with reference back to the literature review in chapter 2. In this discussion

I explore how gender is refracted through the cultural model of ‘smartness’ and effortless work, within the everyday happenings of learning mathematics in this class. I show how this is characterised by a lack of awareness among the students and the teacher of the existence of (self)exclusion on the basis of gender. It seems that gender is played out within the frame of habitual acts in this classroom, and this is out of awareness for the majority. I conclude that there are no heroes or villains in this narrative; rather, I emphasise the importance of collective agency in bringing about change.

Chapter 10: No heroes, no villains: some conclusions in a never-ending story

In this chapter I present my reflections on the contribution to knowledge that this thesis makes, and I discuss the methodological contribution of this study. I also reflect on the research design and how my methodological choices might have been otherwise. I discuss the implications for policy and practice of my analysis in terms of a need for collective change, and public discussion and awareness of the way in which young people – and their teachers - are positioned in mathematics classrooms. I show that this thesis has major implications for understanding of gender and mathematics in Norway; in particular, I argue against attitudes that gender and mathematics is ‘already dealt with’ within this context.

Chapter 2: The research field of gender and mathematics: through four phases

The concerns about equity and access to mathematics in Norway outlined in Chapter 1 lead to my focus in this thesis on how gender plays out within a lower secondary school classroom as the students within it develop their sense of self as mathematics learners. In this chapter, I trace the development of research on gender and mathematics, focusing on how the field has developed in terms of its conceptualisation of ‘the problem’. I argue that research which aims to understand gender and mathematics needs to address issues of gender essentialism and the possibility of diverse trajectories within local contexts.

Since gender and mathematics has been on the agenda since the beginning of the 70s, it has been difficult to find a starting point to launch this review, and there is no perfect match between the ‘time frame’ and the different ways in which researchers have approached the topic. However, this review will be organised in terms of four broad ‘phases’ which underline the ‘moving nature of the field’, starting with what may be seen as a major paradigm shift engendered by Valerie Walkerdine’s (1989/1998) work “*Counting girls out*”. Walkerdine’s work started a new ‘era’, turning the focus of interest from a discussion of perceived problems ‘inside’ girls, such as weaker spatial ability, greater anxiety or lack of confidence, as a way of accounting for their (then) underperformance in tests compared to boys, to a focus on how girls’ ‘underperformance’ was discursively constructed. Walkerdine’s work was part of the ‘social turn’ in mathematics education research (Lerman, 2000), engendering detailed exploration of mathematics classrooms as social contexts in the second phase, where a focus on the classroom context and different teaching styles led to the emergence of identity as an important concept in the research field of mathematics teaching and learning. At the same time, the earlier research aim of investigating and understanding girls’ underperformance in mathematics compared to boys became less important as differences began to disappear during the 1990s. Instead, the research agenda had a new focus: how girls were excluded from the construction of knowledge in mathematics. The third phase is characterised by research which turns the focus more concentratedly onto discourses of mathematics and their connections to masculinity. It explores how girls are required to do a large amount of identity work in order to combine doing mathematics and being feminine. The fourth phase explores the possibility of resistance to ‘ascribed’ identities of disadvantage and how girls may develop new ways of being mathematics students in a rejection of gender binaries. Agency becomes an important concept in this phase, as a means of understanding how individuals can not only ‘operate’ within

discourses, but may even employ them in ways which enable them to fashion their own trajectories rather than being determined by them. This phase also explores the balance of individual and collective in the gendered world of mathematics.

Phase 1: A paradigm shift: girls' 'underperformance' as constructed

I begin this literature review with Valerie Walkerdine's (1989/1998) work "*Counting girls out*" because it marks a major shift within the research field of gender and mathematics in its post-structuralist analysis of "girls, women and femininity, and of the construction of their identities through social, educational and mathematical discourses" (Ernest, 1998, p.1). It shifted the lens of investigation into gender and mathematics away from girls as the site of the 'problem' towards a focus on position and power in the social context. Walkerdine questioned the nature of girls' 'underperformance' in mathematics, and contemporary research that sought to find the origins of girls' 'problems' within girls themselves. Her refocusing of the field drew attention to the importance of discourse in girls' *experience* of mathematics and the importance of identity, opposing the tradition of 'blaming the victim' in previous research that argued that there was something wrong with girls.

A fundamental starting point for Walkerdine is that claims about gender differences in mathematics performance are themselves questionable: differences in scores on particular subcategories of large-scale survey tests are not enough to claim general differences between boys' and girls' performance. Thus, she criticises the focus on boys' better performance on items requiring spatial ability and abstract thinking, versus girls' better performance on computational items, while items where there are *no differences* are ignored. Criticising Shuard's (1981, 1982) analysis, for example, Walkerdine argues that:

when it comes to Mathematics she is quite willing to talk about the differences between girls and boys as if they were two quite distinct groups. ... that girls perform better than boys at computation and those aspects of Mathematics considered low-level, while boys do better on the more complex aspects, particularly 'spatial' questions [But] Shuard misinterprets the data to suggest that girls were good only at computation, whereas the results reveal that on the majority of items there are no sex differences. ... Shuard blames primary schools which, she claims, stress low-level computation because it is easy to teach, thus hindering the development of 'real' Mathematics. So, girls are not 'only' good at computation, but this argument actually negates their performance by implying that even where they are successful, their success is only low-level and can therefore be discounted (1998, p. 28).

Walkerdine emphasizes that this way of presenting differences between girls and boys has crucial consequences for practice, but

The question, then, is whether girls and women are lacking or different. Most of the arguments about their performance relative to men take difference as indicative of something real: high performance indicating that something is present, low that something is missing (1998, pp. 29-30).

Walkerdine explores how these perceptions of deficit have been fed by, and have contributed to, the 'existing truth' about gender and mathematics in the dynamics of girls' construction as weak at mathematics. She critiques research which focuses on global generalisations of women in terms of difference and deficit in spatial ability, brain lateralization, personality factors and socialization experiences. One such claim that has become a 'common truth' is that girls are more anxious about mathematics; noting Fennema & Sherman's (1976) suggestion that men are more likely to be socialised into hiding their anxiety, Walkerdine argues it is not possible to separate anxiety from social processes or 'fantasies' of masculinity and femininity (1998, p. 23). She points to Dweck's work on 'learned helplessness' (Dweck & Repucci, 1973; Diener & Dweck, 1978) in which girls learn passivity as a result of teachers' differential responses to boys' and girls' poor performance as due to lack of ability in girls, versus lack of effort in boys. Surveying classroom studies, Walkerdine notes that a range of British and American researchers have identified that teachers interact more with boys, praising them more for their achievement; they are more likely to be criticised for their conduct than their achievement, whereas girls are more likely to be criticised for achievement (Dweck, Davidson, Nelson and Enna, 1978; Kelly, Whyte and Smail, 1984; Kelly, 1981; French, 1982).

To understand the origins of such 'fantasies and fictions' (1998, p. 30), Walkerdine explores how the 'modern problem' of girls and mathematics is connected to 'the history of both modern Mathematics teaching and ideas about the female body and mind' (p. 31). She argues that the discourses of mathematics learning are clearly gendered, with roots back to the enlightenment where reason was connected to masculinity and emotion to femininity, and mathematics was seen as the development of reasoning and the logical brain. Focusing on how mathematics education tends to hold 'knowing why' as more important than 'knowing how', the first connected to 'real' understanding by exploring connections, and the latter to calculation and rule-following, Walkerdine notes that girls are taught to obey rules and be 'nice', but when doing this in mathematics they are blamed for not having real understanding. Boys, who more

easily break the rules and take more challenges, are seen to develop 'real' mathematics understanding.

Drawing on Foucault, she argues that these truths affect girls' life chances and are constantly reproduced in classrooms. Claiming that "there are no unitary categories of boys and girls", but rather that children are "inscribed as masculine and feminine" (p. 37), Walkerdine argues that it is these positions that affect how children behave; girls want to obey rules and boys want to challenge rules them. Asking how these contradictions are possible within a classroom, Walkerdine explains how the 'ideal pedagogy of teaching' values activity, explanations and openness, meaning that girls 'cause a problem':

...girls' correct performance is seen not only as wrong but as pathological. Girls threaten the smooth running of the child-centred classroom because they seem to learn in ways which have been outlawed for leading to authoritarianism and producing the wrong kind of development. Girls, therefore, constitute a problem for the teacher because they do not appear to function like natural children as defined in the theories (1998, p. 40).

Consequently, "these contradictions set girls up to achieve the very thing which is simultaneously desired and feared: passivity" (1998, p. 41).

Walkerdine's own research explores the nature and origins of this discursive positioning of girls by following groups of children in different phases from a young age, starting with studying mother and daughters at age 4, going on to focus on power and gender in nursery school and later when children start infants' school. Her team revisited the original group of 4-year-old girls when they were 10. In a separate study, they followed a group of students from two junior schools in their transition to secondary school. Finally, they studied students and their mathematical texts in the same comprehensive school, in their fourth year (now grade 10 in English schools, age 14-15).

Walkerdine argues that these studies demonstrate how, from an early age, girls and women are locked into a struggle which focuses on women's roles as 'educators' of children as part of domestic labour, and the preparation of children who will be successful and autonomous in school. Constructions of girls are classed and raced, whereby black and working-class mothers are seen as doing this 'job' inadequately, in a process which

pathologizes domestic practices other than [white] middle-class ones. It is simply not true that black and white working-class girls are doing badly at 6, though their strategies for success and evaluation by teachers are often quite different from those of middle-class girls (1998, p.83).

Following through on the original sample of 4-year-olds, Walkerdine found that the positions for boys and girls are sedimented by the age of 10 but also that gender differences are cross-cut by class; working-class girls' performance was 'disastrous' compared to middle-class girls' (p.84). Teachers' views were highly gendered: boys' poor performance was excused on the grounds of 'late maturity' for instance, whilst high-performing girls were described as 'hard-working', which was not seen as good enough, because it indicated lack of 'ability'. Girls who received credits for being nice, kind and helpful in public were privately 'accused' of this by teachers. In contrast, boys were described as having 'brilliance' and 'flair', and girls themselves noticed their challenges of the teacher's power to know (p.91). At this stage, the middle-class girls also began to show anxiety that they were not 'good enough (p.90); in the fourth year of secondary school, girls were found to overall perform better than boys, but felt less confident. Their contributions in class received different responses; boys' utterances were extended by the teacher, while girls' were not. Ultimately, Walkerdine claims that female students "are put in social and psychic double binds", which leaves few girls able to "achieve both intellectual prowess and femininity" (Walkerdine, 1998, p.162).

The 'social turn': identity as a product of context

Walkerdine's work was a major part of what Lerman (2000) was to describe as 'the social turn' in mathematics education research. Alongside her sociological approach, Lerman identified the influence of two other disciplines - anthropology, and cultural psychology; together, these moved mathematics education research towards "theories that see meaning, thinking and reasoning as products of social activity" (Lerman, 2000, p.23). With this approach, identity emerged as a core concept in understanding students' learning in mathematics, replacing the previous focus on achievement. Situated knowing emphasises the importance of understanding "the-person-acting-in-social-practice, not person or their knowing on their own" (p. 25). Taking Lave & Wenger's (1991) situated learning as a starting point, Lerman argues that Walkerdine showed how we also need understand the regulating effects of discursive practice on the production of subjectivities in the mathematics classroom: "Individual trajectories in the development of identities in social practices arise as a consequence of our identities in the overlapping practices in which each of us functions but also emerge from the different positions in which practices constitute the participants" (p. 28). In addition, he draws on Vygotsky's concept of learning in the zone of proximal development to capture the mechanisms of development as becoming: "Individuality and agency, then, emerge as the product of each

person's prior network of social and cultural experiences, and their goals and needs, in relation to the social practices in which they function" (p. 36)

The social turn affected research on gender and mathematics as well. Not only did it highlight the importance of identity in investigating how male and female students experienced mathematics, but, as Gutierrez (2013) emphasises, the term 'social' as Lerman (2000) used it, "went beyond the layman's definition of involving social beings and interactions and included the consequences for addressing hegemony in society" (Gutierrez, 2013, p.40). For Lerman, power was an important issue within the social turn, identified by Walkerdine (1988) as central to the production of 'the child' in the classroom. Thus Lerman sets the focus on how power and knowledge within a discourse are produced and maintained, and how social inequality is reproduced, emphasising that the dominant discourses in classrooms, which also exist outside of the classroom, distribute students as subjects according to power. The student's individuality is seen as multiple, as a "collection of multiple subjectivities, through the many overlapping and separate identities" (Lerman, 2000, p. 31) based on gender, ethnicity and class, among other factors. Hence, the social turn also enabled a shift to a focus on exclusion, and within the research field of gender and mathematics, there was a shift to investigating how female students developed identities of exclusion from mathematics.

Phase 2: The classroom production of mathematical identities

While Walkerdine (1989/1998) represents a major shift in the field in comparison with previous studies on gender and mathematics, other studies contributed subtler moves, extending the research field in a number of new directions within the social turn. Also arguing for a shift away from what is 'wrong' with girls, and emphasising the importance of the context and teaching styles, Jo Boaler's (1997a, 1997b, 1997c, 1998) work followed through on the issue of girls' under-participation in advanced mathematics rather than their underperformance, focusing on their experiences in mathematics classrooms. Her work directed the focus of research to understanding how different teaching styles have different, and important, effects on students' experiences of mathematics, and how male and female students respond differently to them.

Drawing on a mix of qualitative and quantitative data, Boaler's (1997a, 1997b, 1997c, 1998) 3-year case study of contrasting teaching styles in two London schools, Amber Hill and Phoenix Park, showed their different effects on 13-16-year-old students' experiences of mathematics. Amber Hill was categorized as a traditional school, where teaching took place in homogeneous ability groups and was characterised by a focus on textbooks, teacher explanations, practicing

procedures and a strong orientation to exams. Phoenix Park on the other hand, was categorized as a progressive school. Here, students were taught in mixed ability groups where they were given the opportunity to choose and be responsible for their own actions; they worked on open-ended projects individually, in groups or in pairs.

Boaler's accounts of these schools report differences in the way that students experienced mathematics, both in general and according to gender. She noticed that students at Amber Hill, whether boys or girls, were less happy with their experiences in mathematics than students at Phoenix Park. Noticing how girls in general expressed a strong desire to understand when doing mathematics, Boaler observed that this was particularly emphasised by the girls at Amber Hill, who expressed anxiety in an environment where high speed and right answers were given such high value. This was especially expressed by top set female students. In comparison, the girls at Phoenix Park were happier with their experiences in mathematics, because they were able to take time to think and do group work where they could cooperate and discuss. Boaler argued that there were gender differences in students' responses to this teaching style, claiming that girls expressed a desire for understanding which made them 'more sensitive' to it, while boys - who also wanted to understand - turned school mathematics into a competitive game, enabling them to feel happier about being in a traditional learning environment.

Boaler (1997a) argues that her observed gender differences in responses to teaching styles fit with Belenky, Clinchy, Goldberger & Tarule's (1986) concept of 'women's ways of knowing', which is based on Carol Gilligan's (1982) work which suggested that "girls and boys have differential preferences for ways of knowing and subsequent ways of working" (Boaler, 1997a, p.326). Noting that this position suggests that "women tend to value "connected" knowledge which involves intuition, creativity and experience while men tend to value "separate" knowledge which is characterised by logic, rigour and abstraction" (1997a, p.326), Boaler draws on Becker's (1995) application of these ideas to mathematics. Becker argues that women are alienated from the way mathematics is taught in many classrooms, because 'their ways of knowing' are not appreciated/given high value in such a teaching environment. Hence, traditional teaching styles in mathematics "are in conflict with the way women and girls learn [...] more open approaches to mathematics which emphasise problem solving and group work will allow women and girls to engage in mathematics and perform at higher levels" (Boaler, 1997a, p.326).

Different teaching styles produce different identities

Boaler explored the effect of different teaching styles on students' identities as mathematics learner further in her research with James Greeno in the American context (Boaler & Greeno, 2000). Following their observation of advanced calculus classes in six different schools, they identified two kinds of classroom cultures which they called didactic classrooms and process-oriented classrooms. Analysis of interviews with students through the lens of Holland et al.'s (1998) sociocultural theory of figured worlds, and particularly their concept of positional identity, suggested that the two types of classroom fostered different types of identity, as either restricted and conceptual knowers. Although Boaler and Greeno's study did not pay particular attention to gender as such, they also build their analysis on the idea of 'ways of knowing' presented by Belenky, Clinchy, Goldberger, and Tarule (1986), and its concepts of received knowing derived from 'authoritative sources', and subjective knowing derived from 'affective reaction' to information and ideas. Focusing on the students' experiences and belief about mathematics, Boaler and Greeno (2000) consider the different ways of knowing as characteristic of students' responses to classroom culture. They argue that, while students in didactic classrooms tend to develop identities as restricted knowers, discussion-based classrooms foster more positive identities, based on subjective knowing, as conceptual knowers. While this pattern applies to all students, Boaler and Greeno argue that the dominance of procedural teaching in advanced courses in mathematics is 'likely to be a major factor' in the under-representation of women in such courses:

This seems partly to be due to the desire for connected understanding that is evident among many girls and women ..., and partly due to the need to pursue subjects that fit with developing identities. For many girls, mathematics appears too alien, otherworldly, and "weird" to be a major part of their lives (2002, p. 187).

In her review of research on gender and mathematics, Boaler (2002) continues her argument for the importance of investigating classroom cultures in order to understand the issues. Arguing that previous research has tended towards essentialist views which focus on assumed characteristics of girls, she draws on her Phoenix Park and Amber Hill data to make the case that researchers need instead to focus on the culture that students are a part of. Her primary argument is that researchers' earlier claims that girls preferred rote learning approaches were falsified by her evidence: "girls at both schools sought a deep, conceptual understanding of mathematics, and those taught by teachers who encouraged the exploration of mathematical ideas were able to achieve this goal" (p. 134). Instead, she argues, citing Belenky et al.'s (1986)

concept of connected knowing, “the problem for many girls in the past may have arisen because traditional mathematics environments have not allowed a connected, relational understanding” (p. 135). Although this may sound an essentialist claim in itself, Boaler goes on to argue that responses to mathematics are co-produced:

Such preferences, although they were more prevalent among girls than boys, only became significant in certain teaching environments. This suggests that connected knowing may be less accurately represented as a characteristic of women, as it has been in Gilligan’s work, than a response to certain learning situations. The data I collected appear to indicate that such preferences are highly situated and that different approaches to school mathematics vary in the extent to which they encourage and satisfy such preferences (p. 135).

Recognising that these preferences might have multiple origins, Boaler suggests that a major concern is to develop classrooms which do not “preclude the realization of such preferences and turn the preferences of girls into anxiety and disaffection” (p. 136). She thus argues that investigating the teaching setting is of major importance, in order to allow “a situated, relational conception of gender and culture” (p. 140), despite “a fundamental tension in research on equity, as scholars walk a fine and precarious line between lack of concern on the one hand and essentialism on the other” (p.127).

Hannah Bartholomew (2000, 2002) also focused on the impact of classroom environments. Claiming that students’ feelings about mathematics cannot be separated from their experiences of their lessons, and that “these are the starting points from which students locate themselves—and are located by others—as learners of mathematics” (p. 4), Bartholomew subscribes to the same tradition as Boaler (1997a, 1997b, 1997c, 1998, 2002), but she incorporates into her work a recognition of the importance of discourse - that mathematics is seen as a hard and abstract subject, and that those who are good at it are ‘special’ in comparison to others.

Focusing on the role of ability grouping in the development of identity, Bartholomew explored students’ experiences of mathematics from Year 8 until they took their national GCSE examination (ages 13-16) in 6 different schools, drawing on observations, questionnaires, interviews and attainment data. Looking at high ability sets in particular, she noticed how the image of ‘mathematical brilliance’ was connected to effortless achievement, in terms of producing a large number of correct answers in a short amount of time, noting how this resonates with Walkerdine’s work which noted how ‘flair’ were considered more valuable in mathematics than hard work, a view which tends to marginalise girls.

Bartholomew observed that, while many students in high ability groups were likely to say that others in the class were better at mathematics than they were, boys were far more likely to see themselves as very good at mathematics. Like Boaler (1997a, 1997b, 1997c, 1998), Bartholomew claims that girls' desire to understand mathematics makes them more vulnerable to the fast-paced teaching style which characterises these groups; they had "a distinctive top set culture which ... tends to marginalise many of the girls" (2002, p. 6). Bartholomew describes the culture of high ability groups as 'laddish':

insofar as mathematical ability is seen to be associated with not having to work too hard, it is the students whose behaviour is most 'laddish' who are likely to be seen to be best at maths. In this sense, boys (and it is predominantly middle-class boys) who perform highly in top set maths classes are uniquely positioned to combine high attainment with a 'laddish' identity, thus re-affirming, for themselves and others, both their intellectual status and their masculinity (2002, p. 10).

Hence, making a claim to being good at mathematics is easier for boys than girls, and Bartholomew notes the connection with Boaler's (1997a, 1997b, 1997c) findings that boys turn school mathematics into a game. Focusing on the complexity of being feminine and successful in such an environment, she notes that this is exemplified by Tanya, who realises that she must focus on personal progress rather than on competition with others: she needed to "reconceptualise what it meant to be successful, and this involved dismantling the hegemonic male-dominated model of the brilliant mathematician" (Bartholomew, 2002, p. 8). Thus, Bartholomew claims that girls need to play a different game from boys, in order to 'survive' in a traditional teaching environment in mathematics. I return to this issue of masculinity and femininity in mathematics below.

Girls are excluded

The ways in which classroom cultures contribute to shaping students' identities are more closely inspected in Laura Black's (2002, 2004a, 2004b, 2011) work, which focuses on the role of classroom interaction between teacher and students in the construction of mathematics knowledge. Based on an ethnographic study of the mathematics lessons in one year 5 primary classroom over a period of half a year, Black (2002, 2004a, 2004b, 2011) noticed differential access for different groups of students to 'productive talk' with the teacher; she argues that these differences, which corresponded with students' social class, gender and ethnicity, may be linked to a set of social norms that are embedded in the micro culture of the classroom. Drawing on the sociocultural theories of Holland et al. (1998), Lave and Wenger (1991) and Wenger

(1998), together with Bourdieu's focus on practice and cultural capital (Bourdieu & Passeron, 1990; Bourdieu, 1986, 1990, 1991), she aims to understand how these students construct and negotiate identities in practice as they move along "the learning trajectory from novice to experts" (Black 2004a, p. 51). This view enables us to see how

our understanding of pupils' failure to learn should not be conceived of as a problem of cognitive challenge or difficulty of topic/subject, but in terms of an understanding of how the wider politics of class, race and gender impact the classroom's micro-climate and the construction of identities of non-participation (2004a, p. 51).

Black argues that the different opportunities to construct mathematical knowledge which are embedded in the social practices of the classroom lead to inequalities and the development of identities of non-participation in mathematics.

Basing her analysis on Edwards and Mercer's (1987) analysis of classroom talk, Black (2002, 2004a, 2004b, 2011) categorised teacher-student interaction as productive or non-productive talk, noticing the quantity of these types of interactions over time. Her analysis identified four different groups connected to the nature of the classroom talk: (A) middle-class boys who experienced more productive than non-productive interaction; (B) a group of mainly working-class boys, who experienced more non-productive than productive interactions with the teacher; (C) a group mostly including girls, who were rarely involved in any types of interaction, and (D) a group who experienced an even divide of productive and non-productive talk, and which included students who were moving towards typical behaviour in either group A or group B.

Drawing on Bourdieu, Black noticed relationships between the students' social background and identities of participation or non-participation in this classroom, arguing that "cultural capital plays an important role in the process by which pupil learner identities are constructed" (Black, 2004a, p. 49). Expressing participative identities, group A boys drew on their middle-class cultural capital and hence "tapped into the underpinning pedagogic goals of classroom interactions which permeated the teacher's intended meanings" (Black 2004a, p. 40). Group B, on the other hand, behaved "in accordance with the communicative role the teacher accorded them" (p.42), being characterized by high levels of teacher control and an emphasis on 'cued-elications'; hence their access to participative identities was restricted. The group C girls' lack of involvement meant that the nature of their interaction was not possible to judge, but Black argues (2004a, p. 44) that their quietness became their stipulated role in the classroom interaction, with little access to the construction of mathematical knowledge.

While the issue of gender and mathematics was not a particular focus of Black's research, she notes that in this analysis "the gendered nature of the group and the consistency of their behaviour with previous research is difficult to ignore" (2004a, p. 47). Acknowledging that Bourdieu sees gender as secondary to class in terms of the positionality people take up, she notes that "the cultural capital demonstrated by the girls in Group C related to their gendered position within working-class culture and conformed to many of the female stereotypes portrayed in previous research" (Black, 2004a, p.48). Moreover, Black (2004a) notices that, rather than engaging with the girls about mathematics, the teacher "somehow negotiated with these girls a coping mechanism where they stayed silent on the periphery of the classroom in whole-class discussions, but were praised for neatness and presentation elsewhere" (p.49).

Not all the girls in the class fall into group C. For example, Janet, a late arrival to the class, is initially involved in interactions which were similar to those of the middle-class boys in group A. However, being a Chinese girl, her behaviour "was not in accordance with the set of social norms evident in the classroom micro-culture" (Black, 2002, p. 266). Black observes how the nature of Janet's interaction with the teacher changes over time, and argues that the teacher's expectations led her to both 'under hear' Janet's correct answers and to use controlling 'cued elicitation', leading to Janet's final positioning within group C: "the highly controlled interactions she experienced with her teacher led her to a different kind of communicative behaviour on a consistent basis" (Black, 2002, p. 268).

Another girl, Sian, is more closely inspected in Black and Radovic (2018), drawing on a Bourdieusian treatment of capital. Although Sian is publically positioned as a high ability student by the teacher, like the boys in group A, the nature of her interaction with the teacher contrasts with the boys'; unlike the group C girls, Sian participates regularly, but her interactions with the teacher are likely to be non-productive, involving minimally correct answers, which the teacher used to summarise discussion and move on. Thus they argue that Sian works as a 'pace-maker' for the teacher, enabling the boys to continue their productive talk with the teacher: "it is because of Sian's compliance with the teacher's agenda ... that the Group A boys ... were able to engage in more dialogic talk We view this as a form of capital exchange... since it involves using the right kind of input (or response from the teacher) to signal and be recognised as 'high ability'" (Black & Radovic, 2018, pp. 280-281). Addressing the issue of why Sian is excluded from the dialogic talk which the group A boys are involved in, they go on to argue that "in the cultural context of Class 5 W, our analysis indicates that being male (embodied capital) and high ability was associated with a particular form of competence

(contributing to knowledge)” (p. 284). They suggest that being consistently positioned as Sian is may lead her to internalise it over time, to become a more fragile mathematical identity in her later school career. This theme is also developed in Solomon’s (2007a, 2007b) work.

The teacher’s role in how female students are positioned in mathematics is also explored in a study of Australian teachers’ views by Jaremus, Gore, Prieto-Rodriguez and Frey (2020). Echoing Walkerdine’s phrase, they claim that high-achieving female students seem to be ‘counted out’ by their teachers. In their analysis of teacher’s descriptions of students taking post-compulsory calculus studies in years 11 and 12, Jaremus et al. (2020) noticed gendered views in the ways in which teachers categorised them, with potential for excluding female students from the highest levels in mathematics. Taking a discursive approach and building on Foucault’s (1970) concepts of categorisation, category maintenance, normalisation and naturalisation, Jaremus et al. (2020) analyse the gender constraints which operate within compulsory mathematics, examining how ‘what seems to be taken for granted’ is manifested in teachers’ talk, illuminating the narrow range of possibilities for girls to be “legitimate participants within the senior secondary mathematics classroom” (2020, p. 223).

Among their sample of 22 teachers (12 women and 10 men), Jaremus et al. (2020) identified three dominant categories: students who were seen as gifted, characterised by their perceived natural ability, speed and achievement; students who are seen as ‘dedicated’, characterised as hard working; and students who were seen as utilitarian, having specific career goals which required mathematics, and which were mostly ‘masculine’ careers. Noting that these subject positions “were not equally available to girls and boys” (p. 226), Jaremus et al. (2020) noticed that the utilitarians and gifted groups were predominantly connected to male students, while the dedicated group was mostly associated with female students. Thus “each position produces a different ‘norm’, privileges different students (...) and renders different possibilities for girls and boys to be members of the high-level mathematics student category” (p. 231): the ‘naturalisation’ of mathematics as masculine (and requiring a male brain) excludes girls from the giftedness subject position, whereas the normalisation of effort makes the dedicated position available to them and the utilitarian position is available as long as they can subscribe to the normalised aspirations to male-dominated careers. Citing Butler (1990), Jaremus et al. (2020) note that the giftedness subject position is most damaging to girls, since it functions as a powerful dividing practice through the invocation of nature, premised on the false gender/sex duality (...) thus setting limits on girls’ participation in mathematics from the outset” (p.231).

Drawing on Foucault, Jaremus et al. (2020) note how these categories go beyond teachers' talk and the classroom. Even though not all the teachers expressed gifted discourse views, instead saying that they saw 'hard work' as an important characteristic of students the high level group, this effort to challenge the categories of high-level of mathematics were not enough: "the network of power relations in which mathematics is caught often thwarted the teachers' attempts to produce mathematics as a subject for all, with teachers lamenting how powerful naturalising ability discourses often submerge notions of effort" (Jaremus et al., 2020, p.231).

Developing identities of exclusion and inclusion: marginalised identities

The issue of unequal access to the discourse of mathematics learning is further explored by Yvette Solomon (2007a, 2007b, 2009). Aiming to develop an understanding of why many students fail to develop positive relationships with mathematics, she draws on socio-cultural theory (Holland et al., 1998; Lave & Wenger, 2001; Wenger, 1998) to explore how students are positioned and self-position within the dominant discourses of mathematics education, and its impact on their construction of the meaning of mathematics. Set in England, her work observes how girls at secondary school are more likely to find themselves in the margins of the discourse of learning mathematics, participating less than boys (2007a), in a pattern which persists even at undergraduate level (2007a, 2009).

Solomon (2007a) investigates how secondary school students aged 13-15 experience mathematics classes in different ability groups, the dominant mode of teaching organisation in England at the time. Interview data revealed differences in the way students in different ability groups experienced mathematics: 'top set' students reported that they received more intellectual challenges in the classroom through problem solving and working with others; they were aware that this way of working offered a more creative view of mathematics with the teacher acting as a resource. In contrast, lower set students reported working alone with the focus on drill and exercises, describing mathematics as ritualistic and concerned with finding the easiest way. Solomon found that students in top sets generally expressed a more participative identity, while students in lower sets expressed more marginalised identities. However, she also noticed that girls in top sets often described marginalised identities in ways that were more common among students in lower sets. While top set students described how working at speed was a typical feature of their groups, Solomon (2007a) noticed that girls in these groups felt unable to work at the speed that was required in order to feel successful. She also reports sharp gender differences between two high-performing students on an accelerated pathway concerning perceptions of their own ability: while the boy was happy to describe himself as above average,

the female student described herself as just 'quite good'. Solomon (2007a) argues that even when top sets girls are able to experience the joy of investigative mathematics and finding important connections, they lack the identity of participation that top set boys easily express, concluding that gender is a crucial factor in the development of a participative identity in mathematics, and is a product of both pedagogy and discourse.

That girls seem to develop a more marginalised identity as learners in mathematics, even though they are good at it, is further explored in Solomon (2007b) in interviews with undergraduate mathematics students in their first year at three different universities in England. Even though these students had chosen to study mathematics, and therefore have some sense of self-conception that they are being able to do mathematics, Solomon notes that they may doubt their ability, and develop identities of exclusion, rather than inclusion; they may feel that they don't have a genuinely participative role in the mathematical community. Although this may be the case for all students, Solomon argues that this seems to be more common among women studying university mathematics, than men.

Drawing on Wenger's (1998) concept of communities of practices and focusing on students' relationship to mathematics within both their immediate undergraduate communities of practice and the wider mathematics community of practice, Solomon (2007b) notes that most of the students expressed a lack of control over their mathematical knowledge, focusing on ritual learning for right answers rather than understanding and leading to a marginalised identity in which their learning could fail at any time. Their talk about mathematics revealed fixed ability beliefs that were 'confirmed' by university pedagogic practices and institutional structures: students experienced mathematics as hard and finished, as something which didn't enable them to be creative. These practices supported a 'binary attitude' to whether they could do mathematics or not, in terms of natural ability and mathematical talent, which was expressed by working at high speed and scoring high marks. Solomon (2007b) argues that these beliefs fostered the idea that wanting to understand was problematic, and that one was always at risk of having 'reached the limit', leading to a feeling of exclusion from knowledge construction in the mathematics community.

Although Solomon (2007b) found that the majority of the students said that they didn't see themselves as "potential negotiators of meaning" (p.90), she also noted gender differences in their response to institutional practices of mathematics. Male students felt more on 'home ground' in the climate of reward for right answers produced at high speed, while female students, who expressed a wish for understanding, felt 'out of their depth'. They also expressed

a wish for more collaborative working in groups, because the usual teaching setting made them feel exposed, and wary that their contributions might be seen as too simple. Consequently, Solomon argues, an identity of exclusion is more strongly expressed by female students; students' (self)positioning is more than simply a product of the pedagogical practices within a classroom culture. Students' identities and their relationships to mathematics are also shaped by their membership of wider communities of practice, in this case their aspirations to be part of the professional mathematics community. Hence, she argues that "undergraduate mathematics identities need to be understood in terms of the interface between different practices, some of them diametrically opposed or contradictory" (Solomon, 2007, p.82).

Phase 3: 'Recognising' mathematics as a male domain: the power of discourse and the need for identity work

A major shift in the research field of gender and mathematics appears with Heather Mendick's research that aims to understand more about girls' experience of school mathematics, and its relation to girls' choices in the later years of school, when significantly more boys choose to study mathematics. In her investigation of students who choose to study mathematics beyond the age of 16, when it is no longer compulsory in England, Mendick (2005a, 2005b, 2006) argues that mathematics is experienced as a male domain, in which female students need to do a great deal of 'identity work' in order to continue. Her work combines a focus on identity with recognition of the power of discourse, introducing some of the key ideas in this phase, particularly that of self-protection, and self-policing.

Mendick (2005a, 2005b, 2006) follows the tradition of investigating the challenges for girls by focusing on the context of mathematics teaching. But she 'pushes the field on' by arguing that the process of making choices is influenced by more than classroom teaching and learning cultures; additional influences are the gendered discourses of "three clusters of socio-cultural stories (...) of enlightenment rationality, of socially incompetent mathematicians and of heroic mathematicians" (Mendick, 2005a, p. 213).

Thus, Mendick claims that mathematics is different from other subjects in that it gains power from the way in which it signifies the intellect and acts as a filter for students' access to high status education and employment. She argues that part of this power lies in the way in which the discourse of mathematics is characterized by a binarized system of key features of inter-related options, exemplifying this with a list, including maths people/non-maths people, fast/slow competitive/collaborative, independent/dependent, active/passive, naturally

able/hardworking, real understanding/rote learning, reason/calculation (Mendick, 2005b, p. 212). Although the list can be extended, the point is that

in each pair the two terms are unequally valued, and the term with the higher value is associated with masculinity and the second with femininity. The underlying logic of this background means that new pairs are easy to incorporate into what is a mutually reinforcing system (Mendick, 2005a, p.213).

This binarity of the discourse of mathematics carries both possibilities and constraints; the combination of gender discourses with the social practice of mathematics leads to a ‘natural’ fit between masculinity and mathematics. Drawing on Foucault, Mendick argues that “it is within a range of discourses as maths, femininity, masculinity, schooling, among other things, that each person's educational choices and experiences come into being” (Mendick, 2006, p.18).

Inspired by Walkerdine’s poststructuralist work on gender, choice and subjectivity, Mendick sees identity as “something always in process and never attained and so as requiring constant effort” (Mendick, 2005a, p.205). To capture this point, she introduces the term ‘identity work’ which ties the ideas of gender, mathematics and choice together, and which importantly recognises identity as a process and a verb, in contrast to Boaler’s fixed and static state view of identity.

In her study of students aged 16-19 taking post-compulsory mathematics in England, Mendick (2005a, 2005b, 2006) found that only a small minority of students described themselves as good at mathematics, all of them boys. Contrasting the boys’ and girls’ narratives of self, she found that whereas boys’ narratives were about claims to natural ability, the girls focused on denial of having a natural ability for mathematics. Analysing the ways in which the students draw on the binaries embedded in discourses of mathematics to describe themselves and others, she explores the tensions in girls’ talk about themselves as students studying further mathematics, beyond the compulsory years. Thus she notes (2005a) that it is difficult for these girls to take up a position as mathematically successful, instead playing down their mathematical ability at the same time that they describe a fear of not understanding; dominant discourses “inscribe mathematics as masculine and so it is more difficult for girls and woman to feel talented and comfortable with mathematics and so to choose it and do well at it” (pp.216–217).

In order to combine femininity with mathematics, girls need to do a large amount of identity work as they navigate the discourses of gender and education at the same time, drawing on available resources, constraints and possibilities within these discourses to construct identity (Mendick, 2005a, 2005b, 2006). But the role of discourse means that no choice is free, and Mendick (2005b, 2006) claims that “doing mathematics is doing masculinity”. Understanding

girls' reluctance to participate in post-compulsory mathematics means being aware of the identification patterns within the discourses of schooling and gender that produce girls' choices and performance in mathematics. Equal access to mathematics study, Mendick (2005a, 2005b, 2006) argues, requires that mathematics needs to be opened up, with a recognition of other ways of being mathematical.

How to 'survive' as a female student in the male domain

Driven by similar concerns to Mendick's, Melissa Rodd and Hanna Bartholomew (Bartholomew & Rodd, 2003; Rodd & Bartholomew, 2006) document women's experiences of studying mathematics in two British universities, noting that even though they may gain the same examination results as boys, this doesn't mean that there are equal opportunities within the mathematics discourse; women are seen as equal but different.

Using a narrative approach to explore students' "presentation of particular versions of themselves" (Rodd & Bartholomew, 2006, p. 38), Rodd and Bartholomew found that female students' anecdotal physical invisibility in the teaching setting also emerged as a theme in their narratives: "we began to regard this invisibility not simply as something that was imposed upon the young women we were studying (...), but also as something they actively took up as a defence" (p.39). The young women talked about how they were uncomfortable showing their ability or being pushed by the lecturer to respond to questions in class, to the extent that one student was "embarrassed, almost ashamed, by her contributions in lectures, and seems to shrink from anything that might draw attention to herself, even as she achieves her first class degree" (p. 45). Bartholomew & Rodd (2003) argue that this 'fiercely held modesty' is a form of self-protection within the range of available, gendered, subject positions (p. 17).

Although invisibility and discomfort were dominant themes in the interviews, it was also the case that women who were studying advanced mathematics storied themselves as special, often drawing on themes from early childhood, where an "early identity was embossed with a self-conception as mathematically superior, special, chosen" (Rodd & Bartholomew, 2006, p. 41). In comparison, male students' narratives contained no trace of such a specialness, being more concerned with their current confidence and the quality of the mathematics. Like Mendick, Rodd & Bartholomew (2006) note the easy fit of mathematics and masculinity, and how girls who continue to do mathematics are required to do identity work in order to combine femininity with mathematics.

Similar issues are discussed and further nuanced in Fiona Walls' (2009a) work. Like Walkerdine and Mendick, she builds mainly on Foucaultian theory, focusing on how discourses of power, knowledge and truth create and support social structures and how subject positions are produced within discourses of gender and mathematics. She thus sees individuals as discursively produced through social interaction, and the self as constituted within the discourse, enabling an elaboration on how discourses affect the ways female students act, and how they make choices as mathematics students.

Walls (2009a) aims to give children a voice in the debate about mathematics learning, to develop an understanding of how they become 'mathematical subjects' and what this means for their participation and achievement as mathematics learners and their lives. She reports on a longitudinal study following children over 10 years from the age 7-16, investigating their experiences as mathematics students through their own and their parents' stories.

Walls' analysis identifies gender differences in the way students express their response to mathematics and its effect on their learning and performance. While both girls and boys report that they find mathematics 'boring', girls seem to drop out of mathematics, boys don't. Girls tended to describe mathematics as hard and something they don't really need, whereas boys described mathematics as irrelevant, but added that choosing mathematics is a way of keeping the doors open for future ambitions. Walls (2009a) argues that this pattern relates to girls' experience of mathematics as closely connected to masculinity not only in classroom cultures, but also within the social patterns in their everyday life.

Against this background, Walls (2009a) claims that girls and boys engage in mathematics as 'gendered subjects', drawing attention to the gendering of mathematics ability and activity. She argues that the "deeply embedded discursive alignment of mathematics and masculinity producing boys and girls as masculine/feminine mathematical subjects whose occupational subjectivities were shaped according to the subject positions such discourse allowed" (Walls, 2009a, p. 245). Moreover, Fiona Walls argues that girls and women in mathematics "are required to don a cloak of invisibility that affords them temporary status as honorary males in a male domain" (Walls, 2009b, p.47).

'Clever girls' within the discourse of a high ability mathematics classroom

The role of discourse in students' (self)positioning and their take-up of particular identities in mathematics classrooms is further explored in Foyn, Solomon and Braathe's (2018) study of girls in a Grade 10 high ability group in Norway. Foyn et al. (2018) observe that even though

the female students in this group perform at the highest level, only one wants to continue studying mathematics beyond the compulsory years. Addressing Norwegian policy which aims to enhance girls' participation by encouraging schools to organise students in high-achieving groups, they argue that, in fact, girls who are good at mathematics are trapped within a gendered discourse of mathematics learning, in which they both 'police' each other and 'self-police' in order to (re)enforce particular 'feminine' behaviours.

Drawing on Holland et al.'s (1998) framework of figured worlds and Jørgensen and Phillips' (2002) concept of 'discourse order' to analyse observations, focus group interviews and individual interviews Foyn et al. (2018) find that femininity intersects with mathematics ability in this high ability classroom, with specific rules for how female students are supposed to act within this local context. Being good at mathematics and being a girl seems to be accepted as long as they do not act their 'cleverness' out in obvious ways. Girls' self-authoring within the discourse order left them balancing on 'a knife edge' as they focused on maintaining their positionality as good in mathematics at the same time that they ensured they did not cross the line by acting in ways which were acceptable in boys, but not girls: performing 'natural ability' and competitiveness. While it was acceptable in this classroom for girls to be good at mathematics, acting this out in 'visible' ways would not pass unnoticed, and it would be condemned. Like Mendick (2005a), Foyn et al. (2018) notice the importance of the figure of the 'nerd'. In this classroom, the students position themselves and others in relation to this figure, despite the fact that it is a 'known, but undefined' label, circulating in conversations, but never clearly defined.

When this figure becomes embodied in one of the girls, who is seen to be 'crossing the line' by making it 'more obvious' than the other girls that she is good in mathematics, the girls author themselves in relation to 'the nerd', focusing on how they are different from the nameless 'girl they call a nerd' and blaming the boys for giving her this particular label. Taking the role of someone the other girls can 'hide' behind, her existence in this group enables the rest of the girls to 'survive' as good at mathematics as they distance themselves from her.

The identity work these girls need to do is seen in the complex of the way they navigate within the discourse, aware of the gaze of others, and operating as discourse 'border guards' who control the lines of the 'allowed' acts that combine being good at mathematics with femininity. Claiming that 'the nerd' has chosen to act in this way, they seem to be unaware that they themselves contribute to her positioning, and its excluding effect.

Phase 4: Alternative narratives: resistance, refiguring, agency and the possibility of change

Like Foyn et al. (2018), Radovic, Black, Salas and Williams' (2017) study of three 13-14 year-old high achieving girls who describe mathematics as their 'favourite subject' situates the development of mathematical identities in the context of peer clusters which are themselves nested within the classroom culture. Noting how Choudry, Williams and Black's (2016) work saw friendship and peer relationships as forms of capital, they argue that these may also be a "source of identity ... constructions of *who we are* may have an impact on notions of *who I am in relation to mathematics*" (Radovic et al., 2017, p. 437, original italics).

Drawing on Holland et al.'s (1998) framework of figured worlds, they explore identity as "a dialectical relationship between narrative stories and forms of participation or acts" (p. 437), in which 'others' - including peer clusters - play a central part. Following their nested model of identity, Radovic et al. analyse the cases of three working class girls who belong to three different peer clusters in the classroom, drawing on observations, group and peer-cluster interviews, as well as individual narrative interviews to develop an overall picture of each girl. Even though all three were high achievers and described mathematics as their favourite subject, they differed in the way they developed and negotiated their mathematical identities, in accordance with their peer cluster membership - <mature, hyper feminine, popular>/<'Korean', 'weird', loyal>/<'normal', quiet girls, loud and childish boys> - and a variety of stances on mathematics - as effortless/effortful, as a natural ability, as different, as male - and in terms of what they valued about doing mathematics - independent and collaborative, wider and complex, straightforward and procedural (p. 449).

Radovic et al. hypothesise that the first girl's membership of the mature hyper feminine group who rarely participated in classroom discussion, and her self-positioning as an effortless achiever, is a result of her positioning of the boys in the group (who are older and held back in grade) as 'having difficulties'; consequently, she did not hold the cultural model of masculine natural ability in mathematics. Hence there was no conflict with her identity as female, only a potential tension between mathematics and 'normal life' in the sense of her perceived need for a future career which would not interfere with her projected role as a wife and mother (p. 452). As a member of the 'weirdo' group, the second girl was positioned as having a positive relationship to mathematics because of her interest and active participation in mathematics, rather than any association with ability. Radovic et al. (2017) suggest that she constructed her mathematical identity on the fact that she was different, and that mathematics is different; her

engagement with it involved going beyond correct answers to its wider complexity. Hence, they argue, she showed ‘high levels of consistency between her acts and narratives’, based on her membership of the group. The third girl belonged to the ‘normal’ group, where the girls were quiet. She saw herself as not having natural ability, this being something that only a few male students had: her positive relationship with mathematics was due to her effort. While Radovic et al. do not notice tension in the first two girls’ negotiation of their mathematical identities, they do see conflict in this case in terms of a tension between what was expected of her and the cultural models available in the classroom culture. She resolved this conflict by positioning herself as ‘responsible’, in contrast to boys, and enacted a ‘compliant approach to mathematics’:

It was not only she who struggled in mathematics but all women, and she struggled because the teacher was not able to simplify math enough. In other words, the relationship that Katia had with math and the emotional states that emerged from it were heavily mediated by gender oppositions and by the teacher’s scaffolding (p. 456).

Taking up Gutiérrez’ (2013) stance against essentialism, Radovic et al. (2017) conclude that “peer relations had a central role in mediating each girl’s [mathematical identity]” (p. 457), demonstrating that there are alternatives available for high achieving girls other than taking up the ascribed positions connected to traditional femininity. The negotiation of such identities within peer groups means that they may exist, including on the margins of classroom culture.

The role of peer groups in the production of gender roles within a classroom culture is also investigated by Mary Barnes (2000) in her ethnographic study of a class of high-achieving year 10 students in an Australian independent school. Focusing on “the interaction of student gender, the social construction of mathematical competence, and ways in which mathematics is valued” (p. 145), she investigates different subgroups among the boys in the class and the impact of their actions on their own learning and that of the rest of the class.

Whereas Radovic et al. (2017) focus on girls, Barnes (2000) focuses on two male subgroups in this classroom, ‘the Mates’ and ‘the Technophiles’. She reports that these are the only discernible subgroups in the class, and that, although she observed different characteristics among groups of girls (for example quiet and studious versus active and outspoken), in terms of their general presence in the class “the girls seemed to operate as a single group” (p. 159). Barnes (2000) describes the Mates’ strong physical presence in the class, and their ability to easily claim the teacher’s attention, and to interrupt her. The group was competitive and bragged about their success, acting confidently during group work with other students and communicating with each other across the classroom through eye contact and comments on

irrelevant topics. Often, Mates members took a leader role in groups, displaying obvious boredom when another student took this role, paying attention only when the teacher approached the group. Even though they outwardly displayed an attitude of not taking work seriously, they took the issue of marks very seriously, claiming unfairness and arguing with the teacher if their marks were not as good as they anticipated. The Technophiles contrasted with the Mates, being more isolated in the classroom and not claiming the attention as they worked. They had a strong common interest in computers and STEM careers. In group work the Technophiles were concentrated and aimed to find solutions as quickly as possible. Barnes (2000) finds that they tended to be used by other students as an 'expert resource', although if two were together in the same group, they tended to communicate through 'cryptic remarks' which were difficult for others to follow. They appeared to be unaware that this excluded them, and Barnes notes that they claimed to enjoy mathematics because of its logic and as an individual activity; unenthusiastic about collaborative working, they expressed a sense of superiority to the others.

Barnes' analysis focuses on the concepts of 'hegemonic masculinity' (Connell, 1989; Mac an Ghail, 1994; Walker, 1988) and masculinity as performance (Johnson, 1997). Emphasising that hegemonic masculinities vary according to context, she notes that the masculinity of the Mates was based on sport, as in Mac an Ghail's and Walker's working class groups, "but unlike them, the Mates were neither underachieving nor antischool, but able and ambitious. They established their sense of identity through the school, by identifying strongly with the values of the school, and engaging in a wide variety of school-related activities" (p. 163). They used movement, gestures and tone of voice, and testing the teacher's authority as acts that established and maintained both their membership of the group, and the group's position, within the class. In contrast, the Technophiles displayed "a more rational form of masculinity" (p. 163). Seen as 'a bit weird' or 'uncool' by the other students, "their status in the class was established through the mediation of the teacher, who encouraged them to explain their ideas to the class and praised them when they showed insight or developed "good" solutions to problems" (p. 163). Compared with the Mates, these boys kept their thinking to themselves, and Barnes (2000) notices how they easily described each other as very clever - "they maintained their belief in themselves, and their sense of superiority, by competing to be the first to solve a problem, and by acknowledging one another's ability" (p. 163). Concluding, Barnes notes that most studies of mathematics learning "have treated boys as a homogeneous group, whereas studies of the construction of masculinities have focused on schooling generally rather than specific subject

areas. The results reported here (...emphasize the importance of taking into account socially constructed versions of masculinity and femininity when studying students' behavior in the mathematics classroom" (pp.166-167).

The issue of challenging binaries in gender performance is highlighted by Becky Francis (2012). Drawing on Bakhtin's (1981) theory of dialogism and heteroglossia, she draws on a study of gender subjectivity among high achieving secondary school students in England to show how "the monoglossic, binary account of gender operates to mask and pathologise heteroglossia; yet how heteroglossia nevertheless exists in all productions of gender" (Francis, 2012, p. 1). She argues that, in order to challenge the dominant model of gender binaries and the monoglossic 'truth' which underpins it, we need to not only accept those 'who don't fit' but also recognise that gender is produced within local contexts. Researchers need to

recognise the ways in which individual productions of gender are shot through with contradiction, and incorporate both aspects of performance generally understood as 'masculine' and 'feminine'; and further, how these productions of gender are performed within local socio-economic environments and to specific audiences, to signify in particular ways within a binarised, 'monoglossic' gender system (2012, p. 3).

While not solely concerned with mathematics classes, Francis' original study (Francis, 2010; Francis, Skelton & Read, 2010) analyses how gender is played out in the classroom, focusing on students who combined popularity with strong academic performance. Their analysis identifies how, for example, one of the most popular girls achieved a classroom subjectivity by combining the 'masculine' characteristics of 'assertion, confidence and resistance' with an "overall production of 'girling'(...) achieved via the performance of *precocious femininity*" (Francis 2012, pp.10-11, italics in the original). Francis notes how other girls also employ "hyper-feminine motifs of femininity (...) to balance productions of high achievement and femininity by deflecting or mediating their production of 'clever'" (p. 11). Another girl, who also does not fit within the monoglossic system of gender due to her high achievement in the traditionally masculine curriculum area of mathematics, science and ICT, is "highly invested in the heterosexual gender matrix" (p. 11) in her comments on how girls and boys should behave in order to be popular. Francis argues that her performance illustrates gender at play beyond the monoglossic account of gender, not as "female masculinity", but as gender heteroglossia. Importantly, Francis (2012) sees heteroglossia as not temporary, but "integral within all production of subjectivity" (p.10); heteroglossia "is manifest at least to some extent in all gender performance" (p.12). The form that this takes depends on context:

different signs in the gender matrix, even those which appear most clearly binarised as expressing masculinity or femininity, are prey to heteroglossic re-signification depending on the local discursive arena, and the discursive inscriptions applied to the bodies within it (p.10).

Developing new ways of being: resisting binaries and the negotiation of agency

These analyses of gender performance in the classroom, and in particular Radovic et al.'s (2017) suggestion of alternative ways of being a mathematical girl, move the field on from a focus on how girls merely 'survive' to a new theme that allows a more optimistic view: they may resist dominant discourses of gender and mathematics and refuse to take up a lesser position - it is possible to refigure relationships with mathematics. Research in this phase concerns how individuals negotiate agency within discourses that carry both constraints and possibilities, making it possible to understand how students can act in diverse ways rather than just following predetermined trajectories. This emphasises a recognition of anti-essentialism: we do not need to assume that all boys and all girls are the same, while the idea of agency makes it possible for female students to follow 'unpredicted' trajectories and become female mathematicians with positive identities. It is possible to achieve change in their uneven access to agentic positions as mathematics students, but research suggests that this requires awareness, consciousness and collective movement.

Addressing earlier reports of university students' disengagement with university mathematics (see Brown & Macrae, 2005), Solomon, Croft and Lawson (2010) studied students' experiences of mathematics support centres set up to provide one-to-one support from tutors at two different English universities. Drawing on focus group interviews, they report that the students' 'colonisation' of the physical space provided by the support centres led to positive changes in their relationships with each other, with their tutors and with mathematics. Drawing on Holland et al.'s (1998) theory of figured worlds, Solomon et al. (2010) suggest that the support centres offered a change in the students' positionality, leading to a stronger sense of their ownership of mathematics and to "a more participant identity" (2010, p. 427). The experience caused these students to reflect on and resist the ways in which they were normally positioned, with a possibility of refiguring a previously competitive and individualistic undergraduate community.

The idea of resistance to ascribed positionality in the discourse of mathematics learning and the possibility of refiguring relationships with mathematics is further developed in Solomon, Lawson and Croft (2011). Exploring the idea of a 'fragile identity' where "learners may be

successful in mathematics but nevertheless see themselves as existing only on the margins of the practice, or as lacking stability in it” (p. 1), they investigate students’ experiences of ascribed positionality and identity in three English universities. Exploring questionnaire and interview data on students’ relationships with mathematics, Solomon et al. explored patterns revolving around three themes: relationships with tutors, gender roles in the learning context and perceptions of legitimacy and understanding. They found gender differences in how men and women experienced their university mathematics classes.

The data showed that both male and female students were unhappy with their relationships with tutors, but male students were more positive than female students. With respect to gender roles in the learning context, the data showed that women were more positive towards group work and more negative about asking questions in the class. Moreover, the female students reported that they were less confident in their own ability, and they were more likely to express a need for understanding in order to feel successful in mathematics. Although both male and female students said that they were happier learning mathematics before they went to university, the male students were more positive and confident about their university experiences with mathematics than the female students.

Reporting further on the same support centres as in Solomon et al. (2010), Solomon et al. (2011) note that female students were more positive about using the centres than male students, because they felt less exposed and interactions with tutors were more positive. There were greater opportunities for collaborative working. Hence, Solomon et al. (2011) suggest that students who expressed a ‘fragile identity’ - as marginalised in the usual undergraduate practices of mathematics - were given an opportunity to act in accordance with their beliefs of what it meant to be mathematical by the use of the support centres. This enabled them to resist the ascribed positionality of gender and ability discourses which were often embedded in the discourse of traditional teaching of mathematics, and to take up empowered positions in the discourses of undergraduate mathematics teaching.

The idea that female students may resist and refuse the fragile identities that are offered in the combination of dominant gender and ability discourses is explored by Solomon (2012), who elaborates further on the way in which resistance may lead to a change in what may be seen as automatic and usual behaviour for female students in mathematics. She focuses on the nature of reflexivity in students’ accounts of their experiences with mathematics, exploring its role in the potential challenge to ascribed positionality in university mathematics, and the creation of new spaces of identity. As Solomon (2012) says: “In this account, the reflexivity which

accompanies “ruptures of the taken-for-granted” becomes not only a source of resistance but also of alternative visions” (p. 176).

In this study, Solomon takes a narrative approach, investigating the experiences of two female postgraduate students. One of them, Roz, has already been introduced in Solomon (2009) and Solomon et al. (2010, 2011), in which her accounts of her experiences of doing undergraduate mathematics revealed her resistance and refusal to ascribed positionality, and how she refigured her relationship to mathematics. Analysing the two students’ narratives through the lens of Holland et al.’s (1998) figured worlds framework and its roots in Bakhtin’s dialogism, Solomon explores the nature of reflexivity in their self-authoring as successful mathematics students “focusing on the inevitable multivoicedness of their stories, and its role in reinforcing and/or challenging the figured world of mathematics and the identity positions that it affords” (Solomon, 2012, p. 176).

Roz’ story is important in enabling an examination of how far reflexivity contributes to change. She tells a story of struggling with mathematics and challenging the dominant discourse which emphasises grades and competition. She stories herself as a member of a collaborative group of women who raise a counter-voice to the traditional values which are associated with success in mathematics, and are most often connected to masculinity. However, a conflicting voice emerges in Roz’s description of herself as ‘having a male brain’ because she is good at mathematics, thus apparently supporting the same idea that “doing mathematics is doing masculinity” that she claims to contradict. Solomon argues that such conflicting voices are indicative of Roz’ struggle to find a space in which she can be both a woman and a mathematician. Thus, while Solomon doesn’t find a clear link between the “reflexive accounts of gender and ability and a change in the (self)positioning of women in mathematics” (2012, p.181), she argues that recognising the inevitable existence of multiple voices indicates that there are possibilities for creating new meaning: “‘figuring it otherwise’ is still on the agenda” (2012, p.182).

The idea that individuals may be able to negotiate agency within a discourse, and that female mathematics students may follow unexpected trajectories is pursued further by Solomon, Radovic and Black’s (2016) analysis of a further interview with Roz, three years later in her career, and now in a post-doctoral position. Focusing on how Roz stories her past, present and future pathway of struggle towards ‘becoming a female mathematician’, they emphasise the significance of contradictions in her enactment of a leading identity (Leont’ev, 1978) of being both feminine and a mathematician as part of ‘figuring it otherwise’.

Continuing the overall theme in Roz' story of becoming a mathematician 'against the odds' as both a mature student and a woman, Solomon et al. notice the contradictions in Roz' talk between binary statements - women are more socially oriented and empathic, men are analytic 'systematisers' (which is required for mathematics) - and a feminist stance - "you don't have to give up being female to be a mathematician" (p. 62). However, Solomon et al. note that, in contrast with her earlier struggle to reconcile these conflicting ideas, Roz reflects on the contradiction, focusing on her concern to combine her femininity with doing mathematics by being well-dressed in skirts and heels when she is lecturing. They argue that Roz sees other female mathematicians as compromising their femininity in their dress and actions in order to fit into a masculine world, whereas she "has chosen to be different—to enact a different kind of mathematical identity, which retains simultaneously a strong and visible femininity... Roz is in the process of producing a new hybridised identity out of the contradiction she has experienced and observed" (p. 63).

Using terminology from Holland et al. (1998), they suggest that Roz's expression of the "hard won standpoints" in her story, of overcoming her struggles to become a mathematical woman and 'prove them wrong', enables her to enact a new and a sustained hybridity, drawing on resources from her personal history alongside her imagined future: "Roz finds in academia an imagined space which is resourced by—but also continues to resource—her motive for engaging with mathematics" (p. 66).

This imagined space is also supported by Roz' current activities where she can enact her femininity, rather than compromising it; she talks about being the person in the mathematics department who can take care of relational issues, and how she can use mathematics to help people. Solomon et al. claim that "Roz's story is not just about herself but also about how overcoming contradiction impacts and changes the social structures which created the contradiction in the first place—it is an account of world-making" (2016, p. 67). Importantly, they point out, "this "world making" is not just narrated but is lived in practice through Roz's and others' actions. Without those actions the practice itself cannot change, but at the same time—as Roz realises—she cannot be what she wants to be without wider structural change" (p. 68). Connecting this to the theme of gender and mathematics, Solomon et al. point out that Roz is aware that it is not just about overcoming old contradictions; there will be new battles to fight in order to be a woman in mathematics.

Like previous studies which have noted that discourses carry both constraints and possibilities, and that there is room for change, Solomon et al. (2016) point to the role of contradictions in

hybridity and world-making. They emphasise that this is not a question of a change towards a “feminised mathematics” or a “mathematised (masculinised) woman” (p.69) but, rather, a change towards “recognition of and reflection on such contradictions” (p.70). These ideas are pursued in Black, Solomon & Radovic’s (2015) analysis of the role of ‘caring’ in Roz’ narrative, in which they argue that ‘caring’ is a cultural resource for Roz that contributes to her vision of what it is possible to do and to achieve.

As in Solomon et al. (2016), Roz’s talk about caring is important in order to negotiate the contradictions in her story of struggle. However, Black et al. argue that it also influences her construction of mathematics activity itself. While Roz recognises the popular perception of a gendered division between ‘people friendly’ applied and ‘real’ theoretical mathematics, she sees herself as capable of both, rejecting the idea that they are mutually exclusive. Thus Black et al. suggest that Roz does not simply engage with mathematics by enacting a feminine ‘caring for others’. Rather, Roz “envisages herself as changing the content of mathematics itself so that the traditional gendered and excluding binary (male – pure mathematics vs female – applied mathematics) no longer exists” (Black et al., 2015, p. 1569).

Black et al. (2016) notice how the cultural resource of caring may work towards a positive relationship with mathematics, mediating the view of what mathematics is and what it should be. Drawing a line back to Walkerdine (1989/1998), who argued that ‘caring’ played a role in marginalising girls and women in mathematics, they argue that their analysis of Roz’s narrative shows that change is possible, and that “Roz’s approach to mathematics can ultimately challenge the structures which define its status as a powerful gatekeeper in maintaining wider social divisions of class and gender” (p.1569). There are alternatives to the binaries of femininity and masculinity in mathematics.

Where are we now?

This literature review has tracked how the research field of gender and mathematics has moved and changed character over time from a focus on *differences in achievement* to a focus on students’ *experiences of* and *relationships with* mathematics. It has shown that a major shift within the research field was the transition from investigating girls’ ‘*under-performance*’ to investigating the reasons for their *under-participation*, focusing on the issue of equity and equal access to privileged positions within the world of mathematics teaching and learning. The field has moved from searching for reasons for challenges located inside of girls to recognising the importance of the discourses of mathematics teaching and learning, and cultural models of

mathematics. As we have seen, these discourses are infused with opportunities as well as constraints, and research on gender differences in mathematics has moved over the years to recognise the role of local groups in mathematics trajectories, and of the collective in possibilities for change.

There are a number of important ‘lines’ in this moving field. With the arrival of the ‘social turn’ in research on mathematics teaching and learning, participation in mathematics as practice and the role of discourse in students’ experiences of and relationships with mathematics became a major concern. As Darragh (2016) emphasised, the social turn was followed by an ‘identity turn’, and this was reflected within the field of gender and mathematics too. As in her review, and those of Graven and Heyd-Metzuyanim (2019) and Radovic, Black, Williams and Salas (2018) have shown, there is no general agreement on a theoretical approach to identity. However, although Darragh (2016) and Graven and Heyd-Metzuyanim (2019) call for more agreement and coherence in how to conceptualise identity, I will argue here that the diversity within the field can be treated as something positive, that it enables a dialectic movement of the field. In this review, we can see how, as a key concept within the field from phase 2 to phase 4, researchers’ use of the idea of identity has moved from a more individualist and static conception towards an approach in which individual and context are mutually constitutive and fluid, with new emergent understandings. In the spirit of Bakhtin, plurality can be considered as a good, and forcing a single account is not necessarily productive. This is perhaps more in line with Radovic et al.’s (2018) request for clarity in conceptual choices as a route to coherence.

Another issue emerging from this review is the importance of social class in power and equity issues connected to gender and mathematics, which is particularly noticeable in the British setting. Its role in relationships with mathematics is very clear in Walkerdine’s (1989/1998) and Black’s (2002, 2004a, 2004b, 2011) work, while Bartholomew (2000, 2002) also notes how class interweaves with gender. Later studies which consider the production of gender performances within peer cultures also connect to class, although not explicitly, for example Radovic’s work with working class girls in Chile, and Francis’ work on popularity and achievement in London schools. As Radovic et al. (2017) claim, if we seek to understand why some students are marginalised as learners of mathematics, we need to go beyond an essentialist view of gender and mathematics, and rather consider diversity within groups. Following Gutierrez (2013), identity needs to be seen as as a multivocality of the self, because individuals participate in different and sometimes overlapping discourses: “The self, therefore, is a

collection of interconnected identities constituted in practices such that any given practice positions an individual through and in race, class, ethnicity, sexuality, gender, religion, language, and so forth” (Gutierrez, 2013, p.46). As Leyva (2017) argues, however, intersectionality, particularly recognition of the role of ethnicity, is underplayed in much research in gender and mathematics.

Most importantly, perhaps, this review has underlined the need to avoid essentialist assumptions when investigating gender and mathematics. At the same time, it is noticeable that research often draws on binarised accounts of female and male students. Looking at gender differences leads towards binaries because the nature of the discourse of mathematics is characterized by binaries, as shown by Walkerdine (1989/1998) and Mendick (2005a, 2005b, 2006) among others. Moreover, concern with differences in access to equal opportunities can lead to simple comparisons between boys and girls, and as Walkerdine (1989/1998) makes us aware of we need to avoid the pitfall of ‘overlooking’ similarities because we focus on differences. As Chronaki and Pechtelidis (2012) remind us, it is important to escape the deeply problematic nature of essentialist discourses. In their analysis of a female teacher’s story of her relationship with mathematics, they find that she was trapped by an essentialist view of gender and mathematics; they argue that appropriating such discourses is not liberating at all because

firstly, performing success in mathematics contributes towards fabricating a gendered masculine subjectivity as a self-forming power, secondly, gendered subjectivity depends heavily on appropriating an essentialist ideal of both mathematics and gender through a struggle of articulating available discourses, and, thirdly the essentialist appropriation of hegemonic discourses on gender and maths do not liberate but trap the subject in contradictory and conflicting discourses and practices (pp. 269-270).

As this review has revealed, the field has moved through phases that have focused on binaries in gender and mathematics, towards a more dynamic approach that also recognises cases that “don’t fit” with the ascribed positionalities of female and male students in mathematics. This move prompts the need for a theory that captures more than the binaries of gender and mathematics and enables the researcher to capture the heteroglossic nature of gender. As phase 4 shows, such a theory is offered by Holland et al. (1998) and Bakhtin’s dialogism, and this is the subject of Chapter 3. First, however, I take a step to the side to consider the Norwegian setting since, as Francis (2012) reminds us, we need to understand the context in which gender is played out.

Taking a step to the side: the Norwegian setting of gender and mathematics

In tracking the research field of gender and mathematics, I have become aware of similar concerns in several countries in the Western world, all finding the same issues in girls' under representation in mathematics: the challenges arising within the discourses of mathematics teaching and learning need collective awareness if we are to promote equal opportunities for all students to develop positive relationships with mathematics. However, another issue that strikes me as I track this moving field from my Norwegian perspective is that it is impossible to ignore the lack of research on gender and mathematics in the Norwegian setting. The Scandinavian countries, including Norway, have a strong position internationally concerning gender equity. Hence, it is reasonable to take a closer look at the nature of Norwegian research on gender and mathematics.

A natural starting point is Wedege's (2007) discussion of gender and mathematics research in Norway and Denmark. As a Danish researcher with an interest in gender and mathematics, she notes that there is a lack of research on gender issues in mathematics in the region - very few engage with the idea of 'doing gender', although a number of studies include sex as a variable, and see the potential benefits of a gender perspective. Here, I will focus on how gender issues in mathematics are conceptualised in Nordic research, beginning with the Norwegian setting.

Most work on the topic in Norway focuses on gender differences in test results and individual characteristics such as motivation. For example, Nordtvet (2013) reports that there are no gender differences in mathematics performance in Norway, according to the results of PISA 2012 (OECD, 2013). However, Jensen & Nordtvedt (2013) report that there are gender differences in motivational factors: boys report greater motivation in mathematics, and are seen to show more stamina and 'capacity' in problem solving, in addition to 'higher self esteem' and 'sense of mastery' while girls report greater anxiety about mathematics. Jensen and Nordtvedt (2013) claim that such differences need to be addressed by promoting *inclusive teaching* for all students. In a report for the Nordic Institute for Studies in Innovation, Research and Education, (NIFU) Wollscheid, Ramberg and Smedsrud (2020) reviewed Nordic literature focusing on girls' reported lower levels of motivation and self-confidence in STEM subjects compared to boys of the same age, concluding that there is a lack of understanding of the reasons for these gender differences. In their report, Wollscheid et al. (2020) note that there are few empirical studies of gender differences in motivation and self-confidence in STEM subjects, echoing Wedege's (2007) observation of a knowledge gap in the field in Norway.

As noted in the literature review, a major concern in the field of gender and mathematics is that women become a minority in post-compulsory studies. While one might suppose that the lack of Norwegian research on students' experiences of mathematics could be because women are not under-represented in post-compulsory mathematics in Norway, this is not the case. Drawing on statistics from 2009, Bjørkeng (2011) reports that the percentage of girls taking 'R-mathematics', mathematics for science (focuses on pure mathematics theory) in upper secondary school goes from 48% in year 11, to 40 % in year 12, while the percentage of girls taking 'S-mathematics', mathematics for social science (focuses on applied mathematics) is 55%. Bjørkeng (2011) echoes Nordtvedt's (2013) analysis of these figures when she states that "although girls often have equally good science results as boys, they have less motivation and poorer perception of their skills" (Bjørkeng, 2011, p. 21). The pattern of female under-representation in mathematics is also noted by Grønmo, Hole and Onstad (2015), and Ullah & Bondø (2011), who all point out the low percentages of girls choosing mathematics and physics in Norway. Compared to other European countries, the percentage of female students qualified to participate in the 2015 TIMSS Advanced study¹² should be equal to that of male students, but the figures in Norway were 38% female and 62% male. Grønmo et al. (2015) note that this means that there were only 8.1 % of girls within the year-group choosing the most advanced mathematics throughout upper secondary school, the lowest score among the countries represented in the study.

So, the situation with regard to gender and mathematics in Norway isn't as straightforward as the comparable test results among female and male students could indicate. Given developments in the international research on gender and mathematics, the lack of research on students' experiences in mathematics may conceal significant information about gender and mathematics in Norway. None follow the international trend in using identity as a key concept for understanding students' relationship to mathematics, with the exceptions of Foyn et al.'s (2018) study reviewed above, and With and Solomon's (2014) small-scale qualitative study which suggests that discourses of equity within Norwegian society seem to have little impact on upper secondary school students' self-positioning as mathematics learners; as elsewhere, girls positioned themselves as 'just' hard workers within discourses of ability and gender.

¹² In 2015, IEA and its TIMSS & PIRLS International Study Center at Boston College conducted the TIMSS Advanced 2015 test for students in the final year of secondary school enrolled in advanced mathematics and physics programs or tracks.

Clearly, there are still many questions to be asked about gender and mathematics in Norway. In the final section of this chapter, I present the research questions for this thesis.

Where do I go from here? Research questions and implications for a theoretical framework

Having tracked the development of the research field of gender and mathematics, its relevance for an investigation of gender in a Norwegian classroom is clear. It could be possible to argue that the situation regarding gender and mathematics in Norway is different from that in other countries, because of the strong emphasis on gender equity in Norwegian society. However, as observed in the previous section, female under representation in mathematics in the post-compulsory years is present in Norway as well, suggesting that there is something here to uncover. As we can see from the international research field, there is much to learn about how students experience mathematics which goes beyond statistics and questionnaire surveys.

To inscribe my study within this research field, I aim to go beyond an essentialist view of gender and mathematics, and to understand how gender is performed in multiple ways. We know that the discourses that circulate within a mathematics classroom are local, and they shift and change; some will relate to gender, but this is not a static picture. To understand students' experiences of mathematics, we need to look at the overall 'package' of the classroom, where we can identify mechanisms of students' acts and choices, and how identity and agency is enacted and negotiated within this picture. Gender is played out within such a frame. Thus the research questions for this study are:

RQ1: What are the dynamics of mathematical identities in a classroom?

RQ2: What is the nature of students' agency in their employment of identities?

RQ3: How is gender played out?

In order to investigate these research questions, I needed a theory that could capture the dynamics of a classroom and how individual students negotiate identity and agency within such a context. In the next chapter, I describe my choice of Holland et al.'s (1998) theoretical framework of identity and agency in cultural worlds as a framework that enables such a view.

Chapter 3: Theoretical Framework

As noted at the end of the literature review, the research questions of this study jointly seek to capture the process of identity formation in a mathematics classroom over time, focusing on identity, agency and the role of gender. Holland et al.'s (1998) theoretical framework of identity and agency in cultural worlds seeks to capture the complexities of identity formation in socially constructed realms, providing tools for understanding the complexity of students' choices and trajectories as they navigate the mathematics classroom. This chapter presents the overarching structure and aims of the framework, and the key concepts on which it builds an account of identity and agency and how we can understand them.

The structure of this chapter is inspired by Holland et al.'s (1998) own explanation of the development of 'identity in practice' through four contexts. The first three contexts of identity are most important for this thesis; these are figured worlds, positionality and self-authoring. Together, these enable an understanding of how individuals in the same context develop different senses of self, and how mathematics students in the same class develop different types of identity as mathematics learners. The fourth context, world making, will be important for the implications of this study and its contribution to knowledge.

As we will see, Vygotsky and Bakhtin are crucial to understanding Holland et al.'s theory of identity and agency in cultural worlds. While Vygotsky's contribution features in the first context of identity, figured worlds, I highlight Bakhtin's work in my introduction to the third context of identity – self-authoring.

What the framework offers

As seen in the literature review, there is need to go beyond essentialist view of gender and mathematics, and rather consider diversity within groups of students. In particular, in phase 4 we have seen how the research field goes beyond essentialist views and focuses on alternative narratives of how individuals negotiate agency within discourses that carry both constraints and possibilities. This makes it possible to understand how students can act in diverse ways rather than just following predetermined trajectories. Holland et al.'s framework emerges as a theory that enables to capture the complexity of identity formation and how individual within a context negotiate agency, and it makes it possible to move towards a dynamic approach, including to understand the development of alternative narratives that 'don't fit' with the ascribed positionalities of female and male students in mathematics.

Holland et al.'s theory maintains that individual actors in cultural worlds have access to agency, through the development of 'identity in practice'. They draw on Vygotsky's concept of semiotic mediation – the use of signs and symbols learned from social interaction – by which one can gain at least some control of one's own actions. Hence, people have a potential tool through which they can direct their own behaviour and make changes to their developmental trajectory, even in social contexts which are strictly defined by forces towards homogeneity – powerful normative discourses about 'how things should be'.

Bakhtin's dialogism is a further major source in Holland et al.'s theory, emphasising that human life is essentially about addressing and answering multiple voices, where there are multiple possible meanings to be constructed in the dialogue. Basing their understanding of identity on this approach, Holland et al. argue that it is not possible to treat identity formation as reducible to participation as the members of a group as a uniform or predetermined process, nor is identity ever fixed or 'completed'.

Identity formation is, rather, seen as a complex process drawing on both individual and collective sources from both the present and the past. It intertwines cultural models with social structures, enabling an account of agency through the subject's use of cultural resources to invest or disinvest in their positioning by discursive practices and power differentials. Holland et al.'s framework offers a myriad of possible outcomes when it comes to identity formation in a figured world, building a picture of identity as intrinsically multiple and ever-changing. The theory assigns agency to people such that they can influence their own situation, but this agency is not unlimited and at the same time not unaffected by the social structures in which they live. Holland et al.'s theory is opposed to a deterministic view of identity formation; instead, it presents an optimistic view of how human beings can contribute to bringing about change, even within contexts which are seen as totalitarian.

The concept of identity in this theoretical framework requires special attention, and its first presentation appears in the very beginning of the book:

People tell others who they are, but even more important, they tell themselves and then try to act as though they are who they say they are. These self-understandings, especially those with strong emotional resonance for the teller, are what we refer to as identities (Holland et al., 1998, p. 3).

Understanding identity as a by-product of actions is a starting point in accessing Holland et al.'s approach to identity formation. How people act is crucial for the way they make their way through life, or build their sense of self over time. Holland et al. focus on the ways in which

people are able to improvise in a situation, rather than being ‘stuck’ in (or ‘sutured to’) the circumstances affecting that moment. The human capacity to improvise derives from the ability to draw on experiences from the past and the present, from the meeting of persons, cultural resources and situations in practice. This human capacity may lead to new forms of activity.

By drawing on Vygotsky and Bakhtin, Holland et al.’s theoretical framework highlights agency and the diversity of individual trajectories of identity formation through what appear to be the same terrain. Specifically, for this thesis, a ‘Figured Worlds’ framework enables us to see that students are not all the same in a context such as the mathematics class, and how this comes to be the case.

The first context of identity - figured worlds

The first step in Holland’s project of understanding identity formation is to acknowledge the socially constructed realm, which develops through the work of those who populate it. The construction of this realm, or *figured world* is central to understanding the way people tell others and themselves who they are, through the acts they choose to do as actors in this world.

Figured worlds become the frame

For Holland et al., a figured world is a

socially and culturally constructed realm of interpretation in which particular characters and actors are recognized, significance is assigned to certain acts, and particular outcomes are valued over others. Each is a simplified world populated by a set of agents . . . who engage in a limited range of meaningful acts or changes of state . . . as moved by a specific set of forces (Holland et al., 1998, p. 52).

Applying this definition to a mathematics classroom allows us to see the students and the teacher as the actors in this figured world. There are several kinds of students that populate this world: those who succeed effortlessly and those who struggle; those who are motivated and those who are not; those who are hard-working and those who give up. But it can also be more complex than this dichotomy. All these different actors interact in the figured world by handling and relating to the subject and each other differently, driven by the force of learning mathematics, which is imposed upon them collectively.

Holland et al. describe how figured worlds can be labelled as either figurative, narrativised or dramatised worlds. Figured worlds can be figurative because they allow the abstraction of everyday happenings and expectations about how events and happenings unfold and the interpretation of these in relation to experience. They are labelled narrativised and dramatised

because ‘many of the elements of a world relate to one another in the form of a story or drama’ (Holland et al., 1998, p. 53). Thus, “A figured world is peopled by the figures, characters, and types who carry out its tasks and who also have styles of interacting within, distinguishable perspectives on, and orientations toward it” (Holland et al., 1998, p. 51).

Vygotsky’s account of how humans have the capacity and ability to take control and redirect their behaviour through the use of symbols and their collectively developed meanings, “the ability of humans to manipulate their world and themselves by means of symbol” (Holland et al., 1998, p. 49), is crucial for understanding how people are recruited to, and learn to live in, figured worlds. For example, Holland et al. draw on Vygotsky’s account of how children learn to enter ‘play worlds’ through the use of tangible objects. Over time, the use of tangible objects may be replaced by imaginary objects in order to enter such imaginary worlds, and these worlds may develop from being creative worlds into worlds with more explicit rules and orders. I will return to the use of tangible objects, or more imaginary objects, as artefacts in a later section.

The actors in a figured world learn to ‘live out’ that world in accordance with the rules that have developed over time for the mundane activities within it, and thus make themselves visible to other actors within it:

The ability to sense (see, hear, touch, taste, feel) the figured world becomes embodied over time, through continual participation. . . . A figured world . . . is played out; a frame becomes a world—a space and time established imaginatively—that one can come to sense after a process of experiencing, acting by virtue of its rules. Players become ever more familiar with the happenings of a figured world . . . and learn to author their own and make them available to other participants (Holland et al., 1998, p. 52–53).

Students’ acts as mathematics students are based on their experiences over time within the figured world of the mathematics class, in accordance with their understanding of the happenings that routinely take place in this world.

However, figured worlds are not constant or finally constituted worlds; rather, they are ever in the process of being formed by the action of the people in them. A figured world is “reproduced, forming and reforming in the practices of its participants” (Holland et al., 1998, p. 53). Hence the actors in a figured world interpret or imagine the actions and the events in it differently. These interpretations and imaginings mediate the way the actors behave and present themselves to others, and this is done in multifarious ways. This element of figured worlds makes a major contribution to this thesis in understanding how students who are apparently similar in many ways experience the class very differently.

Figured worlds distribute people differently

In order to begin to understand the diversity and heterogeneity of possible actions within a figured world, it is important to note that figured worlds distribute people differently according to status, power and privilege. Holland et al. describe a figured world as “a social reality that lives within dispositions mediated by relations of power”, where the actors see themselves as “actors of more or less influence, more or less privilege, and more or less power in these worlds” (Holland et al., 1998, p. 60). Furthermore, Holland et al. point out how:

All such worlds are subject to social identifications, that is, associated with the people who conventionally participate in them, and these people in turn are subject to the social differentia of rank and prestige . . . that affect the evaluation, and thus the persuasiveness and authority, of the spheres they populate (Holland et al., 1998, p. 111).

Whereas Vygotsky’s work is crucial to capturing the idea of figured worlds as cultural worlds, Bourdieu’s concepts of habitus and position are important in understanding the distribution of power and privilege among the participants in the figured world. Recognising the role of power and privilege in figured worlds is central to understanding, for instance, who is entitled to act in ways from which others are excluded. Building on Bourdieu’s concept of field, Holland et al. suggest that:

A field is ‘structure-in-practice’, and as such is a world of relationships, of social positions defined only against one another. . . . It is also a peopled world; its positions, which are producers as well as products, are also social personages. Field thus closely parallels our notion of figured world and elucidates our later emphasis on positionality (Holland et al., 1998, p. 58).

While Bourdieu pays attention to the social relations among the players in the field, according to their power and position in it, Holland et al.’s concept of figured worlds draws attention towards everyday happenings. Nevertheless, drawing on Bourdieu’s concept of field means that social position is incorporated into the theory because lived worlds are cross-cut by position and its privileges. Holland et al. agree with Bourdieu’s vision: “The as-if character of possibility that marks fields (and figured worlds) is not an indifferent, “mental” abstraction, an “imaginary” in its usual sense, but a social reality that lives within dispositions mediated by relations of power” (Holland et al., 1998, p. 60). This affects the way people in a figured world position themselves, an important issue I return to below when elaborating the second context of identity; positionality.

Figured worlds are not independent worlds

As we have seen, the activities and events in a figured world are crucial in understanding and interpreting how figured worlds are lived out. But figured worlds are not independent worlds when it comes to understanding how people develop their sense of self. First of all, humans are actors in several figured worlds. Because a figured world is constituted by the actors in it, and these actors are actors in others figured worlds as well, their stories and experiences from other figured worlds are brought into the actual figured world under investigation.

Building on Marxian analyses, Holland et al. argue that the relationships of the activities and practices in a figured world must be understood in the light of a larger picture. This picture contains institutionalised structures of power and privilege that extend beyond the immediate order of interaction in figured worlds. The practices and activities in a mathematics classroom are based on how rank and status are lived out according to a relational hierarchy in a broader picture than in just that classroom, for instance the importance of high grades in mathematics in the world of higher education. Hence a figured world cannot be an independent world, separated from the rest of the institution it is a part of, and the other spheres of people's lives. For Holland et al., a figured world has fluid borders:

It is a landscape of objectified (materially and perceptibly expressed) meanings, joint activities, and structures of privilege and influence—all partly contingent upon and partly independent of other figured worlds, the interconnections among figured worlds, and larger societal and trans-societal forces (Holland et al., 1998, p. 60).

Thus, figured worlds cannot be seen as autonomous and independent realms of interpretation; they are clearly a part of a larger picture, influenced by the structure of power and privilege in institutions and in other spheres of people's lives and how these have developed over time. Hence, mathematics classrooms have to be seen as a part of the larger picture of the institutionalised world of education, from political, socio-economic and cultural points of view. In addition, students' experiences from life outside of the mathematics classroom have to be taken into account when investigating the figured world of mathematics in Class A. I will return to the importance of power and privilege below, under the second context of identity.

Artefacts as tools for mediating actions in a figured world

Holland et al.'s concept of figured worlds draws on the sociohistorical school's emphasis on the importance of artefacts as mediators in human actions. Cultural artefacts have 'developmental histories' in both the past and the present:

Artifacts assume both an obvious and necessary material aspect and an ideal or conceptual aspect, an intentionality, whose substance is embedded in the figured world of their use. By the same token they are both instrument and collective remembrance (Holland et al., 1998, p. 61).

Figured worlds rely on artefacts and how they are employed by people and their performance. Vygotsky had a special interest in "the process of "semiotic mediation", and in the development of voluntary control over behaviour . . . through this mediation by cultural devices" (Holland et al., 1998, p. 35). They note that Vygotsky did not see people as powerless agents, being in an inescapable position due to the 'rules' of the imaginary worlds they entered. Instead, "For him the key to human existence was the ability of humans to escape enslavement to whatever stimuli they happened to encounter" (Holland et al. 1998, p. 35). Cultural devices, collectively developed tools and symbols, and the way people used these were important for Vygotsky's theory of how people could gain control over the social world and their own mental state.

Artefacts as semiotic mediators play a significant role in human life; they mediate interactions within a figured world and provide us with possibilities for taking control over how to live. Artefacts are both tangible objects and words as categories of expression, used by the occupants of a figured world:

Artifacts originate outside their performers and are imposed upon people, through recurrent institutional treatments and within interaction, to the point that they become self-administered. Categories carry an association to those who use them and are subject to them—an association with power—as artifacts do an association with tasks and those who perform them (Holland et al., 1998, p. 62).

In this thesis, artefacts can be clothes, notebooks, expressions such as looking puzzled and bodily actions such as putting a hand up. Their importance lies in how they mediate interaction between students and the teacher in the classroom. For instance, a student who is correcting other students' suggestions about how to solve a mathematics task in plenary, loudly, will be associated with being a certain kind of student, different from one who makes themselves invisible in the classroom, trying to avoid the teachers' and the other students' attention during the same session. However, the use of artefacts also provides an opportunity, though a small

one, for the inhabitants of a figured world to take control of their own actions. Holland et al. draw on Vygotsky on this point:

As we use artifacts to affect others, we become, at some point in our growing up, aware of and capable of using artifacts to affect ourselves. We achieve self-control, albeit of a very limited sort, by the mediation of our thoughts and feelings through artifacts. We learn how to control ourselves from the outside, so to speak (Vygotsky 1978); we learn how to position ourselves for ourselves (Holland et al., 1998, pp. 63–64).

Artefacts, and the use of artefacts, as mediating interactions in a figured world, are in a constant process of development by those who employ them. Holland et al. note:

Semiotic mediation provides for the capacity that may be called symbolic bootstrapping. One of the convincing points about this tool of agency, this tool for gaining control over one's behavior, is its appropriate modesty. It is an indirect means—one modifies one's environment with the aim, but not the certainty, of affecting one's own behavior—and it requires a sustained effort (Holland et al., 1998, p. 38).

Applying this to the mathematics class, if a student is always trying to avoid the teacher's attention because of a feeling of 'not being clever enough', they have the potential to change this situation through symbolic bootstrapping and the use of artefacts. This could be by the use of language, replacing a question mark with an exclamation mark in answers to questions, or raising a hand to call the teacher's attention. However, there is no guarantee the situation will change, and it isn't due to a 'one time happening'. It requires conscious employment of artefacts over time.

Figured worlds do not predetermine identity formation

A major issue for Holland et al. is to underline the complexity of identity formation and the fact that there is no predetermined identity for the actors in a figured world. Rejecting any simplistic notion of identity formation, Holland et al. state:

It is folly to assume that members of a voluntary group, or even members of an "involuntary"—an ethnic or racial—group are uniform in their identities. There may be far less to participation than meets the eye. In other cases, there is more to participation than might be suspected (Holland et al., 1998, p. 190).

In order to understand the complexities in the way students fashion their sense of self as mathematics students, we need to pay attention to a paradox of figured worlds. As we have seen, Holland et al. recognise the force of power and position and how figured worlds distribute people differently, but they also argue that figured worlds not only restrict activity, they also

provide possibilities for alternatives. As noted above, Vygotsky provides a positive view of human capacity to free oneself from authoritative environmental stimuli through the employment of artefacts. Hence, Vygotsky provided an optimistic account which “explored the potential for the liberation and expansion of human capacities that artifactual mediation afforded” (Holland, 1998, p. 64), bringing to light Marx’s thinking on “the possibilities for *becoming*, and the sense of freedom” (Holland et al., 1998, p. 68) in the period after the revolution in Russia.

Thus the discourses that run through a figured world provide both possibilities for and restrictions on how people develop their sense of self and the possibility for becoming, and opposing closed categories for the sense of self. Quoting Shepel’s (1995, p. 428) comment that, “The accumulation and mastery of a cultural tool kit and its use in overcoming the dependency on a particular culture is one of the basic contradictions of human development.’, Holland et al. note, ‘Here we have a paradox. (...) How does liberation from the particular determinations—the entrapments—of our cultural worlds come about through the tools shaped in those worlds for their perpetuation?’ (Holland et al., 1998, p. 64). Part of the answer to how one can free one’s self from determinism lies in the role of cultural models as shared images representing expected assumptions of the world – as, for instance, ‘what is the characteristic of a clever student in mathematics’ – and in artefacts: the way people learn to navigate their way through a figured world and to mediate their own behaviour. The employment of artefacts is key to how interaction takes place between the actors in a figured world and to how individuals may direct their own behaviour, making themselves visible as actors in a figured world, and potentially, as acting differently in it.

A main aim in this section has been to underline how there are possibilities for entrapment by the forces that identity formation draws on, but also opportunities for freeing oneself from the same restrictions. However, as we have already seen, figured worlds distribute people differently, and as Holland et al. note:

Thinking, speaking, gesturing, cultural exchange are forms of social as well as cultural work. When we do these things we not only send messages (to ourselves and others) but also place “ourselves” in social fields, in degrees of relation to—affiliation with, opposition to, and distance from—identifiable others (Holland et al., 1998, p. 271).

Identity in figured worlds

People in a figured world live in accordance with the mundane activities that take place in socially constructed realms, based on unwritten rules and norms developed over time. I have

elaborated on the fluidity of figured worlds in both time and space: it is not possible to treat figured worlds as finalised worlds nor as independent from the surrounding figured worlds. Power and privilege have emerged as an issue, distributing the actors within a figured world differently, and this is the focus of the second context of figured worlds: positionality.

Actors in a figured world live the world out both in relation to the ongoing story of this figured world and in relation to the other actors in it. Holland et al. describe how there are two forms of-identity, figurative and positional: “Figurative identities are about signs that evoke storylines or plots among generic characters; positional identities are about acts that constitute relations of hierarchy, distance, or perhaps affiliation” (Holland et al., 1998, p. 128). In order to make the distinction between these two kinds of identity clear, consider a hypothetical example:

In a mathematics classroom, a student who is getting good grades and thereby is perceived as a clever student is not comfortable in this role, trying to hide their grades from the others and silencing themselves by being invisible in the class. Another student, in the same classroom, is also a student who gets good grades, but in contrast to the other one, they play out the role of being clever – often putting up their hand, answering questions – and receives great responses from both the teacher and their peers for this cleverness. Even though these two students both seem to be high-achieving students, their actions are quite different in the classroom. In order to understand this, we need to pay attention to figurative and positional identity at the same time.

The concept of figurative identity invokes the generic characters who make the storyline or narrative visible, or the ‘standard plot’ of the figured world visible. The ‘standard plot’ is the storyline that is taken for granted in a figured world and includes the mundane acts, activities and happenings. In the mathematics classroom context, a figurative identity may be ‘the clever student’, ‘the struggler’ or ‘the lazy one’. This kind of identity is figurative in the sense that it describes a generic actor or a role in the narrative of the figured world and their particular claimed traits. Holland et al. also describe this form of identity as narrative identity, focusing on the way in which particular characters or identities are storied in the figured world. To understand why these generic characters are played out differently by different people, we need to take account of what positional identity brings to the picture.

The concept of positional identity draws attention to a character’s position in the figured world, relative to the other culturally identified characters in that world. How a character’s sense of social place and how that character is entitled to act, or not to act, is the concern of positional identity, a product of the distribution of power and privilege, and how other actors in the world position themselves within it.

For Holland et al., positional and figurative identity are at work simultaneously. While positional identity concerns “the day-to-day and on-the-ground relations of power, deference and entitlement, social affiliation and distance—with the social-interactional, social-relational structures of the lived world’, figurative identity concerns ‘narrativized or figurative identities, [which] have to do with the stories, acts, and characters that make the world a cultural world” (Holland et al., 1998, p. 127). Importantly, these two aspects of a person’s identity are intertwined. They are not two different kinds of identity, not a dichotomy, but a continuum, two sides of the same coin. The concern is with how positional identity cross-cuts through the figured world and its characters such that, for example, being a female ‘clever student’ or a male ‘clever student’ is played out differently in the same figured world.

A more comprehensive understanding of positionality is elaborated through the second context of identity, which concerns how people relate to each other and how this affects their ‘access to acts’ within the figured world of which they are a part.

The second context of identity: positionality

The second context of identity draws attention to positionality, how the people in a figured world relate to each other and how actors assess themselves as having access, or not, to activities within the figured world.

In a mathematics class, the students live in relation to each other, with the teacher and the subject. Some students never answer questions in plenary sessions, while some others regularly frequent that space. Why do the actors in this figured world assess their access to space, and what are appropriate activities within this space, differently? For Holland et al., the answer lies in positionality. People learn to live out the figured world in accordance with the norms and rules of the habitual acts within it:

They learn a feel for the game, as Bourdieu calls it, for how such claims on their part will be received. They come to have relational identities in their most rudimentary form: a set of dispositions toward themselves in relation to where they can enter, what they can say, what emotions they can have, and what they can do in a given situation (Holland et al., 1998, p.142–143).

In order to understand why people make claims to different positions, we need to understand the positional forces that cross-cut figured worlds.

The force of major structures from outside

Figured worlds are not independent worlds, and power and privilege in surrounding worlds are important in understanding their distribution within a particular figured world. It is not possible to ignore the structuring effects of the major discursive forces such as class and gender:

Social categories also can have meaning across many figured worlds. These categories are by and large associated with the major social divisions—gender, class, race, ethnicity—that separate those who are routinely privileged from those who are not. Cross-cutting markers tend to become stereotypically associated with these social categories, if not actually demanded of their members in practice (Holland et al., 1998, p. 130).

The fluidity of figured worlds makes them part of a larger picture of how social categories of people act in different ways. The local structures of a figured world, its norms, rules and values, are cross-cut by the forces of the four major structures from outside, and particular spaces emerge as available positions associated with different amounts of power and privilege. Thus, the cross-cutting markers that underpin the discourses of a mathematics class will influence the way students are perceived, by others and themselves, especially if they are unaware of the influence of these markers. Gender, ethnicity, race and social class will play a part as a positional force in a mathematics class, separating students according to power and privilege with respect to social interaction in the classroom. Turning particular attention to gender, Holland et al. argue that “Gendered dispositions to participate, or not, in given activities, develop in places where gender participation in activities is treated as a claim of gender specificity” (Holland et al., 1998, p. 143). At least in the Western world, gender as a positional force may lead some female students to see themselves as not having access to significant acts in the classroom such as participating in discussion about mathematics.

Social position becomes disposition

Within these cross-cut spaces, people employ artefacts to make themselves visible, and it is through the use of artefacts that social interaction is mediated, as people make claims to different positions and different spaces within the figured world. Holland et al. use the term *social work* for these actions: “Viewed over the long term, these day-to-day practices are social work, acts of inclusion/exclusion, of allowing/compelling only certain people to evince the sign, that maintains positions and the value of artefacts as indices of position” (pp. 133–134). The social work that goes on within the mundane activities develops into positional identities which “develop heuristically over time” (Holland et al., 1998, p. 137):

The development of social position into a positional identity—into activities or to refrain and self-censor, depending on the social situation—comes over the long term, in the course of social interaction. Relational identities are publicly performed through perceptible signs (Holland et al., 1998, p. 138).

A social position may be a beneficial position connected to power and privilege, but there is nothing automatic in how people take up these positions. During the everyday happenings in a figured world, people get to know ‘their’ position in relation to the other actors, such as what they are ‘allowed’ to say or do, relating to the other actors’ acts. Holland et al. draw on Bourdieu’s concept of habitus to describe how social position becomes disposition: “to encompass one’s sense of the value that is likely to be attributed to what one has to say in a particular situation” (Holland et al., 1998, p. 128). By seeing oneself as being ‘allowed’ to engage in significant acts in the classroom, such as describing the way they reasoned to solve a mathematic problem, may affect students differently. Some will refuse these acts because of a feeling that their answer is not as good as some other students’ thinking, while others will assess these acts the opposite way, as ‘tailored’ for them, because of their mathematical ability in relation to the others:

The development of social position into a positional identity—into dispositions to voice opinions or to silence oneself, to enter into activities or to refrain and self-censor, depending on the social situation—comes over the long term, in the course of social interaction (Holland et al., 1998, p. 137–138).

Holland et al. draw attention to how people in a privileged position claim entitlement, by claiming access to a significant position through employing artefacts that signal power and privilege:

Entitled people speak, stand, dress, emote, hold the floor—they carry out privileged activities—in ways appropriate to both the situation of the activity and their position within it. Those who speak, stand, dress, hold the floor, emote, and carry out activities in these proper ways are seen to be making claims to being entitled. Speaking certain dialects, giving particular opinions, and holding the floor are indices of claims to privilege (Holland et al., 1998, p. 133).

Claiming entitlement is not the whole story, however. To be attributed the power and privilege that comes with various acts depends on interaction with other actors. A positional identity connected to power and privilege needs to be enacted, as well as confirmed and approved by the other actors in the figured world, in order to maintain this positionality. This may happen

unconsciously. Drawing on Gearing and colleagues (1979), Holland et al. describe how habitual acts may lead towards situations of exclusion and inclusion based on signs of identity. They underline the importance of control in order to prevent exclusion of groups of students:

Processes of inclusion/exclusion work in the absence of clear control—that is, even when dialects can be overheard, or more privileged ways of acting can be directly observed and therefore imitated. . . . They emphasize that knowledge . . . is proprietary; that it is generally associated with, or belongs to, a recognized category of people; and that, by virtue of this relation, the use of knowledge signals identity (Holland et al., 1998, p. 135).

So, for instance, some students in a classroom may be ignored because they do not display the right markers of entitlement, while others are noticed because they are the ‘right kind of student’. Holland et al. pay attention to specific signs of identity in classrooms. They emphasise how some students will get positive feedback by employing signs of identity by, for instance, assuming skills of understanding and solving complex mathematics problems: “Teachers will take some students’ groping claims to knowledge seriously on the basis of certain signs of identity. These students they will encourage and give informative feedback” (Holland et al., 1998, p. 135). It is the mundane activities in a figured world, those that evoke a person’s social position over time, that turn social position into positional identity – it is the long-term perspective that matters:

The long term, however, happens through day-to-day encounters and is built, again and again, by means of artefacts, or indices of positioning, that newcomers gradually learn to identify and then possibly to identify themselves with—either positively or negatively, through either acceptance or rejection (Holland et al., 1998, p. 133).

People learn to live in the figured world they are a part of, and they learn to recognise what acts are accessible according to their own social positioning. Because of the fluidity of figured worlds, cultural models, which affect the way people are identified both by others and themselves, may play a significant role. Holland et al. describe how “persons develop through and around the cultural forms by which they are identified, and identify themselves, in the context of their affiliation or disaffiliation with those associated with those forms and practices” (Holland et al., 1998, p. 33).

Rupture and resistance to positionality

Holland et al. note that people may not be aware of the social position they take up, and they therefore develop a disposition which is out of awareness. “The everyday aspects of lived

identities . . . may be relatively unremarked, unfigured, out of awareness, and so unavailable as a tool for affecting one's own behaviour" (Holland et al., 1998, p. 140). Thus, acts of exclusion as well as inclusion may happen unconsciously, alongside habitual acts in the figured worlds.

The mundane activities that take place in a figured world, based on the way people relate to each other and how power and privilege distribute people differently, will be part of the expected acts that characterise the figured world – the habitual acts that take place every day. Holland et al. introduce Vygotsky's concept of 'fossilization', which means how some actions and happenings become 'automatic' in a figured world.

"In a sense some imaginative frames become "fossilized" in mundane daily life. But fossilization is not irreversible. Ruptures of the taken-for granted can remove these aspects of positional identities from automatic performance and recognition to commentary and re-cognition (. . .) This hermeneutic moment leads persons to specify the figured world that prefigures everyday activity" (Holland et al., 198, p. 141).

Sometimes, people experience events that lead them to be conscious of the position they have developed, that is, until now, unremarked. They may notice the mundane activities which have become habitual, or more dramatic activities which radically affect entitlement in accordance with social position. New consciousness of their social position may lead someone to reconsider their access to acts, leading to the possibility of affecting their own behaviour, including active resistance to such positioning. Thus positional identity can become "more or less conscious, more or less habitual, moving sometimes out of awareness, toward fossilization, and at other times toward consciousness and susceptibility to manipulation. As we see it, play, especially socially organized play, works in both directions of this process" (Holland et al., 1998, p. 237).

By drawing on the different resources at hand, the individual's ability to improvise within the frame of the figured world and 'guide their next acts' is a source of redirection through 'serious play' (p. 272) and even major change as in the fourth context of identity, world-making. This human capacity to improvise is a key issue and is elaborated within the next context of identity, self-authoring. Despite their positionality, people have room for manoeuvre within the available spaces in a figured world; they are not forced into a position as powerless agents. In order to understand how people fashion their sense of self within figured worlds, we need to continue on to the third context of identity; self-authoring.

The third context of identity: self-authoring

The third context of identity that Holland et al. present concerns self-authoring, derived from Bakhtin's theory of literary analysis and criticism. This concept goes beyond the picture provided by positional and figurative identity to explore how agency and choice are possible and how people choose to act the way they do. Self-authoring draws attention to how collective and individual perceptions of actions and happenings in a figured world, mixed with the time aspects of the present and the past, interact in a conflictual inner speech in each person. This conflictual inner speech draws on various voices from self and others from the past, present and future; for Holland et al., self-authoring concerns the orchestration of voices in order to make meaning of oneself; it is how people fashion their sense of self.

Taking a step aside: introducing Bakhtin

Even though Bakhtin's work was primarily a contribution to literary analysis, his work also contributes to social thinking and the philosophy of language. In the introduction to *Speech Genres and Other Late Essays* by Holquist and Emerson (1986), Bakhtin's works are seen as a philosophy of another kind, dating back to Kant to explain Bakhtin's important contribution in refusing to treat any question in isolation. Bakhtin's major contribution is to illustrate how processes are open-ended rather than closed. Holquist and Emerson note how reading Bakhtin's texts does not give the pleasure 'we derive from an author who compels us to believe his logic is ineluctable, but the excitement that comes from seeing a mind at work while it is at work' (Bakhtin, 1986, p. xvii). This mirrors Bakhtin's vision of how people construct meaning by being in a constant development in the interplay between the individual and others.

A major concern in Bakhtin's work is with how communication takes place and how meaning is constructed in dialogue. For Bakhtin, the place from which we speak plays an important role in what we say. Emerson and Holquist describe Bakhtin's opposition to Saussure's view of "the individual language user to be an absolutely free agent with the ability to choose any words to implement a particular intention" (Bakhtin, 1986, p. xvi). While the conclusion for Saussure was therefore "that language as used by heterogeneous millions of such willful subjects was unstudyable, a chaotic jungle beyond the capacity of science to domesticate" (Bakhtin, 1986, p. xvi), Bakhtin starts out by assuming that individual speakers do not have this kind of freedom in the first place. Instead, the utterance is regarded as the key unit for the study of speech. Bakhtin stresses how the utterance can in no way be regarded as completely free, but is tied "to the system of language as a phenomenon that is purely social and mandatory for the individuum"(Bakhtin, 1986, p. xvi). Bakhtin emphasises the importance of speech genres,

recognising their enormous and significant variations, while the subject in a speech genre will experience normative restraints “that control even our most intimate speech” (Bakhtin, 1986, p. xvii).

Dialogism

A central conceptualisation from Bakhtin is dialogism, which describes how individuals construct meaning in communication. This was initially seen as communication between the reader of a novel and how the reader made meaning of the novel itself, which was not necessarily similar to the author’s purpose. In this communication, people construct meaning in interplay with others. Holquist and Emerson note Bakhtin’s (1986) view that the words we use act as a kind of trio in a drama. This trio consists of the individual, the speech genre and to whom we are speaking. The self, or the individual, shape an utterance, orally or non-orally, as a response to a previous utterance, according to both the object of discourse (speech genre) and the addressee, to whom they are speaking (Bakhtin, 1986). Every utterance is shaped as an answer to a previous utterance, and these chains of utterances compose Bakhtin’s concept of dialogism as never finalised. Meaning is constructed in the dialogue between the I, the speech genre and the addressee. In this process of answering a previous utterance, meaning is constructed by orchestrating the different voices by the individual in the dialogue.

Holquist and Emerson note how, for Bakhtin (1986), space for free will or liberation from the given setting, the given speech genre, is possible, but only to a certain degree. The speech genre itself enables a relatively small amount of freedom, but the more an individual is familiar with the speech genre and the possible variants of it, the more choice they have within this genre. A speech genre provides possibilities for play and the exploration of a certain kind of free will, but by participating in a speech genre, people cannot avoid being generic due to the super-addressee.

Bakhtin’s (1986) concern with the way in which people’s lives are soaked in signs and rituals, in parallel with the individual’s relation to speech genres: “Human life is always shaped and this shaping is always ritualistic” (Bakhtin, 1986, p. xx). People manifest their humanity in their everyday lives by authoring utterances, as in the dialogism in communication between the I, the genre and the addressee. Furthermore, the individual is tightly intertwined with the collective; for Bakhtin, there is no figure without a ground, and even a dialogue is dependent on a monologue within the individual. Authorship takes place against the background of this interplay of the individual and the collective.

Monoglossia and heteroglossia

To understand the dynamic between the individual and the collective presented above, we need to understand two key concepts in Bakhtin: *heteroglossia* and *monoglossia*. How a novel is populated with different possible meanings, how the speech genre enables enormous variation in the way people choose to express themselves, and how people construct variations of meaning in a social setting is based on Bakhtin's view of the world as heteroglossic or polyphonic. The opposite of heteroglossic, monoglossic, denotes an authoritative stance where there is just one option, one meaning, one way of expressing oneself possible. These two states, monoglossia and heteroglossia, impact the world, the genre or the novel simultaneously as a result of centripetal and centrifugal forces. Centripetal forces work through a kind of authoritative voice to produce a uniform way of conceiving of a given situation, removing alternative ways of expressing or acting in a given setting. Thus, centripetal forces make way for a monoglossic truth or conceptualisation of the world. On the other hand, centrifugal forces enable multiple truths to be at work at the same time, making diversity attainable.

Dialogism, monoglossia and heteroglossia are central to our understanding of a central concept used by Holland et al. to describe the possibility for agency in a cultural world, that is, self-authoring.

Returning to self-authoring

Recall that Holland et al.'s theory of identity formation aims to avoid reducing to either the individual or the social. They achieve this by drawing on Bakhtin's argument that it is not possible to study any event in isolation; dialogism is the core organising principle in the concept of self-authoring:

It is not only being addressed, receiving others' words, but the act of responding, which is already necessarily addressed, that informs our world through others. Identity, as the expressible relationship to others, is dialogical at both moments of expression, listening and speaking (Holland et al., 1998, p. 172).

Holland et al. emphasise that identity is a by-product of actions. This point has even more importance when combined with the concept of self-authoring deriving from Bakhtin's dialogism: "People coexist, always in mutual orientation moving to action; there is no human action which is singularly expressive" (Holland et al., 1998, p. 169).

The collective of a figured world is parallel to the speech genre in terms of Bakhtin's theory, as we have to take systems or processes into account in order to understand an event. Discourses within a figured world which make the way for the values, norms and rules that constitute a

figured world, as well as general discourses from outside, are parallel to what Bakhtin refers to as ‘voices’ or ‘stimuli’. Holland et al. draw on Holquist (1990) to explain human existence as being in a situation of responding to discourses and voices:

So long as I am in existence, I am in a particular place, and must respond to all these stimuli either by ignoring them or in a response that takes the form of making sense, of producing—for it is a form of work—meaning out of such utterances (Holquist, 1990, p.47, cited in Holland et al., 1998, p. 170).

These voices have to be organised in one way or another, so that the individual can construct meaning in a given setting. Self-authoring is the means by which people orchestrate voices and navigate the dynamics of the figured world: “Bakhtin’s concepts allow us to put words to an alternative vision, organized around the conflictual, continuing dialogic of an inner speech where active identities are ever forming” (Holland et al., 1998, p. 169).

There are no automatic or predetermined ways in which people orchestrate voices. As Bakhtin argues, the world is heteroglossic by its nature. Hence, figured worlds are heteroglossic, drawing on several discourses with different strengths while affecting ‘life’ within these worlds. There are both centripetal forces and centrifugal forces at the same time, with a ‘competition’ of monoglossic and heteroglossic forces. Some voices may be ‘louder’ than others: “In a situation of heteroglossia different languages and perspectives come inscribed with differing amounts of authority, which suggest how they might be orchestrated” (Holland et al., 1998, p. 182–183). Some voices derive from authoritative discourses, and work as centripetal forces, trying to lead towards a monoglossic situation.

Building on the concepts of dialogism, heteroglossia and monoglossia, self-authoring provides a way of understanding how people construct meaning and make themselves visible by utterances, or actions, in a given social setting. It is what Holland et al. regard as the broad venue for self-fashioning:

We conceive the space of authoring, then, as a broad venue, where social languages meet, generically and accentually, semantically and indexically, freighted with the valences of power, position, and privilege. Such a large concept is needed if we are to understand more particularly the places each of us occupies, and if we are to develop notions of authorship, of social and personal agency, that do justice both to Vygotsky’s keen sense of persons-in-history and to Bakhtin’s heteroglossic . . . social worlds. Such a concept is needed to do justice to the complexities of self-fashioning in everyday worlds (Holland et al., 1998, p. 191).

It is within the space of authoring people that the nature of agency is seen, through the orchestration of voices which arise from individual and collective perceptions, values and norms, situations of power and privilege and from essential figures. These voices can arise within the figured world itself, as well as from the surrounding worlds, and from the past, present and even an anticipated future:

One's personal agency is not the creation of a self that is always uniquely one's own. Rather, agency takes shape in what we call the space of authoring. This space is formed, both within us and outside us, by the very multiplicity of persons, who are identifiable positions in networks of social production, and of worlds of inner activity that are also scenes of consciousness (pp. 210–211).

The space of authoring is where all the voices we draw on as social beings 'meet', and it is what we draw on to make ourselves visible in the context of figured worlds. These voices are both from the past, the present and even an anticipated future. The space of authoring is the source we orchestrate from in order to make meaning and create an answer to all the voices that affect us. These voices are both from inside and outside us. We are not restrictedly individuals; we are individuals 'playing a part' in a larger picture:

When we act, whether that act is instrumental or imaginative, we 'move' through this space figuratively. None of us is occupied singularly: we are not possessed by one identity, one discourse, one subject position. Each act is simultaneously a social dynamic, social work, a set of identifications and negations, an orchestration or arrangement of voices. And our sense of self comes from the history of our arrangements, our 'styles' of saying and doing through others. The freedom that Bakhtin calls authorship comes from the ways differing identifications can be counterposed, brought to work against one another, to create a position, our own voice, from which we work (Holland et al., 1998, p. 210).

It is within this space of authoring that agency takes place, the nature of how we affect our own style and our own story in human interaction.

Authorship is not a choice

People exist in a dialogical relationship to the world they are a part of. Because of this, it is not possible for a person *not* to construct an answer to the different voices around them. People are condemned to respond to the stimuli surrounding them, because of the dialogic nature of existence. As Holland et al. explain:

The world must be answered—authorship is not a choice—but the form of the answer is not predetermined. It may be nearly automatic, as in strictly authoritative discourses

and authoritarian practices (thus nearing Bakhtin's monology), or it may be a matter of great variability and most significant to a single person's address. In either case authorship is a matter of orchestration: of arranging the identifiable social discourses/practices that are one's resources (which Bakhtin glossed as "voices") in order to craft a response in a time and space defined by others' standpoints in activity, that is, in a social field conceived as the ground of responsiveness (Holland et al., 1998, p. 272).

This crucial feature of human existence in a figured world is not captured purely in terms of identity. The concept of self-authoring highlights how people must answer the figured world they are a part of – they have to respond in one way or another. The acts people choose to do, or not to do, are their responses to the ongoing dialogical chain of acts within a figured world. It is impossible to escape from the state of responding. Hence, the process of self-authoring is never finalised; it is 'openendedness'. The meaning that a person makes of their self, the authoring self, comes from a position that is analogous to the 'I': "In authoring the world, in putting words to the world that addresses her, the "I" draws upon the languages, the dialects, the words of others to which she has been exposed" (Holland et al., 1998, p. 170). This means that we author ourselves by drawing on influences in the present as well as previous experiences. The 'I' orchestrates voices in order to respond any utterance, which is already addressed. "The self is a position from which meaning is made, a position that is "addressed" by and "answers" others and the "world". . . . In answering . . . the self "authors" the world—including itself and others" (Holland et al., 1998, p. 173). The self is authored through the eyes of others. Holland et al. draw on Holquist (1990) to put it this way: "The self, authors itself, and is thus made knowable, in the words of other" (Holland et al., 1998, p. 173). Whereas the self is never finalised, 'others' are: "The other is authored, captured, and finalized in language as though the other were not a subject just as open-ended as the self" (Holland et al., 1998, p. 173).

Styles of authorship

Holland et al. deny any simplistic notion of identity formation, arguing that it is not possible to predict a uniform identity formation within a figured world. Paying attention to self-authoring as identity formation, it is important to remember that people orchestrate different voices, within their space of authoring, so that different individuals express agency in different ways. In the process of self-authoring, different styles of authorship emerge. Holland et al. note that a person may cast themselves merely through the eyes of others – and describe 'outsideness'. To be seen by others, people need to be aware of the way others may see them, from outside. This

is what Bakhtin names “outsideness” or “transgression”, an assumed position that focuses heavily on the eyes of others and leaves the actor with little sense of agency.

The voices that need to be orchestrated in the space of authoring come with different strengths and impacts. For some people, the impact of the authoritative discourse they are involved in may be so strong that they end up ‘ventriloquated’ by it: “The author does not speak in a given language . . . but he speaks, as it were, *through* language, a language that has somehow more or less materialized, become objectified, that he merely ventriloquates” (Bakhtin, 1981, p.299, cited in Holland et al., 1998, p. 179). It is as though people’s own authorship vanishes, and the authoritative discourse speaks through that person. However, people have potential to resist such authoritative discourses. Drawing on Bakhtin, Holland et al. describe the way we may resist such strong influence: “The escape from being ventriloquated by first one and then another authoritative voice comes through the orchestration of and adoption of stances toward these voices” (Holland et al., 1998, p. 185).

By taking a stance towards authoritative discourse, people may redirect themselves. Holland et al. describe another possible style of authorship, an authorship which is filled with a stronger sense of agency and an awareness of oneself – taking an authorial stance. Someone can “rearrange, reword, rephrase, orchestrate different voices and, by this process, develops her own “authorial stance” ” (Holland et al., 1998, p. 183). With the words of Bakhtin:

One’s own discourse and one’s own voice, although born of another or dynamically stimulated by another, will sooner or later begin to liberate themselves from the authority of the other’s discourse. This process is made more complex by the fact that a variety of alien voices enter into the struggle for influence within an individual’s consciousness (just as they struggle with one another in surrounding social reality) (Bakhtin 1981, p. 348, cited in Holland et al., 1998, p. 183)

Developing an authorial stance first entails developing an internally persuasive discourse. This occurs when we reject being drawn into attitudes or beliefs that are influenced by an external, authoritative voice, but, rather, combine that authoritative discourse with ‘one’s own word’. Developing an internally persuasive discourse requires an awareness of voices from outside as well as inside, and through the orchestrating of these different voices, new attitudes and beliefs that affect a person’s acts may be developed. Again, Holland et al. quote Bakhtin:

Internally persuasive discourse—as opposed to one that is externally authoritative—is, as it is affirmed through assimilation, tightly interwoven with “one’s own word.” In the everyday rounds of our consciousness, the internally persuasive word is half-ours and

half-someone else's. Its creativity and productiveness consist precisely in the fact that such a word awakens new and independent words, that it organizes masses of our words from within, and does not remain in an isolated and static condition. It is not so much interpreted by us as it is further, that is, freely, developed, applied to new material, new conditions; it enters into interanimating relationships with new contexts (Bakhtin, 1981, 345–346, cited in Holland et al., 1998, p. 182).

To develop an internally persuasive discourse requires time and experience within the 'life of a figured world'. Holland et al. draw on both Vygotsky and Bakhtin to describe this development. Quoting Bakhtin, Holland et al. note the importance of internally persuasive discourse in struggle against authoritative discourses: "where someone is striving to liberate himself from the influence of such an image and its discourse by means of objectification, or is striving to expose the limitations of both image and discourse" (Bakhtin, 1981, p. 348, cited in Holland et al., 1988, p. 183). The notion of mediation from Vygotsky is also crucial in how "an internally persuasive discourse mediates the reorganization and extension of social speech into new forms of inner speaking. It changes the nature of subjectification" (Holland et al., 1998, p. 182).

Self-authoring – an alternative vision of identity

As Holland et al. point out, Bakhtin's concept of self-authoring allows an "alternative vision, organized around the conflictual, continuing dialogic of an inner speech where active identities are ever forming" (Holland, et al., p. 169). A main point is how identity formation can never be treated as an isolated happening, drawing exclusively on the social or the individual. It is the intertwined relation between the individual and the collective in a figured world that needs to be taken into account in order to understand how people develop their sense of self, the way they self-author. People orchestrate a multitude of voices, bringing the individual and the collective together in the space of authoring, and it is within this space that agency is embedded. It is within this space that individuals may take the first step of improvisation and thus contribute to change or new alternative routes of action. Referring to Vygotsky and Bakhtin, Holland et al. note that "They tell us where—along the margins and interstices of collective cultural and social constructions—how, and with what difficulties human actors, individuals, and groups are able to redirect themselves" (Holland et al., 1998, p. 277–278).

The fourth context of identity: world making

The fourth context of identity concerns the possibility for making worlds, or, more precisely, new figured worlds. As seen in the presentation of the first three contexts, Holland et al.'s theory invokes an optimism based in the human ability to improvise and, orchestrate voices within the

space of authoring, even when in an apparently inescapable situation. The fourth context of identity – world making – pays attention to how collective movement can lead towards the creation of new figured worlds, entailing re-consideration and reorganisation of the norms, rules and values of an existing figured world.

Vygotsky's and Bakhtin's theories are of interest in how new worlds that affect the individual perception of self may emerge. Holland et al. describe how play is the ultimate source for creating new worlds, drawing on Vygotsky's account of the human capacity to enter 'as if' worlds. It is through being an actor in a play world that people learn to think otherwise and act otherwise, in contrast to how one thinks and acts in the real world. Activity in play opens up thought and "allows for the emergence of new figured worlds, of refigured worlds that come eventually to reshape selves and lives in all seriousness" (Holland et al., 1998, p. 236). Holland et al. describe how a mastery of play leads to a mastery of imagination. The capacity to play in different roles and formulate different scenes is the source of agency. Without the capacity to enter into play, there would be little sense of agency. As Holland et al. say, "Through play imagination becomes embodied, proprioception as much as conception, experienced in activity, moved as much as mapped. Through play our fancied selves become material" (Holland et al., 1998, p. 236).

The Bakhtinian concept of carnivalization is important for developing a deeper understanding of the crucial role of play, sometimes out of awareness and sometimes within our consciousness, as the source for the creation of new worlds. Carnivalization is the "very abstraction and mimicry, which make representation itself thematic and thus ironize everyday usage" (Holland et al., 1998, p. 237). It reveals the dualistic situation of the dynamics of habitual acts with their lack of awareness of the situation but also awareness in the same situation. Carnivalization is dependent on consciousness of the figured world, but it also enables the opposite situation to arise. Holland et al. note how Vygotsky's theory of play in human development and Bakhtin's concept of carnivalization "have much to do with social experimentation as well as social reproduction. . . . Here people create new orchestrations from the play of inner speaking and seek to convert them interactively to new imagined practices, new virtualities" (Holland et al., 1998, p. 238). Through imaginary thoughts, new worlds emerge.

The movement that comes from play worlds and enables the emergence of new figured worlds is often "accomplished by the figuring of "the opposition" to this publicization" (Holland et al., 1998, p. 250). Becoming aware of one's own situation in a figured world as not beneficial, and potentially realising that this situation derives from its habitual acts, is of crucial importance for

a move towards a new figured world, by figuring the world otherwise. These new worlds are not necessarily played out, but they are at least an image of how the world should *not* be: “In that counter-world, motives are askew and actions are opposed to the course of events appropriate to the world’s topos” (Holland et al., 1998, p. 250).

Because figured worlds are constructed by the people that populate them, alternative worlds may be constructed through collective acts and movements, through different possible styles. New worlds, or imagined communities, can emerge as either big, spectacular movements, or as more silent, social reconstructions. The new, alternative, worlds carry new identities, cultural forms, and possibilities for renewed agency. Hence, the wheel this theoretical framework offers has turned a full circle, and it leads us back to the first context of identity – figured worlds.

Applying this fourth context of identity to a mathematics class means that there are possibilities for creating ‘new worlds of mathematics’ that carry renewed identities and possibilities for renewed agency for the students. However, this will not happen by itself or out of awareness for the students and the teacher. It requires an amount of consciousness and awareness among the actors of the habitual acts that happen in the present figured world.

In this chapter, I have presented Holland et al.’s (1998) theoretical framework of identity and agency in cultural worlds, focusing on ‘identity in practice’ through four contexts; figured worlds, positionality, self-authoring and world making. The first three contexts of identity are most important for the empirical work to come, to gain insight to how students fashion senses of self within this local context of a classroom culture, in Class A. Moreover, the first three contexts will enable me to highlight students’ agency and their different way of employing identity within this context. This will make it possible to explore how gender can be performed in more ways than focusing on binaries of gender and mathematics. The last context, world making, will be important for the contribution to knowledge and implications of this study.

Chapter 4: Methodology

In this chapter I will give an account for the methodological questions and choices of this study. First, I will illustrate how Holland et al.'s (1998) theoretical framework has implications for the methodology. Subsequently, I will go on to present the methodological approach and the basic choices of how this study was conducted. Finally, I will explain how I analysed the data and how it is presented for the reader.

My world view: the influence of Bakhtin

In Chapter 3, I have given an account for the influence of Bakhtin's work on the theoretical framework of figured worlds. A main concern in Bakhtin's work is how it is not possible to treat a single event in isolation from its context, and as seen in Chapter 3, this is central to the theory of identity and agency in figured worlds. A key concept in Bakhtin's approach is dialogism, which not only has major importance for the theory, but also carries major implications for the methodology of this study.

The importance of dialogism

Gillespie and Cornish (2014) point out, citing Grossen (2010), that it is not possible to identify one specific methodology to capture the essence of dialogism in research, because that would contradict the concept of dialogism itself. Just as there is a magnitude of different possible meanings in a dialogue, there will be a magnitude of different ways to capture dialogism. In this section, I outline some of the methodological implications of using the theoretical lens provided by the theoretical framework of figured worlds and its basis in Bakhtin.

Bakhtin sees the nature of human existence as being in a dialogic relation to the world and other human beings. As seen in Chapter 3, although Bakhtin was a literary critic and not a social scientist, his work has affected social science. In parallel to how the reader of a novel constructs its meaning, where there are several possible meanings that can be constructed in the relationship between reader and novel, we can see people as being in a dialogic relationship to the world. Being in a dialogic relationship can mean both a real dialogue as in a conversation, but also an imaginary dialogue, as when the people who populate a figured world are in a dialogic relationship with the figured world and the figures that constitute it. Because dialogism provides several possible meanings, it opposes the existence of one possible meaning, or one single truth created in the ongoing dialogue. As I explained in Chapter 3, the words we use act

as a kind of a trio composed of the individual, the speech genre and the person to whom we are speaking; this is important in understanding how meaning is constructed.

The dialogic approach permeates the methodology of this study and carries implications for me as a researcher as well. My ethnographical approach to investigating Class A and the way that students fashion their sense of self in this class gives me no exclusive right to **the** 'truth' of Class A. My representation of the figured world of Class A, how this world is lived out, and the way the students negotiate their identities, is constructed in an ongoing interplay between myself, the students and the teacher as we talk about its acts, happenings and utterances. There exists no singular way of understanding students' identity formation within this figured world. Rather, the meaning I construct of Class A and the students' identity formation is one out of several possible ways of understanding these processes. For this reason, it is important to pay attention to the 'I': for Bakhtin, where the 'I' speaks from is crucial, it is the vantage point from where meaning is constructed. This means that my history in person is important to this story.

The 'I' who is telling the story of Class A

My history in person is strongly influenced by my time as a teacher of mathematics in lower secondary school for about 15 years (1999-2015). I have taught almost 300 students from 8th grade through to 10th grade, being involved in their life of learning mathematics at the point in their lives where they go through a general transformation from a grown child to a young adult. In a sense, these students' stories have fashioned me at the same time that I in some sense fashioned them. Moreover, I have been a teacher trainer for 8 years. My classroom experiences, both as a teacher and as a teacher trainer, are rich and diverse, and I am trained to notice and understand 'what is going on' in a classroom. In that sense, I will claim that I am familiar with the genre of a mathematics classroom, and this underpins the dialogic nature of my construction of life in the classroom.

My sensitivity to gender in mathematics is not a new theme in my history in person. As a woman in mathematics, I became aware of being a part of a minority, both in upper secondary school and in my university studies. In the school where I worked, female mathematics teachers were underrepresented. Furthermore, I noticed how more boys were eager to follow an accelerated pathway in mathematics than girls. As a teacher, I was aware of gender differences in students' participation in the classroom, and I have experienced parents' attitudes to the importance of mathematics in their teenager's life as gendered.

Taking a critical view - what could be different?

As I have explained in the introduction to this thesis, my opinion is that the Norwegian debate about gender with respect to school and mathematics needs to be more nuanced. My mission has become one of offering a critical view on life in a lower secondary classroom, trying to notice and point out structures that do not do justice to the democratic ideal of equal opportunities for every individual, regardless of who they are and where they come from. This means that I have been conscious of how things could be different, and that I would welcome changes towards more equal opportunities.

As discussed in Chapter 3, Holland et al.'s (1998) theoretical framework ultimately focuses on change and how change can come about in a figured world. The fourth context of identity in practice, world making, pays attention to two perspectives. The first concerns how 'figuring things otherwise' is the first step toward change. Becoming aware of structures in a mathematics class that do not benefit students equally, and telling this story, paves the way for reflections on how to figure this classroom otherwise. The second perspective concerns how the movement of change needs to be a collective movement. Changing the dynamics of a figured world is not a question of individual responsibility and action; changing values and norms requires collective movement. Even though these theoretical assumptions do not directly influence my methodology, they influence me and the view I take in this study.

Together, my history in person and my critical view constitute the vantage point of the 'I'. It is this 'I' that orchestrates the voices of Class A, in order to make meaning of this figured world and the way that students fashion their sense of self.

The methodological approach of this study

A fundamental aspect of this study is to understand how students negotiate agency and identity within this figured world. The epistemological implications of Holland et al.'s (1998) theoretical framework is an emphasis on the claim that it is not possible to investigate an individual identity as such, because an individual's identity cannot be separated out from the figured world they are part of. This forces me as a researcher to take a relational approach in investigating and understanding how identities emerge and develop in a figured world. Recognising Class A as a culturally constructed realm in which identity development takes place, a relational approach needs to encompass the spaces between people as well as social practices within the community. In addition, Holland et al.'s (1998) essentially Marxian position means that the history of a person and their position within the local context investigated are of central importance for understanding identity, leading to an emphasis on the

fluidity of time (identity is a process of becoming, and is never finalized) and the importance of space (identity is shaped within an ever-changing locality).

Thus, the theoretical framework of figured worlds influenced the design of this study in that I needed to capture the characteristics, norms, rules and values that ‘pave the way’ for the habitual acts of the figured world where the students fashion their sense of self. Because it is the actors in a figured world that constitute the world, and know the way this world is lived out, I aimed to understand the everyday life of this class through its actors’ eyes. Needing to access the shared values and beliefs of this class, and the significance of particular acts within it in addition to (or as part of) individual students’ experiences as mathematics students meant that I needed to go beyond taking ‘snap-shots’ of life in the classroom. I needed to develop an understanding of both individual and collective perspectives at the same time, within an ever-changing space.

Going ethnographical

Capturing this complexity of individual and collective perspectives in a classroom has led me to take as broad an approach as possible. Because figured worlds emerge and develop over time, I also needed to capture how Class A developed from Grade 8 to Grade 10. An ethnographically inspired approach combined my need for gathering data on Class A as an evolving figured world with data about the students’ identity formation as they moved through the years of lower secondary school. Bryman (2016) describes ethnography as a “research method in which the researcher immerses him- or herself in a social setting for an extended period of time, observing behaviour, listening to what is said in conversations both between others and with the fieldworker” (Bryman, 2016, p.690). Fetterman (2010) describes how ethnographies are used to tell authentic stories of a cultural group through the eyes of the people that populate this group, in their daily life. Creswell (2016) adds to this to describe ethnography as a research design where “the researcher describes and interprets the shared and learned patterns of values, behaviours, beliefs, and language of a culture-sharing group” (Creswell, 2016). Often, ethnographies are equated with participant observation. However, as Bryman (2016, p. 423) emphasizes, taking an ethnographic approach means that the researcher focuses on using several sources of data to gain insight to the culture of the group being investigated, including interviews and documents as well as observation.

Geertz (1973) emphasizes how ethnographic studies search to achieve ‘thick descriptions’ of a culture in order to obtain to build a knowledge base and draw an overall picture. In order to ‘cover as much as possible of the territory’ I collected several types of data: fieldnotes from my

observations, focus group interviews, individual narrative interviews and documents such as copies of the teacher's diary and students' diary note.

In order to gain insight into the socially constructed world of learning mathematics in Class A, I wanted to become 'as immersed as possible' among the students and the teacher who constituted this figured world. However, there is no automatic connection between 'becoming immersed' and gaining access to knowledge about the fabric that constructs a figured world. Inevitably, there are limits in what I actually can say about Class A, because it is the people who populate a figured world who carry this world out.

Emic or etic stances

Taking an ethnographic approach to investigating a mathematics classroom as a figured world and trying to understand how the students fashion their sense of self in this culturally constructed realm raises the question as to whether I have become an insider in this figured world or not, and if I am, in what sense. As Fetterman (2010) points out, in an ethnography when one aims to immerse oneself in a culture, the researcher needs to be aware of both emic and etic stances and the challenges these bring.

Understanding the classroom from the inside feels important within the theoretical framework of figured worlds, and my intention has been to try and capture the figured world of Class A as closely as possible through the eyes of the students and their teacher. However, this is problematic from the point of view of dialogism – it is important to be conscious of my role in the research and what I can say about the world I am investigating. Am I becoming an insider, or do I remain as an outsider, or some combination of the two? How does this affect my access to knowledge?

Bakhtin draws attention to how meaning is constructed in the tension between centripetal and centrifugal forces. Hong, Falter and Fecho (2017) argue that if meaning in language is constructed within these tensions, the same applies to what we construct with language: the meaning we make of cultural constructs as figured worlds undergo the same tensions, but it is within these tensions that we seek to construct meaning. Hong et al. (2017) point out how the tensions between emic and etic stances are “at the core of his [Bakhtin's] beliefs about the conduct and expectations of research. From his view, *emic* and *etic* stances are subject to similar tensions as that of language” (Hong et al., 2017, p. 22 italics in the original). Researching in the spirit of Bakhtin means that I need to be aware of these tensions between emic and etic stances; even as I search to understand the figured world of Class A through the students' eyes, I can't

escape the tension I meet in this process by drawing on my previous experiences, my history in person. Drawing on Bakhtin, Hong et al. (2017) point out that:

Even as we endeavour to see the world through the eyes of the other, we can't escape the opposite tension imposed by our own experience. Nor can we help but acknowledge the past, that 'something created is always created out of something given,' yet what is created is never just 'given and final' (Bakhtin, 1986, p. 119–120, cited in Hong et al., 2017, p.22).

Doing research means that new meaning which is not finalized will be created. Again, drawing on Bakhtin, Hong et al. (2017) argue that the researcher has no place as an outsider:

The person who understands (including the researcher himself) becomes a participant in the dialogue, although on a special level ... The observer has no position *outside* the observed world, and his observation enters as a constituent part into the observed object. (Bakhtin, 1986, p. 125/126, parentheses and italics in the original)

To single out the position of the researcher would contradict dialogism, and Hong et al. (2017) point out how it would not make sense to discuss whether the researcher is an actor in the research or not; rather, the question concerns how much.

Immersing myself in the everyday life of one school class, Class A, meant that I became someone the students in this class learned to know, and I was in some sense an actor in this figured world. However, I was not an insider like the students and the teacher, and my mission in this classroom made me a different actor, being in a different dialogic relationship from the other actors in the classroom. I am aware that there was no unified opinion among the students as to how far I was a part of their culture. They related to me in different ways; some were more eager than others to communicate with me and related to me as an extra teacher. At the end of my very last day in the field, one student exclaimed when realising this was the last lesson I was to be a part of, "Aren't you going to be here anymore?", as though she was going to lose something. I don't know whether the other students shared her reaction, but it is a sign of how, at least for some students, I was a part of their everyday life in the mathematic classroom.

My ethnographic approach

As Bryman (2016) notes, there are different approaches to doing an ethnographic study, depending on whether the researcher's role is overt or covert, and what data sources are to be used. I wanted to take an open role as a researcher, because there would be questions about who I was and what I was doing in that school, both from the teachers and the students in Class A.

It was commonly known that I was doing a PhD about students' time in lower secondary school and how they related to mathematics, but the exact topic of the study was not known.

Drawing on Bryman's (2016) categories of level of participation and involvement in the field, my approach was that of a minimally participating observer - the researcher is a participant observer, but observations are not the main source of data, while interviews or documents, or both, play a more prominent role. However, ranking the role of different data sources is difficult in terms of dialogism. Bakhtin's emphasis on how it is not possible to single out individual units from a context means that it is problematic to disentangle the types of data, because they are collectively dependent on the interplay between me as a researcher and the classroom that I am investigating.

My aim of taking an ethnographic approach in order to develop an understanding of Class A as a figured world guided me towards combining:

- participant observation in periods in the mathematics lessons in Class A over two and a half years;
- focus group interviews at different points during the period of lower secondary school;
- interviews with the teacher at the end of 8th and 9th grade and
- in-depth individual interviews with the students focusing on their narratives as mathematics students and of Class A.

Attributing hierarchically ranked roles to these data is not possible; rather, they capture different angles of the figured world of Class A and the students' navigation of their sense of self within it.

Deciding on the different types of data

I collected various types of data, all equally important in this study. I detail these below.

Participant observations

My theoretical framework emphasizes that data about values, rules and norms can be captured through observation of the habitual acts and mundane activities in the figured world. My intention in becoming 'immersed' in Class A as a participant observer was that it would enable me to get to know, and begin to share, the students' and the teacher's story of Class A; it would also enable me to become familiar with the genre of the classroom and its habitual acts. Moreover, it would help me to understand the way that teaching and learning in this particular class proceeded, what characterized the relationships between the students and between the

students and the teacher, and also the students' expressed relationships with mathematics in this context.

I considered using video as the lens for observing lessons, partly because it is recommended by several researchers, such as Jacobs, Kawanka and Stigler (1999), Klette (2009, 2015) and Derry et al. (2010), as enabling the researcher to more accurately and comprehensively capture 'the life' of the classroom. However, I decided to not do this, because of several practical and relational issues, and a more theoretical concern that it could be problematic in the spirit of dialogism. A practical issue was that I wanted to be adaptable to the teacher's plans and any sudden occurrences such as change of rooms, groups, schedules that life in a school brings. It was important for me to be able to join the mathematics lessons with ease and not give the teacher more to organise because I was hoping to spend almost two and a half years with this class. Avoiding dependence on technological equipment that could affect my flexibility was important.

Furthermore, I didn't want to be known as 'the video lady' among the students. Rather, I was more focused on trying to immerse myself as an extra teacher in the mundane activities of the classroom as a natural part of the students' world, as far as that was possible. I wanted the students to relate to me as naturally as possible in the lessons so that I might get the most authentic impression as possible of the life in the class. Moreover, I aimed to become a familiar person for the students, so that they would view me as a natural person to talk to in interview settings.

A theoretical issue around the use of video concerned my dialogical approach. Being in a dialogic relationship with this class as a researcher meant that I needed to be aware of Bakhtin's trio in the construction of meaning: the 'I', the genre and to whom we speak. Being an honest and transparent 'I' as a researcher, in terms of my history in person and my intentions in this study is an important and necessary in the spirit of dialogism. Using video as a means of obtaining a more 'objectified truth' in the classroom would undermine my intentions in a number of ways: in addition to placing me behind the lens as videographer rather than in the classroom as (ex)teacher, the use of video entails multiple choices and filters which are far from objective in terms of placing of the camera and related decisions on what is data in the classroom (de Freitas, 2016).

I visited the class regularly during the years 2017-2019. I started up in the second semester of 8th grade, and was participating in two periods, 3-4 weeks. In 9th grade I was participating three periods during the year. In 10th grade I was participating three weeks during the first semester,

and in the second semester I was participating for an extended period. Every year it was on the average three mathematics lessons per week, for 60 minutes. The details of my visits appear in Figure 3, “The timeline for the fieldwork”. While being in the classroom, I most commonly started to listen to the teacher’s talk and observing the students in the first part of the lesson, using a free spot in the classroom, among the students. When the students were working in groups or individually, I joined as a teacher; helping students who asked for assistance, approaching groups conversations or taking initiative to help students move on in their work. In the last part of the lesson, most commonly a short sum up, I returned to the free spot among the students, observing the students. My fieldnotes were created during the lessons. Most often I was a doing a ‘map of the classroom’, indicating who was sitting where, combined with notes of what the students were doing. Most of the time I was also writing down descriptions of what happened during the plenary session, including topics of the teaching, examples on the blackboard, who was talking, what was said and so on. See Appendix 1 for examples of my fieldnotes and drawings of the class seating. In addition, I recorded my impressions from my visit in the class, paying attention to surprises or lack of surprises in the classroom and significant actors or incidences. Moreover, I was reflecting over interesting conversations among the students, between the students and the teacher, between me and the students or between me and the teacher.

Focus group interviews

Focus group interviews provided an opportunity to gain a broad information base about the students’ shared beliefs about mathematics and what it was like to be a mathematics student in Class A. As well as enabling me to obtain information from as many students as possible during a fixed amount of time, focus groups provided a space in which students could enter into a dialogue with each other, providing opportunities for disagreement or for consensus to emerge and become visible.

Bryman (2016) describes how focus groups are useful when the researcher aims to get beyond what people would say in an individual interview. Participants encounter and reflect on others’ utterances and may potentially revise their own view; a focus group also provides the opportunity for collective sense-making and construction of meaning. As described in Foyn et al. (2018), where the label of the ‘nerd’ emerged quite unexpectedly, there was a possibility for focus group interviews to create or generate joint meanings of previously undefined but known phenomena among students. Hence, I considered focus group interviews as especially

informative about the values and norms of the figured world of Class A. The dialogue between the students would illustrate the discourses at play too.

I organised 3 focus group interviews during the fieldwork, 1 in Grade 8 and 2 in Grade 9. In Grade 8 the teacher helped me to pick students that would work together as a group which would enable easy communication in the group, between the students, both boys and girls. In Grade 9 the idea was to group the students according to gender in the first interview, however in the end this was not possible, because students were absent at different points. In the second interview, I tried to pick students to create groups that represented sub-groups in the class, however this was not possible to do consequently, because of considerations made by the teacher. The topic guide was designed to create discussion among the students by inviting them to agree or disagree on statements about mathematics, discuss how they would rank the importance of mathematics in comparison to other subjects and so on and so on (see Appendix 2).

Individual interviews

Individual interviews with the students would enable me to get beyond the other data by capturing their accounts of personal histories and processes of change, in addition to capturing the students' individual accounts of Class A, outside of the focus groups. I was particularly interested to capture the student's individual narratives of self in order to identify how their trajectories as mathematics students might differ within the same context. Aware of the importance of history in person, self-authoring and the role of figures from the past, present or future, I chose a narrative approach; as Clandinin and Connelly (2000) argue, narratives are a way to capture human experiences, including in educational research. Including both common shared stories and individual stories, narrative accesses "the stories of the experiences that make up people's life, both individual and social" (Clandinin & Connelly, 2000, p. 20). Narrative interviews followed the spirit of Bakhtin, providing a window on the ways in which students orchestrated the different voices in their lives. As the theoretical framework of figured worlds emphasises, authorship is not a choice. Moreover, as Solomon and Braathe (2015) argue, agency is enacted within the interview, through the co-construction of a dialogue.

The interviews were conducted in the last semester of 10th grade so that the students could tell their story spanning the three years of lower secondary school. I interviewed 19 students, taking them out of the classroom to a different room during their mathematics lessons or during the break time where we would be undisturbed. In order to make space for individual narratives, I designed the interview as an open process which would encourage them to talk in general about

their experiences and make choices about what they would tell me. (See Appendix 3 for the topic guide.) To this end, I asked them to draw a picture of the three years, drawing three different timelines indicating their level of effort, their performance in terms of grades, and how much they liked mathematics. One such timeline is illustrated in Figure 3.

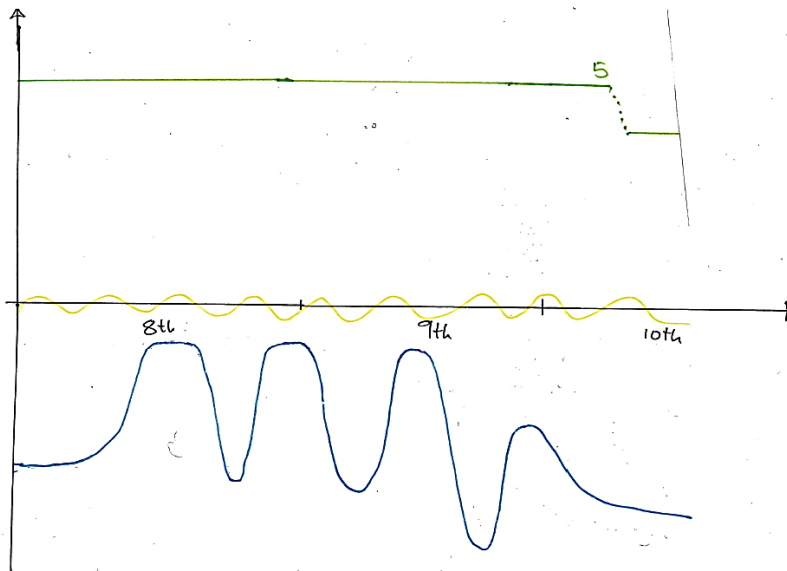


Figure 3. Grades (green line), work effort (yellow line) and feeling about mathematics (blue line) from grade 8 to grade 10

The horizontal axis, in Figure 3, indicates years in lower secondary school and the vertical axis indicates how the student assess their level of performance (seen in the green line), their level of work effort (yellow line) and their feeling about mathematics (blue line). Hence, the green, yellow and blue timeline indicate how the students' see their performance, work-effort and liking for mathematics evolve over time. Level above the horizontal axis indicates a positive level, below indicates a negative level. Numbers at the green line indicate level of grades. As the students drew their timelines, I asked them to explain their drawing. I tried to not disturb the flow of talk with questions, but rather to enable them to keep telling their story using questions like; "can you tell more about that" and trying to stay silent to allow them to take the initiative.

Individual interviews with the teacher were also important because she played a significant role in this figured world, as the bridge between the students' life as mathematics students and the national curriculum guidelines and legislation, and the internal school guidelines. She was connected to the students in a particular relationship, in terms of both the assessment process and the students' individual and group well-being. I wanted to get to know the way she made sense of the students and the life of Class A. Because of my experience of teaching in lower secondary school we shared an understanding of the context of being a teacher. Her talk enabled

me to gain an insight into the discourses at play which concerned the curriculum and legislation regarding the teaching and learning of mathematics. Her thoughts and beliefs about the students and the class would contribute to a more complex account of both the figured world of Class A and the way the students fashioned their sense of self as mathematics students.

I interviewed Miss A twice, at the ends of 8th and 9th grade, focusing on her thoughts on the students' performance and way of working with mathematics, relations among the students, and challenges and advantages concerning mathematics teaching and learning in this class, in order to capture if her view of how the class was evolving. The details of the interview topic guide are in Appendix 4.

Documents

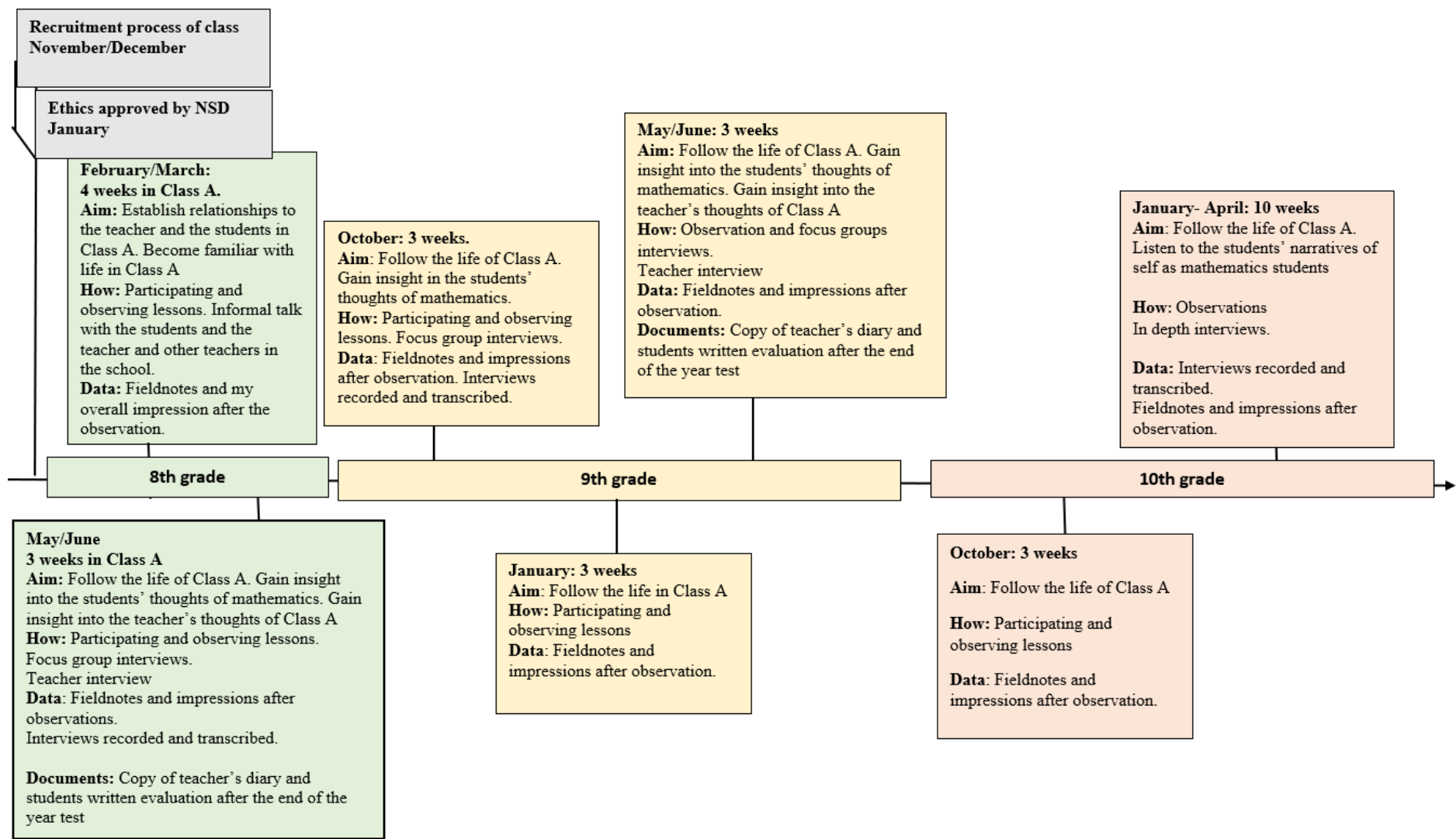
I also collected copies of the teacher's records throughout the period of my observation; these provided insights into her view of students' performance in terms of teacher assessment grades and notes about individual achievement and progress. See Appendix 5 for (anonymized) examples.

I also asked the students to write reflections after the end of year tests in 8th grade and 9th grade. I supplied questions to help them frame their evaluations of how they had performed in the test and how they had prepared for it. I hoped to gain some insights into students' perceptions of mathematics and of themselves as mathematics learners through these reflections (see Appendix 6 for an example).

The execution of the fieldwork: What and when

To do a 'pure' ethnography of Class A would mean that I would immerse myself among the actors in Class A throughout the entire period of lower secondary school. Being among the students in every mathematics lesson, every week, was not achievable within the frame of my PhD study. My solution was to immerse myself in the mathematics life of Class A in particular periods during the years of lower secondary school. In the timeline (Figure 4), I have indicated the details of my 'immersion' in Class A, alongside other details of the data collection

Figure 4. The timeline for the fieldwork



Evolving processes in an evolving world – reasoning the choices

Choosing an ethnographic approach to investigate Class A as a figured world provided me with the opportunity to obtain information from several sources and gain “thick information” that would enable me to develop my understanding of Class A as a figured world over time combined with the information of how the students storied their relationship to mathematics, teaching, each other and the common culture of Class A. As Fetterman (2010) emphasises, ethnographers need to keep an open mind, allowing alternative interpretations of data throughout the study. Keeping an open approach at the same time that I needed to make choices was a challenge - choices that affected the study needed to be done at some point or another, but I was concerned that if I made choices too early, I could lose valuable information. In this section I explain the choices I made during the data collection process.

The sampling process – keeping doors open

Sampling choices followed me more or less throughout the process of researching writing this thesis, from identifying the school and class to the final analysis and presentation.

School and class – identifying an accessible figured world

The first choice to consider concerned the number of schools and classes I should use to answer my research questions. My choice to keep as open an approach as possible during the data collection implied that I needed to invest time in order to get beneath the surface of the mundane activities of the life in the classroom, and I needed to be sensitive to evolving and emerging issues over time. Choosing one class in one school would enable me to meet these requirements. However, the grade of the class was of not irrelevant. I wanted to get access to an 8th grade class in order to follow the class as long as possible through the years of lower secondary school, to the end of 10th grade.

In order to become a part of a class for almost two and a half years, I needed to recruit a teacher who was interested in allowing me such a long period of access to their classroom. This was more difficult than I expected. After two months of searching I met a teacher, Miss A, who agreed to commit to my project, letting me be a part of her mathematics lessons as much as I wanted. I could not predict how this class would fit my intentions for this project. Questions that worried me were whether the students would accept me as a person they would communicate with, if the teacher would get tired of me being immersed in her classroom and if she would want to leave the project, or whether there might not be time to do the interviews I wanted, in between the teaching. I considered recruiting an additional teacher and a class, in

order to strengthen my chances of gaining an insight to the life in a class that I hoped for, but I decided to start the process in this one class and keep the door open in case I needed to recruit another class in order to get enough data.

My fears didn't materialise, as it turned out; as the process of 'immersing' in Class A developed, I was able to communicate with the teacher and the students, and the teacher accepted my presence. During 8th grade I concluded that there was no need to recruit more classes, and I kept my fingers crossed that I would have the opportunity to follow Class A throughout lower secondary school.

Choosing as an open approach as possible

When I started to immerse myself in Class A, I wanted to take as open an approach as possible in order to gain access to the mundane activities in this class and to be able to pay attention to what this figured world offered. As Fetterman (2010) emphasizes, choosing an open approach does not mean lack of rigour: "The ethnographer enters the field with an open mind, not an empty head" (Fetterman, 2010, p. 1). I was not a tabula rasa entering this classroom, with no idea of what I was going to focus on. I was informed by the theoretical framework of identity and agency in figured worlds and I carried with me the topic of interest for my study.

My first intention in immersing myself in Class A was to become familiar with the genre through the habitual acts that took place in the classroom, providing an insight into the figured world. However, within the pattern, structures, histories or incidents in this figured world, there would be a magnitude of different possible topics to choose to investigate. What to choose as my main topic was something I wanted to keep open until I was convinced that I had a topic to investigate which was so important that it was impossible to ignore. If I had chosen a topic to study in advance of the data collection process – for instance, paying attention to who was contributing in plenary sessions - I would run the risk of either meeting a class where this topic was not an issue, or I could overlook other issues that were more prominent and deserved my attention (Bryman, 2016). A restricted focus would mean that I wouldn't be sensitive to different aspects and evolving issues that I would find interesting. In my years as a teacher of mathematics, I have repeatedly experienced how life in a lower secondary school class offers unexpected happenings, events or situations. I trusted my gut feeling that there would be structures, patterns or incidents that would evolve which would be of interest for studying the way the students developed their identity as mathematics students in lower secondary school.

However, this ‘open approach’ was not entirely open. I was influenced by the literature and I paid attention to change, and I carried with me my interest in gender. Because of my previous years in mathematics classrooms as a teacher, my ‘glasses’ have been coloured in terms of what I turn my gaze on in the classroom. However, being aware of this impact on what attracted my attention, is not something I consider as a disadvantage. I did my best to start my investigations of the life of Class A as openly as possible, trying to recognize the happenings that routinely took place. I kept possible choices of structures or patterns in the classroom to follow open, as well as the choice of which students would finally be my case studies for further investigation and interview. I kept an eye on the experiences that I noted in my fieldnotes, and the evolving issues in the focus group interviews and in the teacher’s interview. I tried not to predict what was my major interest of the life of Class A before something struck me. Hence, the research focus in this study has been dynamic, and has been open to change during the field work, although the topic for the study – the development of students’ identity as mathematics students - has been pinned throughout the process.

A dramatic incident: awareness of a gender issue in Class A

At the end of 9th grade, I suddenly become aware of a prominent feature or pattern in Class A that became impossible for me to ignore once I was aware of it. I recognised a gender issue in Class A that was more extensive than first anticipated. I had previously noticed how a group of boys in Class A drew most of the attention in the mathematics lessons, and how they were often mentioned in my informal talks with both Miss A and other teachers who were involved in the class. What I had not been aware of was how this gender issue could be seen in Miss A’s assessment record. Figures 5 and 6 portray how the students’ performances in mathematics (measured by tests and teacher assessments) differed according to gender.

As these figures show, the boys in Class A were performing at a higher level than the girls. Their trajectories show them either performing steadily at a high level (grade 5 or 6) or, if they were not at a high level, improving or keeping their grades steady. For the girls, on the other hand, I couldn’t recognize any pattern. It seemed like their performance was going in all directions. Once I recognised that the gendered pattern in Class A concerned more than the actions I had already noticed, I decided that the issue of gender in a Norwegian mathematics classroom needed to be on the agenda when investigating life in a mathematics class in lower secondary school. This incident became a turning point for the choices in the forthcoming research process.

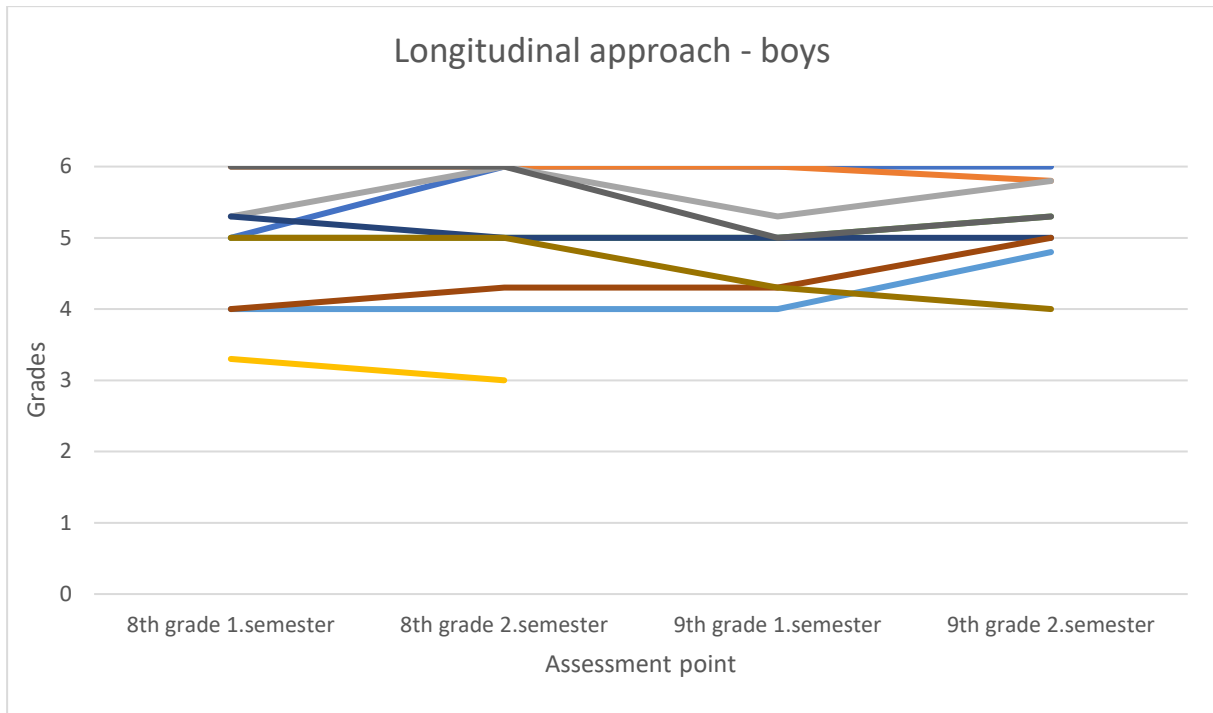


Figure 5. Boys' grades from grade 8 to 9. Assessments include written test and teacher assessment combined. Each coloured line represents one student's trajectory.

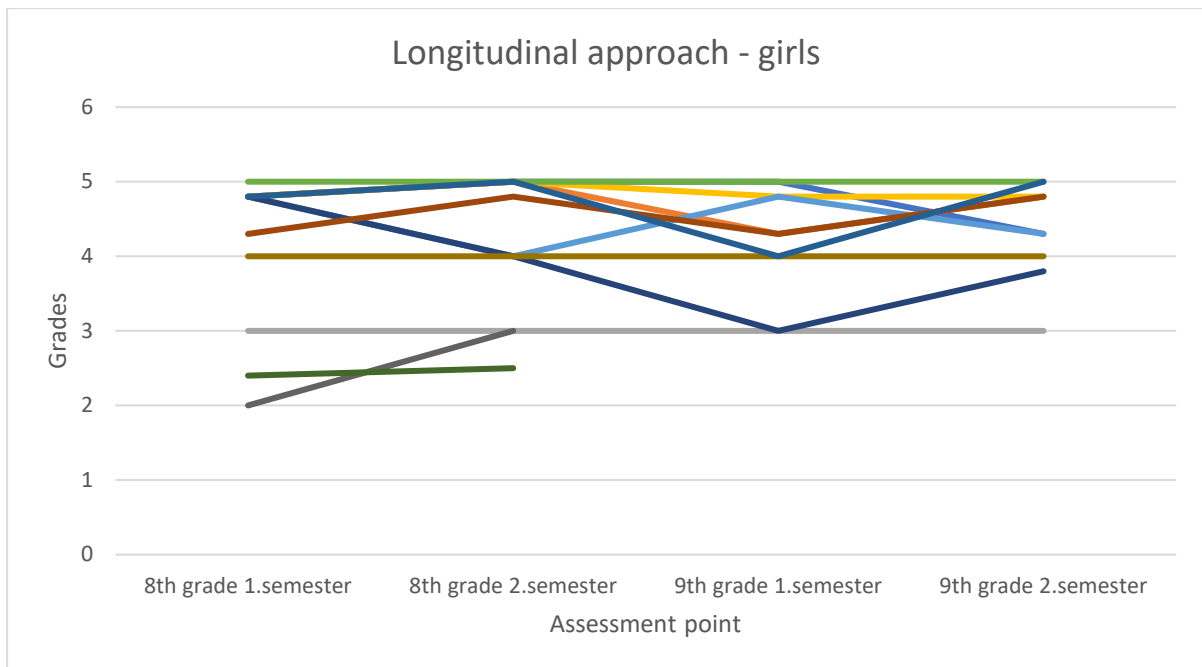


Figure 6. Girls' grades from grade 8 to 9. Assessments include written test and teacher assessment combined. Each coloured line represents one student's trajectory.

Student cases- significant actors in the figured world

The next choice I needed to make was to select the students who would be my case studies, where I would focus on individual identity formation over time. I was concerned that I needed to wait until I had discovered a ‘issue’ or a ‘conflict line’ in the structure of the class, or patterns in the classroom culture, or until a special incident arose. I kept notes of possible cases from the end of 8th grade on, and I kept that process open for as long as possible, in case any unpredicted incident might occur that would be of importance. The issues I became aware of in Class A were a combination of my impressions from the students, based on how they acted in the classroom, beliefs or attitudes arising from the focus group interviews, assessment scores, and informal chats with the students inside or outside the classroom. My original plan for the narrative interviews was to choose 4-8 students but I worried about what I could lose or gain in my selection. Even though (or perhaps because) I was becoming familiar with the students and their similarities and differences, their complexities, their achievements and their beliefs about mathematics, I found it difficult to decide who to choose. I hesitated to select the students in advance of the interviews, since clearly, I would not know what their narratives of self as mathematics students would bring. I was also concerned that the students might feel that they were not seen as ‘interesting enough’ for my project. Because my role as a researcher was open, they knew what I was doing. My conclusion was that I should undertake narrative interviews with all the students who had signed up to the study and postpone the selection process until later.

Even after the 19 interviews, I was still not sure who to pick as case studies. I needed to get an overall impression of the students’ stories, beyond just listening to these once, and decide who would bring in different aspects of their lives as mathematics students. I decided to transcribe all of the stories, effectively starting the analysing process (Jenks, 2011), and becoming more aware of what they highlighted. In the end, my selection of cases was not a consistent process. Some students were emerging as interesting choices from pretty early in the process from 8th grade on; some were interesting cases before the individual interviews; some emerged directly after the interviews; some during the transcription process; and the last emerged at the very last moment, as I became aware of how his story represented a useful contrast to the rest during the writing/analysis process.

In the next section I present my final choice of cases. From now on, they will be the main characters in the story of Class A.

Presenting the cast of characters and the context

The pupils in this 8th grade class had been together as a class for about a half year before I met them. There were 26 pupils in the mathematics lessons, 13 girls and 13 boys. Two out of these boys were from the 7th grade, on an accelerated mathematics programme, and one boy was on an accelerated mathematics programme and attended classes in upper secondary school. Although he attended Class A, he worked on his own. All the students had Norwegian as their mother tongue, and only one was not Norwegian ethnically.

The characters

Student	Why and when they became a case
Ross (M)	A significant actor in the classroom, became more and more 'present' and impossible to ignore as time went by. Acts out the figure of a 'smart boy' in mathematics. Caught my attention at the beginning of the data collection process.
Elias (M)	Went through an enormous change during lower secondary school. Caught my attention in 8 th grade, his way of acting in the classroom reminded me of a previous student I had taught. Struggled with mathematics, but my hunch was that he was able to do more than he thought. Followed him closely through the years, even though he was taken out of the class during 9 th grade, to be thought mathematics in a 'special group' for students that struggled with mathematics.
Kine (F)	A girl represents a mismatch between her achievement and the way she stories herself. Typical of a girl who is described as just needing to gain confidence in herself. I was aware of her from 8 th grade on, because of her very negative attitude to mathematics, even though her assessment scores were telling a different story.
Emilia (F)	A hard-working girl who I noticed early in the focus group interviews, because she was one of a few students who said they really enjoyed mathematics in 8 th grade. She did not stand out in any particular way, could be one in the crowd. Became a case as a result of her interview, which related an unexpected happening.
Rikke (F)	A typical girl who I have 'met before' - very concerned with teenage culture and being popular. Struggled with mathematics. Was given the same 'cure' as Elias, be taken out of Class A and to follow a 'special group' for students that struggled with mathematics, but it affected her differently. Her story as a struggler in mathematics is a classic one. Became a case in order to provide a different perspective on Elias.
Alexander (M)	Represents a 'smart boy' in mathematics, but very differently from Ross. Sometimes I could almost forget that he was in the classroom. My analysis of the figured world and what it meant to play out this world in a successful way, led me

	to realise that he was the closest representation of a successful student in Class A. He was the last case I decided on. Embodies the values of Class A but orchestrating these very differently from Ross. Not a stereotypical boy in mathematics.
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In my analysis, the students have been matched to constitute contrasting pairs with common and different features:

Ross and Alexander: Both represent the ‘smart boys’ in this classroom. However, this pair represent more than just being the same in gender and achievement. They represent differences in ways of acting, self-positioning and the space of authoring. They reveal that begin in what might seem to be a powerful and fruitful position is not the whole story.

Kine and Emilia: They represent the girls with good grades in this class. Like Ross and Alexander, what makes this pair interesting is more than that they are the same gender and have the same grades. While Kine can be seen as a stereotypical girl with low confidence and expecting to fail at any moment, Emilia makes her way through Class A with a lot of identity work in which she orchestrates multiple voices, to keep her everlasting joy and love for mathematics and numbers.

Elias and Rikke: Two students who start from a difficult position in opposition to the other pairs. They are both given extra attention in 9th grade because of their difficulties with mathematics, becoming a part of a small sub-group taken out in 9th grade to be taught by ‘Mr X’. While Elias ‘recovers’ from his problems during 9th grade, Rikke’s problems remain.

The supporting actors:

Miss A	The mathematics teacher. She is one of two main teachers responsible for Class A, and is connected to all of the students as their mathematics and science teacher. She has an opinion on how the relationships in the class are. A very kind and thoughtful teacher who is always in a good mood.
Herman	A ‘typical’ teenage boy, easy going and seems to get along with everybody in the class.
Jessica	A girl who raises her voice and challenges majorities and authorities.
Eva	A girl who seems confident in herself, easy going and in a good mood, does her work and is happy with how things are.

Sarah	She is doing well, comes along with the other students, surprises everybody but herself by her good performance in 10 th grade.
Josephine	A popular girl, easy to communicate with, Rikke's friend and her support.
Mr. X	The teacher of the group for students who struggled with mathematics.
Albert	A boy who the other students and the teacher refer to for being very clever and having a special interest in mathematics. Taking accelerated pathway in mathematics in upper secondary school, and because of this, he is often absent from the mathematics lessons.
Isak	Same as Albert, but he is not taking accelerated pathway.

The context – going from the big picture of the Norwegian school system

The Norwegian school system 'Grunnskolen' (primary and lower secondary school) is geographically oriented, recruiting students from a limited area. The teaching in the school is grounded in the national curriculum, and various education policy documents (Udir, 2020). An aim in Norwegian schooling is the education of the whole child, and the curriculum draws both on aspects of 'bildung', combining to educate 'good citizens' with attitudes, beliefs and values as a good human, and achievement (Skagen, 2012). However, the school has a broader intention. Schools are a central part of the local environment in Norway as meeting places for the population in that area. For young people, school is the place to meet other students your own age, and it has a crucial role in everyday life for young people.

The school in this study is located just outside of Oslo. It is in a high socio-economic status area, based on economy and education levels. The area that the students are recruited from is fairly homogenous, with few people speaking a language other than Norwegian, and there are few who are not native Norwegians. The school has a reputation for being a school where the students achieve high grades, and this is underlined by statistics presented on its webpage. At the same time, the webpage highlights that the school is a place where the students are happy to be. In my formal and informal chats with students, teachers and the administration of this school, the common belief is that this is a school with a reputation for being high achieving. The attitude among the teachers and the administration is that the parents are known for wanting to contribute to their children's development in achievement.

Analysing the data

The ontological implication of my theoretical framework, particularly Bakhtin's dialogism, is that it is not possible to investigate any utterance such as an act, a happening or a statement in isolation, because this occurs between people in a context over time. Hence, the unit of analysis must extend beyond isolated happenings the beyond individual utterances. To take this perspective means that it is the dialogic relationship of the individuals and context that is of importance, and the relations between individuals within the context. As I have argued above, it is therefore not possible to single out and treat the data as isolated units; they need to be considered as collectively contributing to answering the research questions of this study. Holland et al. (1998) argue that humans are not limited to focusing on just one aspect at a time: "Humans are both blessed and cursed by their dialogic nature—their tendency to encompass a number of views in virtual simultaneity and tension, regardless of their logical compatibility" (Holland et al., 1998, p.15). Thus, I have aimed for an analysis process which is flexible, drawing on the different sources of data without breaking them into components. I have avoided any attempt at triangulation of data, on the grounds that aiming to come closer to a 'truth' would not make sense within this theoretical context and would contradict the concept of dialogism. The different sources of data contribute jointly to gaining a broad access to the figured world of Class A.

Moreover, taking a dialogic approach has an impact on the interplay between me as the researcher and the life in the classroom under investigation. As I turn my gaze on what is important to me, in turn affected by my history in person, I am orchestrating my own voices.

Analysing the fabric of Class A as a figured world

My long period of participant observation gave me the opportunity to experience the life of Class A over time, to the point where I was beginning to share the story with the actors in this figured world. I became tuned into the mundane activities of the classroom and I developed expectations about daily events which enabled me to recognize and reflect on the habitual acts that took place. My fieldnotes and were a crucial starting point for these reflections, and I reread and replayed the focus groups and interviews; this 're-reflecting' made me conscious of what I understood as the values, norms and rules of life in Class A.

I transcribed the focus group interviews as soon as possible after they finished. Doing the transcribing myself forced me to listen carefully and pay attention to the conversations in retrospect; as Jenks (2011) points out, this work contributed an important vantage point in the

analysis process. I paid attention to the genre of the talk and the common beliefs or attitudes which circulated in the conversations. I noticed not only compliance, but also resistance, in the students' arguments and discussion.

The individual interviews that I conducted at the end of 10th grade were designed to obtain information about the class as a figured world as well as the students' narratives. Again, doing the transcription myself was useful. At this stage of the analysis process I was interested in the part of the interview which concerned utterances and statements about Class A. Because I had interviewed all the 19 students who had agreed to join the study, I ended up with a rich collection of accounts. This enabled me to understand the 'standard plot' of Class A and how individual students resisted or complied with it, in addition to the norms, rules and values of the figured world and the genre of the classroom.

The teacher's interviews added to this understanding of the class, as she authored it to me. Because of her central role, this was an important contribution to my understanding of the construction of Class A: I noticed her way of describing its common culture, the students she saw as playing an important role, and what she recognized as important values and norms in the class. In particular, I noticed the various discourses at play in her talk. Copies of her written records were also important for me to be able to reflect upon her understanding of the class as a unit.

Table 2 presents the operationalization of key concepts from Holland et al. (1998) that underpinned my analysis of Class A as a figured world.

Sub-Concept	Definition	About	Operationalization
Norms/ Rules	Expected actions or moves	Habitual happenings	Observations- what is repeatedly observed? Expected actions based on previous experiences in observations Narratives - descriptions of characteristic actions in the class. Co-constructions in focus group interviews
Artefacts	The use of language or important materials	Tangible objects, expressions, oral or non-oral	Observations –particular or characteristic use of language, body language or abstract or concrete objects. Narratives – description of the use of language or objects Co-constructions in focus group interviews

Values	Choice of actions, or important object to possess	How artefacts are employed, positional acts	Observations – significant acts that seem to give credit Narratives – description of what is important to do/possess in order to claim status. Co-constructions in focus group interviews
Figures	References, performances that affect the actors	Particular type, specific people, roles that the actors tend to react to in particular ways.	Observations Co-construction in conversation among the actors Narrative - utterances of actors who hold a significant position
Available positions	Groups in the figured world	Belonging to group, exclusion/inclusion, connected to rank of power or privilege	Observations – recognized actions of group member Narrative - descriptions of particular acts from a group of people connected to rank of power /privilege Co-constructions in focus group interviews
Voices	Influences or stimuli	Impacting moves, actions	Narrative – description of influences affecting acts or choices. Co-constructions in focus group interviews
Discourses	A particular way of understanding actions or artifacts.	May impact actions, generate value systems	Narratives – descriptions of normative actions Co-constructions in focus group interviews
Authoritative discourses	A particular way of understanding actions or artifacts that are hegemonic	Impacting actions, generating value systems	Narrative - descriptions of actions that are impossible to ignore. Co-construction in focus group interviews

Table 2. Operationalisation of sub-concepts important for analysing the figured world of Class A

Analysing the figured world was a dynamic rather than a linear process, combining what I saw and experienced through being a participant observer with information from the individual and focus group interviews. The overall design of this study, combining participant observation and interviews, enabled me to develop my analysis over time in a continuous process of reflecting and re-reflecting on the data. At the same time, I was aware of the dialogic interplay between my role as a researcher and the figured world I was doing research on.

The analysis of students' positionality and self-authoring

There are several ways of doing a narrative analysis. Lieblich et al. (1998) distinguish the main dimensions of narrative analysis as categorical or holistic, and content versus form. My analysis

of the students' narratives, in the spirit of dialogism, has been closest to a holistic analysis, drawing on an overall impression of the talk, focusing on issues such as genre, flow, contradictions or lack of contradictions and expressed attitude. Starting at the moment of the interview, the analysis involved a dynamic process of reading and re-reading the transcriptions as I noticed and reflected on particular key concepts which were operationalized as in Table 2.

Sub-Concept	Definition	About	Operationalization
Positional utterances	About relations to groups or actors	Positionality	Describing/explaining oneself in relation to subgroups/persons
Presentation of self	Sensemaking as a mathematics student	Identity/ self-authoring	Describing characteristics of oneself
Reasoning choices/situations	How a student assesses the possibility of changing/maintain a situation	Agency	Describing possibilities for affecting one's own situation as a learner in mathematics
Genre	Overall style of talk	Self-authoring/style of authorship	Tone of voice, use of specific words, passive or active voice
Orchestration	Making sense of oneself by arranging different voices/forces	Space of authoring	Sense making in the narrative
Flow	Narrative structure, choice of incidents, combination of ideas	Self-authoring/style of authorship	Sequencing of events, connections
Contradictions	Conflicting/contradictory issues in the talk	Ruptures	Contradictory claims/voices

Table 3. Operationalisation of key concepts important for analysing the narratives of selves

The interviews were constructed to give the students the opportunity to reflect on their situation as mathematics learners, using a combination of talk and drawing. In each case, I explored to what extent the two representations of self (talk and drawing) matched. My analysis process combined inspection of each student's timeline and mark-up of the transcribed text to gain an overall picture of the narrative. See Appendix 7 for an illustration of this analysis process.

The researcher as novelist - orchestrating the students' voices to tell the story of Class A

Doing an ethnography is more than doing the fieldwork; it involves writing a text and communicating the researcher's experiences of a culture to an audience. Fetterman (2010) argues that ethnographers are both storytellers and scientists, and that creating a text for others carries methodological implications. Who our audience is when we speak of our response to the context we are a part of is a key issue in dialogism. My aim is to make the students'

experiences in the classroom accessible to more people than myself, and as I have argued, this research is not an effort to tell an objective truth, or **the** 'truth' - dialogism denies the existence of a single truth. My research tells the life of a classroom, as I experienced it and through my eyes, and I have attempted to make the 'I' from which I speak visible and accessible to the reader. It is an attempt to be honest, which goes beyond claiming to tell an objective truth. I will argue that rather than search to find a truth, my intention in this text is to contribute to democratic debate about the presence of absence of equal gender opportunities in this Norwegian classroom. Following Bakhtin, this should not be considered as a finalized debate.

Although I do not seek to tell an objective truth, my story is not fiction; it is a description of a reality, through my eyes. My aim is to bring a critical light to the hidden stories of a classroom, to ensure that the debate about gender and school in Norway and the claim that girls are in an advantageous situation is not finalized. As I do this, I orchestrate the different voices that have affected me: as a result of immersing myself in the classroom and getting to know the story of Class A, I must react to it. For me as the novelist of this story, authorship is not a choice, the world must be answered.

Ethics

Taking an ethnographic approach and being immersed in the everyday life of a classroom brings a number of ethical challenges. First of all, as Clandinin and Connelly (2000) argue, to do good research means that you need to be a good person. This study is conducted with respect for the participants' lives in this classroom, and it is not a study which aims to track heroes or villains; rather, it is conducted to describe the everyday life of a mathematics classroom, focusing on the individual and the collective in the same moment. To be true to the theoretical framework of this study means that it would make no sense to treat a single happening in isolation from its context, or blame individuals for incidents, structures or patterns in this figured world, because of the complex interwoven dynamics between the individual and the collective. Moreover, as the theoretical framework points out, change requires collective consciousness and movement. Thus, I have no intention of suggesting that any individuals in Class A should have acted differently. This is particularly the case for Miss A, who it may appear is criticised in this thesis. Whatever possibilities we might see for her to act differently, it is important that it is recognised that she acts as a member of a figured world and is positioned within it according to powerful discourses and cultural models.

All of participants of this study are given full anonymity in this thesis, and it is not possible to trace them. Only those who consented to participate appear in the analysis. The ethical approval

for the students and the teacher followed Norwegian research protocol, being approved by application to the Norwegian Centre for Research Data (NSD) as following NSD guidelines (see Appendix 8 for details of the ethics process and information and consent sheets).

The structure of the story

The forthcoming analysis section (Chapters 5-8) appears in two parts. Chapter 5 presents the analysis of the figured world as the first step, drawing on seven students' Grade 10 interviews, the focus group interviews from 8th and 9th grade, and Miss A's account of Class A.

Chapters 6-8 present the next part of the analysis, focusing on the pairs in the cast of characters. I begin with the two boys, Ross and Alexander, as representatives of the 'smart boys'. Chapter 7 focuses on Kine and Emilia, who are high achieving girls. Finally, Chapter 8 tells the stories of Elias and Rikke, who struggled with learning mathematics in 8th grade. Each pair draws attention to a different layer of the figured world, both in terms of gender and achievement.

First, though, I begin the analysis section with an illustration of Class A as an imagined observer might experience it. Although this presentation draws on my experiences as a participant observer in Class A, my aim is to provide the reader with an understanding of this classroom as an unknown third person might see it.

A Vignette: observing Class A

Imagine that you have the opportunity to visit a lower secondary school class in order to see how the students' school days are and how they act. Class A is the class you get to visit. If you just had the opportunity to spend 10 minutes in the class, I have a guess of what your impression of this class would be. What would most probably strike you as a first impression is how Class A consists of a group of similar students. By just looking at them, it's easy to get the feeling that this is a homogenous group of boys and girls. They seem to fit the teenage stereotype; they are dressed in very much the same way and they act as teenagers are expected to do in school, in a nice way. You would have seen that the students in Class A, and in the whole of this school for that matter, have mostly the same ethnicity, and I could have told you about how they live in the same area located around the school. So, at first glance, I guess your impression of this class is that they are a group of similar students, who try to do their best as teenagers in lower secondary school, and no one seems to be left out.

If you could stay as an observer in this class for a longer period of time, the impression you would get of Class A would be stronger. Going beyond how the students look and focusing on the way they act in school and in the classroom, the word you might choose to describe them would be 'easygoing'. This easygoingness would be seen in the way the students are prepared for their schoolwork, in the way they and Miss A, their teacher, coexist in their common work of learning mathematics in lower secondary school, and in incidents in the breaks between the lessons.

Looking at the students' actions I guess you would have an impression that this is a group of teenagers who are serious and care about school and their education. You would see that there is good attendance and a low rate of absence in this class. In addition, you would have seen that the students are usually on time for lessons and have brought books and other equipment needed for the class. As additional information, I could have told you that the students have said in interviews that it is important to them to learn in general and that they have a plan for upper secondary school, and that education matters. As a former teacher, I would agree with the word 'easygoing' to describe this class, and I could add that this class is a well-functioning class.

Being in this class with Miss A, you most probably would have noticed the way the teacher and the students relate to each other and coexist in this classroom. My guess would be that you would characterise this coexistence as positive and constructive for those in the class. You might support this by focusing on how communication between the students and the teacher.

and between the students themselves, is easygoing and positive. I could have added to your view with saying that during my time in this class, together with Miss A, I have not observed any major conflicts during the many hours I have spent there, in lessons and in breaktimes. I think you would have shared my impression that there is kind of unspoken agreement on a common goal for both the students and the teacher in this class. The students expect to learn, and the teacher plays an important part in helping them fulfil their expectations. In addition, I guess you would have noticed that there is a friendly atmosphere in this classroom. I would have supported your view by telling about how I have often observed that the students are in a good mood, and so is Miss A. I would have told you that I have noticed that there is a lot of laughter among the students, and between the teacher and the students as well. Small jokes are often told, and the students and the teacher tell stories about events outside the classroom. So, I would guess that you would have described the environment in the classroom as kind of informal.

Maybe Miss A has told you that she cares about her students. I would say that I am not surprised by this, and that I have noticed how she shows that she cares for the students and, the way I see it, the students know that she cares about them. I think you would agree that the relationship between the teacher and the students is easy-going. I can give you two different incidents from observation which demonstrate this.

Incident: Hannah and Celina say they are anxious about a science test the next day. Miss A takes time, in her break, to comfort her students by explaining the structure of the test and how she has faith that Hannah and Celina will be able to do it. She gives them advice on how to work together to prepare themselves for the test.

Incident: Maya needs a written recommendation for her application to upper secondary school abroad. Maya tells Miss A that she hasn't received the recommendation from her as promised, and Miss A immediately goes through her mail to see what has happened. Even though it is difficult to say if it is Maya or Miss A who should have done something differently, Miss A uses all of her break to see if she has forgotten to respond, and she does it with a smile.

I think you would have noticed that Miss A is not challenged as the leader of the class in general. If a disagreement came up during your time in this class, I guess your experience would be that Miss A listened to the students' arguments, and when the discussion was over, her final decision would have reflected the students' opinions. I would have told you that I find the term 'democratic leader' a suitable expression for the way Miss A leads the class.

I could add that I have noticed incidents that indicate a high degree of cooperation between the students and Miss A at school. If something practical needs to be done, such as helping out with technology in the classroom or moving the classroom furniture around, the students are willing to help out. Vice versa, if the students need help Miss A is helpful. This is mostly seen in emotional matters concerning school and performance. I guess we would agree that between the students, and between the students and Miss A, relationships are based on respect and they take care of each other.

Bringing in mathematics, the impression slightly changes

What if you could join several mathematics classes with Miss A and the students in Class A. My guess is that you might change the opinion you so far have of the class. Most probably, you would see your harmonious picture of a homogenous group of students being challenged somewhat. First of all, you will note that 4 or 5 students are going off to another group for their mathematics teaching. These students struggle to learn mathematics, and they are seen to need more help than others, because they don't achieve as good grades as the majority. Most probably, you would notice that these students are keen to leave the class. Even after these students have left, I think you would have noticed that the students were not as alike as your first impressions suggested. I could add to this by telling you that I have noticed how the students act differently when they are working with some kinds of tasks. They generally choose the task difficulty on the basis of their perception of what they need to do, or what they want to achieve. Their textbook gives three different options according to level of difficulty, and the teacher often draws on the text-book as a resource. I have often noted that the students choose different task levels, and that some even consider the highest level of task from the textbook as too easy. I could add that there is normally a part of the lesson when the students work independently, but there are multiple ways in which they act during this time.

If I had asked you to pay attention to the students' relationship to Miss A in mathematics lessons, you most probably would see something different from what you saw earlier. You would notice that she is still the leader of the class, but you might see that she is challenged mathematically by particular students, who present themselves as her equals in mathematics, or even better. I guess you would have seen that some students tend to comment that a problem she illustrates in the plenary session could have been solved more efficiently by the way they do it, for instance. Maybe you might have noticed situations where those same students keep asking why they have to follow the method Miss A presents, when they could have used another

method which is easier. I would have told you that I have noticed that some boys in the class match the picture you describe.

Maybe we could have discussed whether Miss A is provoked by these actions or not. I haven't noticed that she is, because she has not made it an issue in the classroom. Maybe she is, but she doesn't show it. Maybe she thinks it is good for the class to have these interruptions, because the concepts and methods are discussed more than if these questions were not asked. But we don't know the reason for all this.

In order to understand more about this classroom culture, we need to listen to how the students describe it. This will enable us to gain an insight in how the actors experience the figured world they are a part of. This is the subject of Chapter 5.

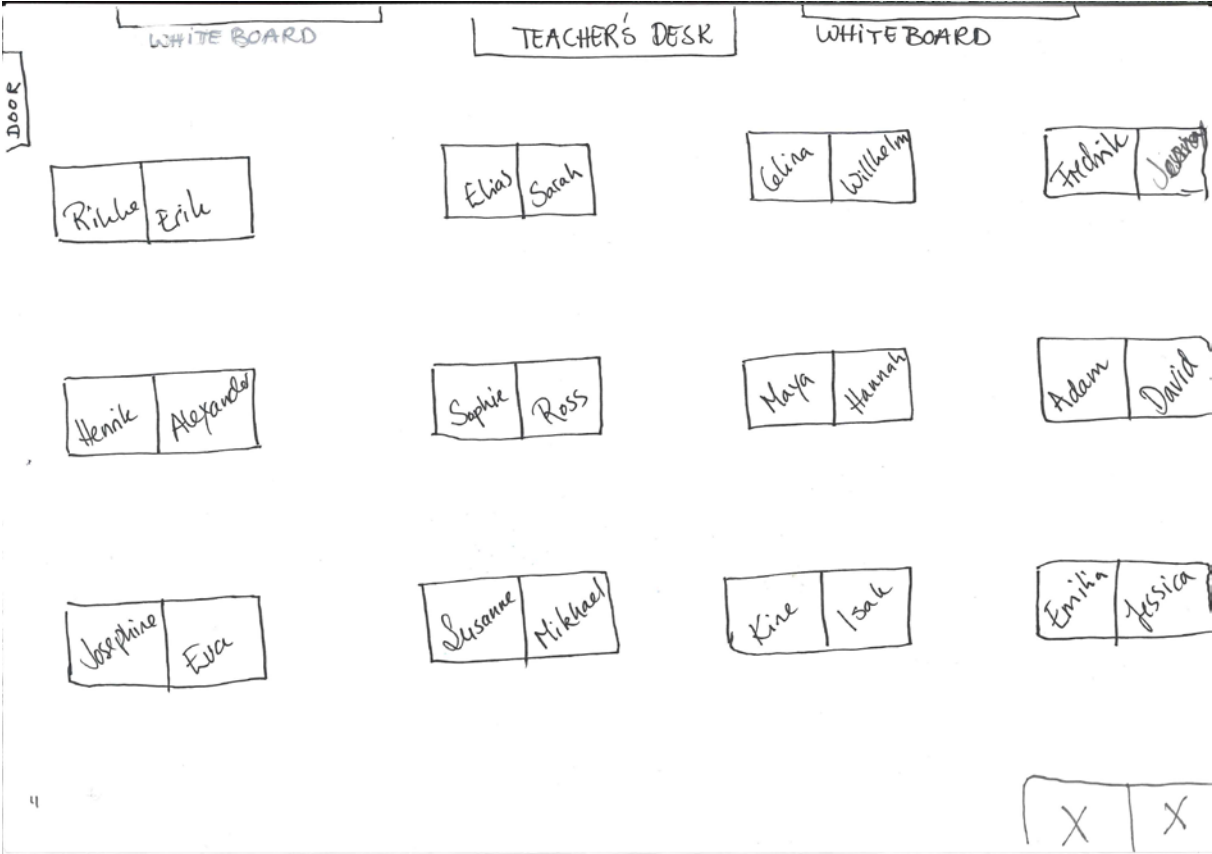


Figure 7. The classroom, an example of a map of the students' given places.

Chapter 5: The Figured World of Class A

As seen in the vignette, the visit to Class A, a first, superficial, impression of this mathematics class is one of a quite homogeneous group of very similar students. However, the more time spend in this class, an awareness of variation in the students' ways of acting as mathematics students starts to emerge. In this chapter, I begin to explore this variation and the nature of students' agency and employment of identity as they develop through the lower secondary years of their mathematics class. Drawing on Holland et al. (1998), I will investigate Class A as a figured world, recognising the forces, dynamics and voices that constitute the fabric of this mathematics classroom and its mundane activities.

From now on, I will treat Class A as a figured world and the students in the class and their teacher, Miss A, as the agents in it, more or less all engaging in a common goal – the students' learning in mathematics and their overall education. As seen in Chapter 3, Class A can be recognised as a narrativised or dramatised world: there is an ongoing collective narrativisation of Class A in which the students are the actors. Some actors are considered especially important in this collective narrativisation, and the other students act in relation to them. Together, they constitute the narrativised world of Class A.

The students' stories of Class A enable an insight into this common shared story, and with it the building blocks of this figured world. On the basis of the operationalisation of the theory described in Chapter 4, I will treat values, norms and rules as important sub-concepts when it comes to establishing an understanding of the construction of the fabric of Class A and how the students are distributed differently on the basis of power and privilege. Because figured worlds are fluid worlds, it is worth bearing in mind that the distribution of power and privilege are influenced by the more universal distribution of power and privilege in society in general, as well as the students' experiences from participating in other figured worlds. The values, norms and rules of the local figured world of Class A, in addition to the norms, rules and values from other spheres of society, will contribute to the students' storying of their learning in mathematics in lower secondary school. This means that we need to take into consideration the students' stories of Class A, their acts in the mathematics classroom, the cultural models that underpin perceptions of mathematics and mathematics ability and general discourses of learning in school.

In what follows in this analysis, I will first present excerpts from seven students' stories of Class A, in 10th grade. I have chosen to start at the end of the story, as it were, since these seven 10th

grade accounts together provide an overall picture of what constitutes the figured world of Class A as the students look back over their trajectories from grade 8 to grade 10. The analysis will pay attention to a common shared narrative of Class A, and the values, norms and rules in this narrative. As the analysis unfolds, the significant actors, or figures, in the figured world of Class A become clearer, together with their connection to positionality in the class. This latter provides an insight into the distribution of power and privilege in this figured world, and how it developed over time.

I supplement these individual narratives with excerpts from focus group interviews from 8th grade and Miss A's story at the end of the 8th and 9th grades. As a significant actor in Class A, Miss A's story enables a deeper understanding of the discourses that affect the mundane activities in this class. Together, the students' stories and Miss A's story provide an understanding of the collective narrativisation of Class A as a developing figured world.

Class A through the eyes of seven students

In every individual interview in 10th grade, the students were asked to describe the class. Analysis of the students' talk of Class A, enabled me to notice how the students storied the class, their choice of words, and the discourses they drew on in their positioning of self and others. While I noticed a set of shared understandings, values and norms, there was also some resistance to the common shared story of Class A, providing further insights into the dynamics of the class. In particular, the analysis reveals a group structure within Class A which is not apparent to the casual observer, and which is important in understanding the central relationships within this class. I begin with Alexander's contribution to an overall understanding that Class A is a 'good' class:

T: Do you think 10 A is a good class in maths?
A: Yes, compared to many others.
T: What makes it so?
A: I feel that most people understand it well.

T: Tror du 10 a er en flink klasse i matte?
A: Ja i forhold til mange andre så.
T: Hva er det som gjør det.
A: Jeg føler at de fleste skjønner det bra.

Alexander starts out by telling how he regards Class A as a clever class in comparison with others, supporting this claim by explaining that he thinks that most of the students in this class understand mathematics. Indeed, this matches the overall first impression from our visit to the class in 10th grade.

In her interview, Emilia says something similar, presenting a picture of Class A which emphasises the students' ability to work and to keep focused:

T: What would you say characterises your class in maths lessons?

E: We are a class that likes to work with maths in a way; we're not a class that talks about everything else.

T: So work effort and concentration on the subject..

E: Er, I guess it's that we work quite well together, no matter who we work with, and manage to work with maths.

T: So good cooperation.

E: Mmm

T: Is it different in maths lessons from other subjects?

E: No, it's pretty similar; we're a class that enjoys learning.

T: So maths lessons aren't very different?

E: No.

T: Hva vil du si preger deres klasse i mattetimene?

E: Vi er en klasse som liker å jobbe med matte på en måte, vi er ikke en klasse som prater om alt mulig annet.

T: Så arbeidsinnsats og konsentrasjon rundt faget..

E: Eh, det er vel det at vi jobber ganske bra sammen uansett hvem vi jobber med, og klarer å jobbe med matte.

T: Så godt samarbeid.

E: Mmm..

T: Er det annerledes i mattetimene enn i andre fag?

E: Nei, det er ganske likt, vi er en klasse som er glad i å lære

T: Så mattetimene er ikke veldig annerledes?

E: Nei.

Emilia describes the class strongly as a unit, emphasising a whole-class scenario with students who enjoy working with mathematics, who stay focused on the subject, and who cooperate well. In addition, it is worth noticing that she uses the term 'we' when she describes the class, underlining the impression of a whole-class unit scenario. Her comments indicate that she expects to see the students in Class A working well with each other in any combination. Moreover, she describes the students in the class as sticking to the subject and working hard in mathematics lessons. As she talks about how she expects other students to behave, she presents 'how it should be', and an impression of the norms or rules of this figured world begins to emerge. This collective statement is summarized by Emilia as "*We're a class that enjoys learning*". This applies to all their lessons, but it explicitly includes mathematics.

The next student is Eva. She describes the class as Emilia and Alexander do, as a group of students where everyone wants to master the mathematics, again suggesting a kind of whole-class unit scenario, but in her elaborations on this theme, she begins to draw distinctions between the students in terms of the grades they get, challenging the unit presentation:

T: What do you think 9A, 10A or 8A have been, learning maths?

E: I think it has been pretty good; everyone wants to get it.

T: So, you feel like you're an equal class?

E: Yeah, no, maybe a bit.

T: A bit maybe, can you say something more about it?

E: There are some who get 6s in every single test, also there are quite a few who are average, and also some who can't do it, the special group

T: Which group is the biggest?

E: I think the average, 4 and 5 are the most.

T: Do you think that the class is a clever class in maths?

E: Yes.

T: Why do you think that?

E: Mmmm, in maths lessons, I think everyone works and does as well as they can, and we also have the ones who are very good, that helps [strengthen that impression].

T: Hvordan synes du 9a, 10a eller 8a har vært å lære matte i?

E: Jeg synes det har vært ganske bra, alle har lyst til å få det til.

T: Så, du føler du at dere er en jevn klasse?

E: Ja, nei, jo litt kanskje.

T: Litt kanskje, kan du si noe mer om det?

E: Det er jo noen som ligger på sånn 6ere i hver eneste prøve, også er det ganske som ligger på middels, også er det noen som ikke klarer det, den ekstra gruppen.

T: Hvilken gruppe er størst?

E: Jeg tror den middels, 4 og 5 er den det er flest av.

T: Føler du at klassen er en flink klasse i matte?

E: Ja

T: Hvorfor føler du det?

E: Mmmm, i mattetimenene føler jeg at alle jobber og gjør så godt de kan, også har vi jo de som er veldig flink, som hjelper [på det inntrykket].

As we can see, Eva holds back a bit when asked if the students in the class are an equal group of students (*Do you feel like you're an equal class?*). It is as though she evaluates her answer as she speaks, switching from “yes” to “no” and moderating to “*maybe a little*”. Her hesitation in agreeing to my suggested summary of what she has just said and her final concession “*maybe a little*” suggests that she is rethinking the collective narrative of Class A. She goes on to tell me how the students are divided into subgroups by grades.

What is noteworthy is how she uses grades to talk about how Class A is divided into groups, without being asked specifically about grades. Neither Alexander nor Emilia did this. In making such a move, she introduces an uninvited focus on grade levels. Her talk gives an impression of how grades seem to position students differently, suggesting that grades have considerable power to undermine the narrative of equality. Eva believes that some students always get top marks while the majority of students get average grades of 4 or 5, and a few ‘can’t do it’ – and those are in the ‘special’ group.

It is important to notice how she uses the term ‘average’ to refer to the 4 and 5 group, because 4 and 5 are good grades in the Norwegian assessment system, and 5 is even considered a high level of achievement. What has started to emerge in Eva’s talk are traces of a value system

associated with grades, denoting something that actors want to achieve or possess in this figured world. In this sense, grades are an artefact in Class A, and their ‘possession’ is a marker of positionality in it: good grades matter, and Eva tells how the students can be divided into subgroups in accordance with the grades they achieve.

Almost in justification of this account of grades, Eva goes on to talk about the class as Alexander and Emilia do, telling me that she believes the class is a clever class in mathematics, arguing that everybody does their best; the whole-class unit scenario is presented once again. This expectation of the way students in Class A act should act is comparable with Emilia’s presentation of her expectations, although Emilia was more explicit about the students’ acts in Class A. Thus, Eva’s opinion of what is expected confirms Emilia’s account, contributing further to the emergence of the norms or rules in Class A about how the students should work. Finally, Eva raises the issue of how the students who are doing really well are of importance for the class’ reputation as a high-achieving class. This idea of the importance of a specific group of students is followed up by Elias, who expands on the idea of differential positioning to suggest that it is about more than grades:

T: How would you say the class is in maths?

E: I think the class is okay in maths, but there are definitely some who are a lot better than others. Because Albert and Isak are much better than others.

T: But if you leave them out, then what?

E: There is some variation, but there’s a group that is quite a lot better than the others, at a higher level than the others. They pull the impression of the class up, I think.

T: How do you tell the difference between people?

E: They do more difficult tasks, help others a bit more, give explanations and discuss a bit more with Miss A.

T: Hvordan vil du si at klassen er i matte

E: Jeg tror klassen er helt grei i matte, men det er definitivt noen som er veldig mye bedre enn andre i matte. Fordi Albert og Isak er veldig mye bedre enn andre.

T: Men hvis du legger de utenfor da?

E: Det er litt variasjon, men det er en gruppe som er ganske mye bedre enn de andre, på et høyere nivå enn de andre. De trekker inntrykket av klassen opp tror jeg.

T: Hvordan merker man forskjell på folk?

E: De gjør vanskeligere oppgaver, hjelper andre litt mer, gir forklaringer og diskuterer litt mer med Miss A.

Elias starts out describing Class A as merely ordinary –it’s an okay class – which is quite different from how the other students have described the class. So far, the descriptions have concerned how Class A is a good and clever class. He immediately draws attention to a group which is “*very much better than the others*”. Elias adds that Albert and Isak are *definitely* much better than others, singling out these two named students as having a particular position or role:

they are significantly better than the rest of the students in the class. Thus, Elias' description of the class leads to the emergence of a key figure in this figured world, the figure of being exceptionally high-achieving students in mathematics.

Elias goes on to say how he sees Class A as a class with variations in levels, even if we are not including Albert and Isak. He describes a group which he thinks is at a higher level than the rest of the class, just like Eva's story. They both rely on achievement to single that group out. However, whereas Eva drew on grades to talk about how students are positioned differently, Elias' talk also includes actions in the classroom as the distinguishing features of those who are seen as high-achieving students in this class. He describes how this group do more difficult tasks, and how they act as 'assistant teachers' by helping others, giving explanations and talking to Miss A. In this way, we are introduced to the range of actions that are significant acts for what is seen as a clever student in Class A. By acting as 'assistant teachers', these students seem to take up and enact the available positions of high-achieving students. Like Eva, Elias emphasises this high-achieving group of students as responsible for the overall impression of the class as a high-achieving class or a clever class.

Sarah tells much the same story. She, too, regards the class as a good group of students in general, but she also notes that there are some students who perform at another, higher, level compared to the rest of the class. However, Sarah contributes further to the emerging picture by raising the issue of who this high-achieving group of students are, and a gendered picture begins to arise:

T: Do you feel you have any groups in the class, or do you feel that—

S: (Interrupts) I think we have, or we are very much together as a class, but I feel we have those who are very good at maths who can do anything, somehow, who are much better than lower secondary school, almost, and then we have those who want to be good at math, who work on it but aren't the best, too. But I think everyone wants, or is motivated to be better, to be like that.

T: Who are the ones who are very good at maths?

S: I don't know. I feel boys or people think that. At least in our class, the guys are the smart ones good at maths, but I think that it differs from class to class.

*T: Føler du at dere har noen grupperinger i klassen, eller føler du at
S: (Avbryter) Jeg føler vi har, eller vi er veldig samlet klasse, men jeg føler vi har de som er veldig gode i matte som kan alt liksom, som er mye bedre enn ungdomsskolen nesten, og så har vi de som vil gjøre det bra i matte, men som jobber med det men ikke er de beste, også ja. Men jeg tror alle vil, eller er motivert til å bli bedre, til å bli liksom.*

T: Hvem er de som er veldig gode i matte?

S: Jeg vet ikke, jeg føler gutter eller folk tenker at. I hvertfall i vår klasse, er gutta de smarte de flinke i matte, men det tror jeg er forskjell fra klasse til klasse.

Once again, a student portrays the whole-class unit scenario of Class A. But like the others before her, Sarah goes on to talk about the various groups of students in terms of their grades in mathematics, and, once again, we get an understanding of this whole-class unit reputation being rather more nuanced than first appears. Like other students, Sarah talks about how the students in the class do the best that they can in mathematics, and this matches what has earlier emerged as a norm or rule according to how the students are expected to act in this class. But what Sarah also raises in her interview is a potential issue of a gendered dimension. When I ask her who are the ones who are good at mathematics, she first says, “*I don’t know*”, but she then goes on to say that she thinks that people in general think that boys are good, and that the boys in this class are the smartest and best in mathematics. However, she distances herself from the generalised view, emphasising that while she sees that this is the case in Class A, she does not believe that this is the case in general. When Sarah talks about how the boys employ positions as the smartest and the most clever students in mathematics, she draws our attention to how the whole-class unit scenario of students doing the best they can seems to hide the ongoing mundane activities in the classroom. We know that the other students have highlighted how grades and achievement position students differently in Class A. Sarah’s talk suggests a gendered dimension that seems to divide the students in this particular class according to available positions, even though she believes this is not the case in general.

Kine repeats the issues from Sarah’s story. However, Kine goes straight to describing a mathematics class divided by level, and she doesn’t mention the whole-class scenario as most of the other students have done. Furthermore, the gender dimension seen in Sarah’s talk returns.

K: I feel there are a lot of very good people. And, I feel like, we have quite like, I feel there are like three groups, those who are very good, where I might be, those who are in the middle, so, perfectly fine in many of the topics, there are also those who, there are many who don’t care so much, who don’t bother to work. And then there is a group that is in the [special] math group and things like that, and you notice that quite easily because they are not there, they are not in the lessons.

T: Can you say that there is something that characterises the different groups somehow?

K: Just that there are a lot of very good people, and there are many who are in the middle and stuff.

T: Are there any differences between boys and girls in class?

K: No, I don't think so. I don't feel it, anyway. (...) We always hear that girls are so much better at school, but in our class, there is a group of maybe 10 boys who are the best in the whole grade.

T: Okay, so you don’t feel that this is the case in your class.

K: I feel there are boys who are the best in our class; I don’t feel there is such a big difference between us.

K: Jeg føler det er veldig mange veldig flinke (...) Og, jeg føler jeg, vi har ganske sånn, jeg føler det er sånn tre gruppe, de som er veldig flinke, der hvor jeg kanskje er, de som er midt på, sånn helt greit i mange av temaene, også er det de som, det er mange som ikke bryr seg så veldig som ikke gidder å jobbe. Og så er det en del som er på mattegruppe og sånn, og det merker man jo ganske lett for de er jo ikke der, de er ikke i timen.

T: Kan man si at det er noe som kjennetegner de forskjellige gruppene liksom?

K: Bare det at det er mange veldig flinke og det er mange som er midt på og sånn.

T: Er det noen forskjell på gutter og jenter i klassen?

K: Nei, jeg tror ikke det, jeg føler ikke det i alle fall- (...)Vi får jo hele tiden høre sånn, og jenter er så mye mer flinkere på skolen, men i klassen vår er det en gruppe på kanskje 10 gutter som er de beste på hele trinnet liksom.

T: Ok, så du føler ikke det stemmer for klassen din.

K: Jeg føler det er gutter som er flinkest i klassen vår, jeg føler ikke det er sånn veldig stor forskjell på oss.

Kine starts to present Class A as a class with many high-achieving students, and she says that the class is divided into subgroups according to grades at three levels, in addition to those who leave the class and go to Mr. X's group. She then repeats the impression from the other students' talk of how grades position the students differently, positioning herself in terms of grades as well.

When asked about what characterises the different groups, she says that the group in the middle is the largest and that there are a lot of clever students, which seems like a contradiction. Either way, it shows how she regards the class as a class with a high level of achievement. Kine goes on to talk about a group of boys in Class A, who are the best among all the 10th grade students in this school, as an exception to – for her – a general assumption that girls do better in school. She repeats Sarah's mention of a gender dimension in Class A. Her last sentence notes that the boys in the class are the best, but at the same time, she claims that there are few differences in the class, which seems like a contradiction too. It is as if she is suddenly caught by the whole-class unit scenario of Class A and its overall high level of achievement, the common narrative of the class.

Finally, turning to the interview with Ross, we see how he contributes further to the students' account of the figured world of Class A by presenting a new value for success in mathematics. He presents 'smartness' as a value that, in his view, positions such students differently, and he describes how a high-achieving student acts, in similar terms to Elias. In addition, Ross describes another available position which is in this class – the case of the *not* smart student:

R: Yes, we have groups in the class.

T: Yes.

R: It's those who are not smart, then those who consider themselves a bit smarter, then those who are popular, and then the others

T: Okay, so it's a bit divided. Is there anything special about maths?

R: In the maths lessons?

T: Yes, or how do you see each other in relation to maths?

R: There are many, some who are seen as smart and some are seen as not so smart.

T: What's the reason that someone is considered one or the other?

R: It's maybe based on grades, then there are others where you just get the impression that those people are smart because of how they behave in the lesson.

T: What would you say characterises someone one who people think is smart?

R: Ehh, like personal features?

T: Or how can you decode it?

R: If you actively participate in the lesson, and if you sometimes have to contradict the teacher then you will describe that person as smart, and then that person themselves thinks they are smart and, of course, grades.

T: Yes, eh, and on the other hand..

R: I don't know, maybe someone who doesn't participate so much in the lesson, someone who doesn't speak, someone who focuses on other things in the lesson – we often have those who help others, and those who work for themselves to get better grades and those who don't care so much, it's often those you consider not so smart.

T: Where do you want to put yourself?

R: Ehh, I'm not quite sure, I think maybe I would put myself among the smart, if it doesn't sound cocky.

R: Ja vi har grupperinger i klassen.

T: Ja.

R: Det er de som er ikke smarte da, men de som anser seg selv som litt smartere, de som er populære da og de andre

T: Ok, så det er litt delt. Er det noe spesielt i matte.

R: I mattetimene?

T: Ja eller hvordan dere ser på hverandre i forhold til mattefaget?

R: Det er jo mange, noen som blir sett på som smarte og noen som blir sett på som ikke så smarte, liksom.

T: Hva er grunnen til at man blir sett på som det ene eller det andre?

R: Det er jo kanskje karakterbasert da og at man bare har fått inntrykk av at de personene er smarte etter hvordan de oppfører seg i timen, da.

T: Hva vil du si karakteriserer en som man tenker er en som er smart?

R: Ehh, liksom persontrekk på den personen?

T: eller hvordan kan man avkode det?

R: Hvis man deltar nye aktivt i timen, og noen ganger skal motsi læreren for eksempel så vil man jo karakterisere den personen som smart, og da tenker jo den personen at den er smart selv og selyfølgelig karakterbasert da.

T: Ja, ehh, men i motsatt fall da.

R: Jeg vet ikke, kanskje en som ikke deltar så mye i timen, en som ikke snakker, en som fokuserer på andre ting i timen enn enten.. Vi har jo ofte de som hjelper andre, og de som jobber for seg selv for å øke karkateren sin og de som ikke bryr seg så veldig, og det er ofte de som ikke bryr seg så veldig at man anser for ikke så smarte.

T: Hvor vil du plassere deg selv?

R: Ehh, jeg er ikke helt sikker, jeg tror kanskje jeg ville plassert meg selv blant de smarte, hvis det ikke virker cooky.

Unlike what we have seen earlier, Ross goes straight into describing the class as a divided group of students. It seems that he is unaware of the whole-class unit scenario that we see in the other students' stories. He claims that being 'smart' is a crucial factor in how the students are able to

position themselves in this class, and by saying “*those who consider themselves to be a little smarter*”, he draws attention to a kind of binary concerning smartness: one is either smart or not smart. He presents a new group, the ‘popular ones’, in addition to the rest, who he evaluates according to their grades. Popularity is an issue which affects the students from several different perspectives. However, Ross does not speak about the issue of popularity in the rest of the conversation. He goes on to elaborate on the issue of smartness, and it becomes clear that Ross sees ‘smart’ as the crucial feature for a student in this figured world.

Like Eva, Ross pays attention to the important role that grades play in gauging smartness. We have already seen that getting good grades is part of the norms and rules in this figured world, and for Ross this seems to be an expected artefact for a smart student to possess. In addition, he pays attention to the way the students act, emphasising that contributing to the classroom talk is a significant act for a smart student. In the same way that Elias describes the way a high-achieving student acts as a kind of ‘assistant teacher’ by helping others, Ross emphasises the importance of discussion with the teacher for how a smart student acts in this class. We get the impression that Ross recognises ‘smartness’ as a significant value in this figured world. He tells me that when a student discusses with the teacher, the student is positioned as a smart student and, correspondingly, a student positions as a smart student by doing this. However, it seems that some students are entitled to act in a specific way, or maybe are expected to act in this way, and that this is something that other students cannot do. This matches my impression gained from Elias that being smart, or smarter than the rest, is an available position in this classroom.

Ross raises the issue of a contrary case: *not* being a smart student. He starts out by drawing a kind of binary in how he assesses smartness by describing how some students do not contribute to the classroom talk, and do other things instead of paying attention in mathematics class. He concludes that if a student does not appear to care about learning mathematics, then that student is not a smart student.

In addition, we see how Ross places himself as belonging to the smart group of students, even though he makes a statement about how this may not be seen as a proper way to view oneself. It seems as if Ross is aware that it is not appropriate to self-position this way; it is like the Norwegian soul with the egalitarian ideal holds him back when he describes his affiliation with the smart group of students.

Our first impression of Class A as a harmonious class starts to crack slightly when the topic of discussion is mathematics in these seven students’ stories. It seems as though there is more to

the impression of Class A as an easy-going, harmonious class, where everybody is doing their best. The students have talked about the importance of achieving high grades, and of maintaining high grades as an important artefact for recognition as a clever student in mathematics. Grades are a significant value in this figured world, positioning the students differently. Furthermore, a gender issue in mathematics has emerged from these seven students' stories: a group of boys seems to occupy favourable positions in the mathematic class.

The way in which mathematics as a subject seems to reveal cracks in the harmonious impression of Class A suggests that we should pay attention to the way the students talk about mathematics. It is time to listen to the way the students in Class A talk about how they perceive mathematics as a school subject.

A shared truth emerges: mathematics is the most important subject

How the students relate to mathematics in Class A is a discussion topic on several occasions, both in their individual interviews in 10th grade and in the focus groups in 8th and 9th grades. In the interview with Herman in 10th grade, he suddenly introduces how mathematics has a special role for him compared to other subjects:

H: In any case, it's important to me, and it's even more important to others. How to do it, everything for the exam, is very important to some people.

T: Very focused on tests?

H: Yes.

T: Is it important to you?

H: No, maybe not in other subjects really. But perhaps it is important to me in maths.

T: Why?

H: I don't know really. I'm told all the time that maths is the most important subject.

T: Who says that?

H: Everyone, really! Everyone says that maths is the most important subject. After all, it makes a difference to what you can choose to be.

T: I wonder where you've got this from?

H: I don't really know, it's like you're told. Family, friends, teachers.

T: It's out there?

H: Everyone agrees that it's the most important subject.

T: Is it more important to get a good grade in maths than in other subjects?

H: Yes. Definitely.

T: Why?

H: That's why I thought like that (about the situation in 9th grade).

T: So what was it about making that journey?

H: It's easier to go from 4 to 5 in SFF [social studies] for me than to go from 4 to 5 in maths. But I just felt that . . .

T: . . . it was important?

H: Yes, that it was important. It's one of the most important subjects.

H: Hvert fall, det er viktig for meg, og det er enda mer viktig for andre. Hvordan man, alt som har med tentamen å gjøre er veldig viktig for noen

T: Veldig sånn prøvefokus?

H: Ja

T: Er det viktig for deg?

H: Nei.. det er kanskje ikke i andre fag i det hele tatt. Men det er kanskje viktigst for meg i matte.

T: Hvorfor det?

H: Jeg vet ikke helt. Jeg blir liksom fortalt hele tiden at matte er det viktigste faget.

T: Hvem er det som forteller det?

H: Alle egentlig! Alle sier at matte er det viktigste faget. Det har jo, det spør jo helt hva du velger å bli.

T: Jeg lurer på, hvor er det du har dette fra?

H: Jeg vet egentlig ikke, det er sånn man blir fortalt. Familie, venner, lærere.

T: Det ligger der ute?

H: Alle er enig om at det er det viktigste faget.

T: Er det viktigere å få en god karakter i matte enn i andre fag?

H: Ja. Definitivt

T: Hvorfor det?

H: Det var derfor jeg tenkte sånn (Om situasjonen i 9.klasse)

T: så det var det som var med å lage den oppturen?

H: Det er lettere å gå fra 4 til 5 i sff for meg, enn å gå fra 4 til 5 i matte. Men jeg bare følte at..

T: ... det var viktig?

H: Ja, at det var viktig. Det er jo ett av de viktigste fagene.

In this excerpt, Herman starts to talk about how he thinks mathematics tests are the most important tests for him to focus on. Trying to explain his view, he repeats several times that mathematics is the most important subject without presenting any specific reason. He appears to have no doubts about how this is the case for him. When asked what has caused him to think this way, he repeats several times how “*everybody says*” that mathematics is the most important subject. Once again, he is not able to be concrete about his reasoning. Instead, he says that this view of mathematics is impressed on him by everyone, finally identifying family, friends and teachers when pressed. It seems that, for Herman, the importance of mathematics is just a fact. He concludes that there is a general agreement that mathematics is the most important subject, vaguely linked to aspirations for the future – “*it makes a difference to what you can choose to be*”.

Herman’s story gives us a glimpse of how a student in Class A might find it difficult to ignore ‘the fact’ that mathematics is the most important subject in school, and how this fact is impressed on them by everyone. The position mathematics has as a school subject seems to be inscribed upon this student from outside, by parents, friends and teachers, as though it is an

authoritative discourse – he has no means of explaining it. Is Herman's a solitary voice or is this a common account in Class A?

Going back in time: Mathematics is special

In the focus group interviews at the end of 8th grade, the students in Class A were asked to rank school subjects according to importance, before comparing and discussing their opinions. Several students shared why they ranked mathematics at the top of the list. In the excerpt below, they discuss what subjects they find most important in school, and different arguments for their opinions are introduced. It seems that the students share a common perspective on the issue:

Trine: ...which subject do you think it is most important to do well in, not whether you like it, but which subject would you pick out then?

Mikhael: Then I would have chosen maths, really.

Erik: Me too. If I were to choose a subject I had to get 6 in among others that I got 3 in, I would say maths.

Trine: Why?

Erik: Not that I'm saying I will get 3 in all the others.

Trine: No, no, I just wonder why would you choose maths to be that subject?

Erik: It's like that is what almost all jobs involve in one way or another.

Trine: Okay, but what about the others?

Erik: At least, the jobs I want and dream about.

Trine: Are there any other subjects you think it is important to do well in, Jessica?

Jessica: It's not like that for me. But I might want to take maths as the second most important. I think theatre and stage are a bit more important in a way. If you think of a social future.

Trine: So you're thinking another way?

Jessica: Yes, because then you get better at working with people if you're good at being a bit forward and so on.

Trine: What would you say, Mikhael?

Mikhael: I would take maths as most important, and English second most important.

Alexander: Yes.

Erik: Same here, actually.

Trine: ... hvilket fag synes dere det er mest viktig å gjøre det bra i, ikke om det liker, men hvilket fag ville du plukket ut da?

Mikhael: Da ville jeg valgt matte egentlig.

Erik: Jeg også. Hvis jeg skulle velge et fag jeg måtte få 6er iblant andre som jeg fikk 3 i, ville jeg sagt matte.

Trine: Hvorfor det?

Erik: Nå sier ikke jeg at jeg vil få 3 i alle de andre.

Trine: Nei nei, jeg bare lurer på hvorfor ville du valgt matematikk til å være det faget?

Erik: Det er jo på en måte det er jo det som så godt som alle jobber involverer på en eller annen måte.

Trine: OK, men de andre.

Erik: Hvertfall de jobbene jeg har som drøm å oppnå.

Trine: Er det noen andre fag dere tenker det er viktig å gjøre det bra i? Jessica?

Jessica: det er ikke det. Men matte vil jeg kanskje ta som nest viktig. Jeg føler at sal og scene er litt viktigere på en måte. Hvis du tenker på en sosial fremtid.

Trine: Så du tenker på en annen måte.

Jessica: Ja for da får du bedre kontakt med mennesker hvis du er flink til å være litt frempå og sånt.

Trine: hva ville du si Mikhael?

Mikhael: Jeg ville ta matte viktigst, og engelsk nest viktigst.

Alexander: Ja.

Erik: Samme her faktisk.

This discussion reveals that, like Herman, the students in this group see mathematics as among the most important subjects. However, there are differences in the way they argue their opinions. Mikhael starts out by stating that mathematics is the most important subject, and Erik agrees quickly with that. Like Herman, Erik says it is more important to achieve a high grade in mathematics than in other subjects, and that mathematics would be the subject he would like to get the highest grade in, if he could choose. Erik explains his view by saying that every kind of occupation involves mathematics in one way or another, at least for the jobs he aspires to.

Jessica, who is one of the students who struggles with mathematics, argues against Erik's and Mikhael's views claiming that 'Sal og scene'¹³ is more important because it develops skills in social interaction which are important for a social future. Nevertheless, she goes on to say that she considers mathematics the second most important subject, suggesting that, even though she struggles with mathematics and is known to be a student who holds different opinions from the majority in the class, she finds it difficult to ignore or resist the position mathematics is generally seen to have in Class A. Indeed, none of the other students in the group take up her argument; Mikhael repeats his view that mathematics is the most important subject, adding that English is the second. Alexander and Erik quickly agree with him. Jessica's is a lone voice in this group against what appears to be a hegemonic claim for the importance of mathematics, and even she bends to this authoritative discourse in placing mathematics in second place, despite having no apparent reason to do so. In the same way that Herman's account suggests that the importance of mathematics is inscribed on him from outside, Jessica's final "yes" in response to Mikhael gives the impression that she concedes to the dominant view.

Mathematics: Gaining the ticket to a good life

The discussion in this focus group interview in 8th grade is not unique. In all of the groups, the students typically place mathematics in the top three of their lists, and mathematics is the only number one subject that the students agree upon. In all the groups, the students struggle to argue concretely about why mathematics is important beyond the common observation that it is important for their future occupations. However, there is one argument that the students present which is concrete, and this is that mathematics is one of the subjects they will have a written test in at the end of every semester, the 'tentamen'; this raises the issue of grades, achievement and performance.

¹³ This is a subject the students can choose, focusing on stage performance and acting.

Trine: Okay, if you are going to pick three subjects that you think are important to do well in, which subjects would you choose then? Can you compare to see if there is any that are the same?

Eva: Everyone has maths.

Trine: Norwegian, maths, English, hmm, everyone has taken maths. Why?

Eva: That's what we have the exam in, and we use it all the time. That's what is important.

Trine: But is it important to get a good grade in it, or is it important to learn it?

Everyone: Learn it!

Trine: So the grade doesn't play that big a part?

Eva: As long as you understand it halfway.

Trine: OK, hvis dere skal plukke tre fag som dere synes det er viktig å gjøre det bra i. I hvilke fag ville dere valgt da? Kan dere sammenligne å se om det er noe likt?

Eva: Alle har matte.

Trine: Norsk, matte engelsk, hmm alle har tatt matte. Hvorfor det?

Eva: Det er jo det vi har tentamen i og vi bruker det jo hele tiden. Det er jo det som er viktig.

Trine: Men er det viktig å få en god karakter i det, eller er det viktig å lære det?

Alle: Lære det!

Trine: Så karakteren spiller ikke så stor rolle?

Eva: Så lenge du skjønner det sånn halvveis.

In this excerpt, Eva suggests that everyone chooses mathematics as among the most important subjects because it is one of the subjects which is assessed by 'tentamen'. She adds that "we use it all the time", a reason that is brought up in the other groups too but always treated rather like an obvious fact that does not need to be explained, suggesting traces of the same authoritative discourse of the importance of mathematics. Indeed, Eva's argument raises the question of why English and Norwegian are not mentioned since these are also tested in the 'tentamen', and their absence suggests that mathematics is somehow seen as more important.

One other issue arises which will be of importance later in this chapter: this concerns the students' responses when they are asked if it is more important to achieve high grades or to learn and understand mathematics. They all respond that learning is more important, and it is implicit that they are concerned about understanding mathematics before remembering rules and formulae. However, Eva – who has introduced the testing issue in the first place - adds that it is not necessary to understand it all, suggesting that grades might matter more. At this point in 8th grade, it seems as if the students are concerned about the importance of learning the subject, prioritising understanding over grades – or at least, given Eva's comment, this is something that they feel they 'ought' to say but might not wholly believe. Whether or not they can sustain this view by the time they reach grade 10 is important in what follows.

As we have seen, the students connected mathematics to their visions of the future, often without elaborating on the argument. Hannah's contribution illuminates this point:

Trine: But is it that everyone has to have mathematics?

Everyone: Yes..

Trine: Why do you think so?

Hannah: Yes, because it's something you need your whole life and if you don't have maths, then everything gets a lot more difficult. I have an uncle who didn't follow in maths lessons and he has quite a difficult time now.

Trine: Men er det sånn at alle har matematikk?

Alle: Ja..

Trine: Hvorfor det tror dere?

Hannah: Jo for det er noe du får brukt for hele livet og hvis du ikke har matte så er, alt blir veldig mye vanskeligere. Jeg har en onkel som ikke fulgte med i mattetimene og han har det ganske vanskelig nå.

In her 8th grade way, Hannah voices an opinion on why it is important to succeed in mathematics - if you do not, you will have a hard time. Paying attention to mathematics and succeeding in it is a ticket to a better life; noticing what is the case in the world around them, and without really being able to explain why it matters in any concrete way, the students of Class A know that you fail mathematics at your peril.

Voices from outside: Parents' attitudes towards mathematics

Figured worlds are fluid worlds, and the students in Class A are affected by their surroundings. During the focus group interviews in 8th grade, the students mentioned their parents' attitudes towards education and mathematics several times, reinforcing the message about the importance of succeeding in mathematics. Their beliefs about their parents' attitudes emerged in the focus group interviews in 8th grade, when the students were asked what subject they thought their parents would say was the most important one.

Trine: If you asked your parents, what subject would they say is important to do well in?

Erik + Rikke: Certainly maths.

Erik: Definitely.

Trine: OK.

Erik: My dad is such a typical maths-pro then.

Trine: Hvis dere hadde spurt foreldrene deres da, hvilket fag ville de tatt som viktig å gjøre det bra i?

Erik + Rikke: Sikkert matte.

Erik: Definitivt.

Trine: OK

Erik: Faren min er jo sånn typisk mattepro da.

Rikke and Erik answer immediately and simultaneously when asked which subject their parents would choose as the most important. This is interesting, because Erik and Rikke represent two contrasting cases: Erik is doing well and enjoys mathematics, whereas Rikke struggles with it. Nevertheless, they both think that their parents would have chosen mathematics. In addition, Erik makes it clear that there is no doubt that the subject would be mathematics, because his

father is extremely good at it. Herman also thinks his parents would choose mathematics as the most important subject, because it is linked to being ‘smart’:

Trine: What subjects do you think your parents would chose as important to do well in?

Herman: It's different with Mom and Dad. Dad would say gym and maths and Mom would say maths and English or something.

Trine: Why? Why do you think they would both say mathematics?

Herman: I don't really know; they want their kids to be smart and they think that's the way to be smart.

Trine: Hviket fag tror dere at foreldrene deres hadde valgt som viktig å gjøre det bra i?

Herman: Det er forskjellig med mamma og pappa. Pappa hadde sagt gym og matte og mamma hadde sagt matte og engelsk eller noe.

Trine: Hvorfor det? Hvorfor tror du de begge ville sagt matematikk?

Herman: Jeg vet jo ikke helt, de vil jo liksom at barna deres skal bli smarte og de tenker at det er veien til å bli smarte.

As we have seen, Herman’s opinion in 10th grade was that mathematics is the most important subject. This is reflected in his contribution to this 8th grade discussion, where he attributes an explicit link between doing well in mathematics and being smart to his parents. This resonates with Hannah’s comment about how mathematics is a ticket to a good life. The students’ stories of mathematics and their parents’ views of it seem to be all about being smart, doing well and getting the grades; nowhere do they talk about mathematics as intrinsically useful.

What the students tell us: values, norms and the beginnings of a new positionality in the figured world of Class A

The seven students’ stories from the 10th grade represent how the students in Class A perceive the values, rules and norms in this particular figured world. We know from Chapter 3 that figured worlds are constituted and re-constituted over time. While the students persisted with a characterisation of their class as a whole-class unit scenario, in which everybody did their best, it also transpired that they experienced their class as one where high grades matter and – importantly - differentiate between people. In contrast, in 8th grade, although the students talked about the importance of achievement in mathematics, they did not relate this to their class culture or to the status of different individuals within it. However, a more complex picture was to emerge: by the 10th grade, grades were seen as of significant value, positioning the students differently; furthermore, they were linked to gender, in that a group of boys seemed to take up a special position marked by their high grades in mathematics and their behaviour in lessons. In the next section, I explore Miss A’s account of the class in relation to these changes.

Class A through the eyes of Miss A

I will now turn to Miss A, who has been the mathematics teacher during all of Class A's years of lower secondary school and is a special insider in this figured world. She has a particular relationship to all of the students in the class and relates to them in terms of both their well-being in school and their performance as students in mathematics. She is in charge of both the teaching and the assessment in mathematics in this class, making her an important person for all of the students in Class A and connecting them to her in a particular relationship. At the same time that she occupies a particular position in relation to all of the students, she is also the bridge between them and the school authorities. Miss A is tied to the guidelines for teaching that the school authorities in this school promote, which, in turn, represent those of the political authorities as given in the national curriculum and in educational legislation. As the teacher in Class A, she is a significant actor and holds a particular position in this figured world. As the following analysis shows, exploring the way she stories the class contributes to a more comprehensive understanding of how this world is constituted.

I interviewed Miss A twice, first at the end of 8th grade, and second at the end of 9th grade. My analysis begins with her 8th grade interview and her characterisation of Class A at this point, then moves to her account of the class in 9th grade, drawing attention to how the figured world of Class A evolves during the first years in lower secondary school and Miss A's part in it.

Miss A's 8th grade story: The influence of 'bildung', and a gender issue emerges

In her 8th grade interview, Miss A describes a nice image of Class A which reflects the seven students' 10th grade stories. We can recognise the whole-class unit scenario which they present in Miss A's 8th grade interview:

T: Yes, if you were trying to highlight some of the characteristics of the class, what words would you choose then?

A: They accept difference, they can cope with a lot. We have someone special in the class who is allowed to be themselves. Kind, caring, good to each other, sense of humour.

T: Very nice words. Do you feel the class is academically strong?

A: Yes I do, but we have a range.

T: But if you were to compare with to other classes you've had, are they strong?

A: Yes.

T: Ja, hvis du skulle prøvd å trekke frem noen kjennetegn på klassen, hva ville du valgt av ord da?

A: Takhøyde, de tåler veldig mye. Vi har noen spesielle i klassen som får lov til å være seg selv. Snille, omtensomme, gode mot hverandre, humor.

T: Veldig gode ord. Opplever du klassen som faglig sterk?

A: Ja det gjør jeg, men vi har jo spennet.

T: Men hvis du skulle sagt noe i forhold til andre klasser du har hatt, er de sterke?

A: Ja.

Miss A starts out describing the class in positive terms, and the words she uses match the picture of the nice class we know from the students' stories. She stresses how the students seem to take care of each other, and that it is possible to be different without being picked on. She doesn't say who these students who act differently are, although she implies that she is thinking about some particular students (*"we have someone special"*).

A tension between 'bildung' and achievement emerges

The way Miss A describes the class at this point highlights how they act socially as a group rather than how they perform academically. Achievement and grades do not feature in her first description of the class, appearing only when she is asked specifically about this. Even then, she starts to answer that she sees the class as academically strong, but expresses a reservation straight away about how there are various levels of achievement among the students. It seems as though it is important for her to stress this variation. However, she finally summarises Class A as academically strong, compared to other classes she has been teaching.

Miss A's prioritisation of the social qualities of the class, above grades, and her reluctance to talk about grades suggest how Miss A – at this point – seems to pay more attention to how to act as a good human in general – 'bildung' – before valuing achievement of purely academic goals. The tension between 'bildung' and achievement is embedded in the Norwegian curriculum and is a tension which teachers in 'Grunnskolen' (primary school) are frequently exposed to in their work. Indeed, the curriculum can be seen as a source of 'voice' for teachers, which draws both on the discourse of 'bildung' and the discourse of achievement.

As the conversation with Miss A went on, I asked her specifically about the students' performance. In her answer, we see the same tension as in the last quote. This time, it is the students' effort versus their achievement (i.e., higher grades), which do not always match up for the students:

T: What's it like being a good student in class 8A?

A: I think that it's very good; I think there is a lot of focus on grades there and that they cheer each other on. I've also heard comments like 'That's great for you'. So they see that it doesn't necessarily have to be 5 or 6 to be good. I think it was a girl who said that to Rikke.

T: Hvordan er det å være en flink elev i klasse 8a?

A: Det tror jeg er veldig bra, jeg tror det er mye fokus på karakterer der, og at de heier på hverandre. Jeg har også hørt kommentarer som at 'det er jo kjempebra for deg'. At de ser at det ikke nødvendigvis ikke må være 5 eller 6 for å være bra. Jeg tror det var en jente som sa det til Rikke.

Miss A answers by saying that she thinks that being a good student in Class A means being a clever student, pointing to the large amount of attention paid to grades among the students in the class. But without taking a break, she goes on to stress how the students cheer each other on for doing their best, even if they do not achieve high grades. It is as though as soon as Miss A begins to talk about the importance of grades in Class A, she immediately takes a step back to remind me that effort is also valued in the class, even though it might not pay off with good grades. To emphasise the point, Miss A notes that Rikke, one of the struggling students, was encouraged by another girl in this way: *“It doesn’t necessarily have to be 5 or 6 to be good”*.

In this excerpt, the tension between ‘bildung’ and achievement is evident in Miss A’s narrative of the class once again, underlining the impossibility for some students of achieving high grades even when they do their best. The curriculum refers to the need to motivate and encourage students to do their best in every subject even though their skills will differ, and Miss A’s highlighting of this story about Rikke illustrates the importance of students’ social actions once again – at least one girl in the class is mentioned as acting in accordance with the curriculum. It appears that Miss A is consistent in drawing more on the discourse of ‘bildung’ in her 8th grade story of the class compared to the discourse of achievement, in that she tempers her mention of grades with references to students’ actions which are focused on support for others.

A gender issue in mathematics emerges

As the conversation goes on, Miss A spontaneously presents a gendered picture of what happens in her class, without being asked specifically about gender differences:

T: Are there any subjects where doing well is connected to status?

A: Yes, in this class we have a whole bunch of special boys with Ross, Erik, Alexander, Albert and Isak and so on, who are very interested in mathematics and science. And getting good grades in mathematics is high status.

T: So that’s in the boys’ group – how about the girls?

A: I have the impression that they like to do well, but I haven’t picked up any indication that mathematics is particularly significant.

T: Do you think there are any other subjects where it is important to do well for these girls?

A: I think maybe they thinking a bit more in the direction of language, for those who like to write.

T: If you were to make a 10th grade prediction, who do you think is going to do well?

A: Erik, Ross, Emilia.

T: Er det noen fag det er status å gjøre det bra i?

A: Ja, her i denne klassen har vi en hel gjeng med spesielt disse guttene med Ross, Erik, Alexander, Albert og Isak og sånn som er veldig opptatt av matematikk og naturfag. Og at det er god status å få god karakter i matematikk.

T: Så det er i guttegruppa, hvordan er det med jentene?

A: Jeg har inntrykk av de liker å gjøre det bra, men jeg har ikke fått noen indikasjoner på at matematikk er noe hverken eller.

T: Tror du de har noen andre fag det er viktig å gjøre det bra i for disse jentene?

A: Jeg tror kanskje de tenker litt mer i språkretingen, for de som liker å skrive.

T: Hvis du skulle lagd et frempek for 10.klasse hvem tror du at kommer til å gjøre det bra?

A: Erik, Ross, Emilia.

When I ask her if any subject is more connected to status than others, Miss A suddenly introduces a group of boys who she thinks are very interested in mathematics and science, more so than the rest of the class. The boys she names are already familiar from the seven students' stories in 10th grade, storied by Elias and Eva as heavily influential in Class A's reputation as a high-achieving class. It seems significant, then, that Miss A names these students in 8th grade, positioning them as belonging to a special group in the class. Indeed, as we will see, these boys have particular power and privilege as actors in the figured world of Class A.

Miss A talks about how these boys connect status and high grades in mathematics. Achieving high grades matters in this group. Thus, there seems to be more to the picture Miss A has given so far of a class of students who appreciate everybody's effort despite their results. Mathematics is explicitly a part of the discussion when the harmonious picture of Class A seems to crack. The focus is now on achievement, and the previous focus on students' social actions has disappeared. The discourse of 'bildung' seems to be overrun by the discourse of achievement when mathematics and the boys in this group are discussed.

Another crucial feature is the way in which Miss A brings up the importance of mathematics for this particular group of boys: she builds her account by drawing a contrast with the girls. Although I have not asked her specifically about gender, Miss A volunteers that she thinks the boys and girls in this class relate to mathematics differently at this point. When she says that she sees the boys as having a special interest in mathematics and how performing at a high level in mathematics it is important for this particular group, she also says that this is not how she envisions the girls. Miss A explains that she doesn't think the girls in Class A have a particular interest in mathematics, either in terms of the subject itself or in terms of grades. She adds that she thinks the girls seem to be eager to do well in general, but not in any specific subject, apart from maybe language and writing.

At end of this excerpt, I ask Miss A which of the students she predicts will do well in 10th grade, and she nominates Ross, Erik and Emilia. She has already mentioned Ross and Erik among the boys who are interested in mathematics, but Emilia was not mentioned as having such a special interest. Miss A has said that the girls are concerned about doing well in general, so perhaps she sees Emilia as a student who might do well in mathematics for this reason, even though she doesn't think she has a particular interest in mathematics. It is not clear what she thinks at this point, although her perception of Emilia is fleshed out when she returns to discussing these three students later in this interview. This time, she mentions them among the students who she perceives as more ambitious than the rest of the class. Emilia is mentioned first:

T: Of the students you have, is there anyone you think is particularly ambitious?

A: Yes, I have to say Emilia works extremely hard and tackles challenges head on and wants to stretch herself. Albert is also in a class of his own because he pushes himself a bit. Mikhael also works incredibly well and has so much desire to do it.

T: They're the ones you want to pick that push themselves a bit more.

A: Yes then there's also Erik and Ross, they are the same, they think that the subject is interesting and like to enjoy it and discuss.

T: Av de som du har foran deg, er det noen du synes er spesielt ambisiøse?

A: Ja, jeg må si Emilia jobber ekstremt hardt og tar utfordringer på strak arm og ønsker å strekke seg. Albert er også i en klasse for seg i og med at han forserer litt. Mikhael også jobber utrolig godt og har så veldig lyst til å klare.

T: Det er de du vil plukke ut som driver seg selv litt ekstra.

A: Ja, også er det Erik og Ross da, de er jo sånn, synes at faget er interessant og liker å drolle og diskutere.

In this quote, we see how Miss A gives various reasons for why she sees the students as ambitious. She says that she sees Emilia this way because she is a hard worker, more or less the same way as she sees Mikhael. Albert is at another level ('in a class of his own'), while Ross and Erik are very interested in mathematics and enjoy mathematical conversations. It is noticeable that Emilia's desire to do well in mathematics is not described in terms of her ability or interest. Rather, it is more because of the way she works with the subject. This contrasts with her description of three of the boys – it is because of their ability and interest in mathematics. This mirrors Miss A's earlier account of how the boys seem to care more about mathematics and have a stronger interest in mathematics than the girls.

Significant actors emerge

From the students' 10th grade stories, we know how Elias described Isak and Albert as being on another level compared to the rest of the class. Similarly, Miss A describes Isak in a particular way in her 8th grade interview:

A: I think Isak is in a class of his own because he is so incredibly smart, so I think he feels that there isn't enough challenge. So I try to emphasise that he must work on how he presents the maths, because he hasn't really learned that well and he thinks it's boring. That's why he doesn't make a big effort in class.

A: Jeg tenker at Isak er i en klasse for seg for han er så utrolig smart, så jeg tror at han føler at det blir lite utfordring. Så jeg prøver å legge vekt på at han må jobbe med føring, for det har han egentlig ikke lært seg så godt og det synes han er kjedelig. Derfor gjør ikke han den store innsatsen i timene.

Miss A says that she thinks that Isak is in a league of his own at this point in 8th grade because he is “*incredibly smart*”, just as she stories Albert. The emergence of these boys as figures in Elias’ 10th grade story is predicted in Miss A’s 8th grade interview. It seems that Miss A says that Isak doesn’t need to act the same way as she expects the other students to do. It is as though he employs a particular position in this class.

Like Ross, Miss A is also aware that there are some students who are significant in the class as a result of their popularity. In her 8th grade interview, she presents, on her own initiative, a group of students she labels as the ‘popular ones’:

A: Herman, Jessica, Mikhael, David, Josephine, Sophie, Rikke and Kine are such a popular bunch.

T: What's the reason why they are popular and have this position?

A: As for David, he's very good at football. Eh, Herman hasn't had this position in primary school at all so it's cool for him.

A: Herman, Jessica, Mikhael, David, Josephine, Sophie, Rikke and Kine er en sånn populær gjeng.

T: Hva tror du er grunnen til at de er populære, har denne posisjonen?

A: For David sin del gjelder det at han er veldig flink i fotball. Eh, Herman har overhodet ikke hatt denne posisjonen på barneskolen så det er jo kult for han.

Miss A doesn’t justify the reason for why she sees these students as a popular bunch, but she mentions skills in sports, and more precisely, football for one of the boys. The reason for why the rest of these students are categorized as popular, is not expressed explicitly.

The 9th grade story from Miss A

Just as she did in 8th grade, Miss A pays initial attention to the students' social actions in 9th grade. She still perceives Class A as a nice group of students:

T: If you were to use any adjectives about your students

A: Good with each other, taking care of each other, helping each other, both academically and with practical stuff. Good atmosphere. Lots of humour. A bit muddled sometimes, but they are 9th grade so maybe that's why. Also, I just want to say that all temporary teachers who have them say that they are so nice, that there is a good working atmosphere in the lessons and so on; they manage to show respect for teachers at all levels, the main teachers, subject teachers and temporary teachers.

T: Hvis du skulle brukt noen adjektiver på elevene dine

A: Gode med hverandre, ta vare på hverandre, hjelper hverandre, både faglig og hvis det skulle være noe praktisk. God stemning. Masse humor. Litt sånn surrete av og til, men de er jo 9.trinn så kanskje det er noe med det. Også vil jeg bare si at alle vikarer som har dem sier at de er så fine, at det er god arbeidsro i timen og sånn, de klarer å vise respekt for lærere på alle nivåer, både kontaktlærere, faglærere og vikarer.

The generous picture of the class presented in 8th grade still holds in 9th grade. This time, Miss A adds how the good attitude towards teaching and learning in Class A remains, even when they have substitute teachers. Listening to teachers and wanting to learn are expected acts in Class A. Miss A says that the students help each other, both academically and practically. Once again, this reflects the students' story of a whole-class unit scenario, and as in Miss A's 8th grade interview, she starts to draw on the discourse of 'bildung' when describing the students.

Class A as a high performing class – benefits and costs

As in the 8th grade interview, I questioned Miss A about the academic level of the class. This time, the conversation concerned how the students think about this:

T: How do you think the students in this class feel about the academic level in the class?

A: They feel it's high.

T: Hvordan tror du elevene i denne klassen opplever det faglige nivået i klassen?

A: De opplever det høyt

Miss A states, without reservation, that the students perceive the academic level as high, just as she did in 8th grade. However, this time, she doesn't talk about the way the students act when their achievement is being discussed, as she did in 8th grade.

The conversation about achievement continues, and I ask Miss A to elaborate on how the students might experience the academic demands in the class differently:

T: Are there any who this is positive for, or some it's difficult for?

A: I know it's positive for this group of girls in the middle, and these three guys Herman, David and Mikhael. Kine can feel a bit of performance pressure. Rikke is pretty weak academically generally, so she is sensitive about her achievement in general.

T: Negative, do you mean?

A: Yes.

T: Yes, there's a balance between if you're motivated, or not motivated.

A: Yes, so we are a bit worried about losing her now because she has a lot of failures, compared to her friends. Jessica doesn't worry anyway, she does as she pleases.

T: Is there anyone here you're worried about when it comes to maths?

A: Rikke, Josephine, Elias

T: Er det noen det er positivt for, eller er det noen det er vanskelig for tenker du?

A: ... Jeg vet at det er positivt for denne jente gruppa i midten, og disse tre gutta Herman, David og Mikhael. Kine kan kjenne litt på prestasjonspress. Rikke er ganske svak faglig over hele linja, så hun kjenner veldig på det nå.

T: Negativt mener du?

A: Ja

T: Ja det er en balanse det om man blir motivert, eller ikke motivert.

A Ja, så hun er vi litt redd for å miste nå for hun får som mange nederlag i forhold til venninnene sine. Jessica bryr seg ikke uansett, hun gjør som hun vil.

T: Er det noen av disse du er bekymra for, når det gjelder matte?

A: Rikke, Josephine, Elias.

Miss A starts by telling me how she thinks the high academic level is positive for some students, mentioning those who are seen as quite good. But she goes on to say that Kine might feel pressure to perform, that Rikke struggles and that Jessica doesn't seem to care. Rikke and Jessica are among the students who are in the struggling group. Kine, on the other hand, is quite a different case. Miss A returns to Kine several times during the 9th grade interview:

T: If you were told that you were going to get a group for a written exam, who would you trust?

A: There are the five guys on the side; I would also pick out Kine and Mikhael.

T: Hvis du fikk vite at du skulle få opp en gruppe til skriftlig eksamen, hvem hadde du stolt på da?

A: Det er disse fem gutta på siden, også ville jeg holdt en knapp på Kine og Mikhael.

The five boys Miss A refers to are Albert, Isak, Alexander, Erik and Ross. These are the same students who emerged as a group with a special interest in mathematics in 8th grade and they have kept their position within this significant group into grade 9. In addition, Miss A mentions Mikhael and Kine as students she thinks will perform among the best students in 10th grade. Emilia was mentioned among this group in 8th grade, but not this time. Kine is now emerging as a strong student in mathematics, according to Miss A, but at the same time, she is storied as

unduly affected by pressure to achieve. Miss A's concern suggests that she thinks that Kine is rather fragile, singling her out from the boys on the list.

The gender issue evolves

This group of boys, with their special interest in and attention to mathematics, have already been mentioned in 8th grade, and Miss A returns to this group later in the conversation, elaborating on their importance and their effect on the rest of the class. This time, Miss A talks about how they inspire the other students towards a higher level in mathematics, and she names the group explicitly as 'the smart boys':

T: Is there anyone who influences the class academically?

A: Yes, then I have to mention this group of boys, 'the smart boys'; they are a driving-force, academically. They easily affect the others in a positive way.

T: So you think they have a good effect?

A: Isak is absolutely the best in maths. We have a new student now, and he is very good at looking after the new student. And William, he was a bit quiet and unusual last year. But he has developed and is much more open and verbally active. And when it comes to the academic side, I have to say Kine, because when she really trusts herself and comes through, it's really great.

T: Er det noen som preger klassen faglig?

A: Ja, da må jeg snu meg litt mot denne guttagruppa, 'smarte gutta', de er veldig pådrivere for det faglige. De har veldig lett for å dra med seg andre oppover.

T: Så du synes de påvirker på en god måte

A: Isak er absolutt flinkest i matte, og nå som vi har fått en ny elev så er han veldig flink til å veilede den nye eleven. Og William, han var litt sånn stille og rar i fjor. Men han har kommet seg veldig, mye mer åpen og muntlig aktiv. Og når det gjelder det faglige må jeg si Kine, for når hun virkelig stoler på seg selv og kommer med noe er det virkelig flott.

Miss A's characterisation of this particular group of boys underlines how she recognises them as a driving force in Class A, pushing their fellow students towards a higher level. Although she does not specify exactly what they do to affect the other students, she identifies Isak as important for helping a new student out, apparently positioning him as an 'assistant teacher'.

In 8th grade, Miss A described these boys as simply interested in mathematics and motivated by the status that they associated with high grades. Now, she ascribes a more prominent position to them as influencers in Class A in general. She gives little explanation of how this happens beyond her reference to Isak helping a new student, and it seems as if the simple existence of this group is enough to account for their influence on the rest of the class. Only one girl is mentioned as having a similar influence - Kine, who has replaced Emilia as a high-achieving girl worthy of mention in Miss A's story. Even then, she stories Kine as in need, and in a distinctly different position to the boys.

The tension between 'bildung' and achievement that was generally apparent in Miss A's account in 8th grade did not apply when this group of boys were discussed – only achievement

was at stake when she talked about them. Now, this seems to be the case with the whole class. Whereas, in 8th grade, Miss A applauded how the students in Class A cheered for each other regardless of their grade levels, this kind of behaviours no longer receives the same attention. Indeed, the issue about helping others seems not to focus on those who are helped, but on those who help and what this says about them. Essentially, what has remained of ‘bildung’ in the class has morphed into these boys as teachers, where a primary function is to signal their high levels of achievement in mathematics.

Miss A’s account reflects the students’ stories too; recall how Elias and Ross reported the importance of acting like an assistant teacher. It seems that these acts not only have value in this figured world from the students’ point of view, but also Miss A’s. Furthermore, these are acts which she particularly associates with these boys, and in relation to their high levels of achievement in mathematics. As key figures in setting the pace and image of Class A, they seem to have been given access to the teacher’s domain, as ‘assistant teachers’. The positioning of this specific subgroup, the smart boys, draws attention to how power and privilege are unevenly distributed among the students in Class A.

What is the contribution from Miss A’s stories?

When listening to Miss A’s story of Class A from 8th grade and 9th grade, it is noticeable that there is no tension between her portrayal of the class in these years and the students’ stories of Class A in 10th grade. It seems that the figured world of Class A has evolved along a clear trajectory which is captured in the students’ stories. However, Miss A’s stories provide an additional and sometimes more comprehensive underpinning of the way this figured world is constituted of several sub-elements; her accounts highlight a tension between competing discourses of ‘bildung’ and achievement, the existence of particular figures in the classroom, and the role of gender.

The tension between ‘bildung’ and achievement

The students’ stories in 10th grade repeatedly described the high achieving nature of the class as a defining characteristic – it was what Class A was known for. Miss A’s 8th and 9th accounts confirm the value attached to this performance. At the same time, another narrative circulating in the students’ stories focused on doing one’s best, and the need to support others in this. While the tension between these two narratives is implicit in the students’ stories, it is clearer in Miss A’s account, which shifts between a traditional discourse in Norwegian schools - ‘bildung’ - and a more recent policy-driven discourse of ‘achievement’. As a teacher, obliged to follow the

national curriculum and meet the demands of testing, this tension is imposed on her more explicitly. She notes the students' supportive behaviour in addition to their academic levels when we are discussing achievement in 8th grade, but there is a tension in the curriculum between 'bildung' and achievement, and Miss A draws on both discourses in her narrative.

However, 'bildung' seems to lose ground to 'achievement' as time goes by. While Miss A's 8th grade story draws on 'bildung' several times, and invokes it even when we talk about achievement, by 9th grade it seems to have become less important. Although Miss A talks about the students' good-natured acts when the conversation is not about achievement, these disappear from her narrative about achievement in 9th grade. They are replaced with more references to 'ideal figures' whose behaviour carries the semiotic markers of achievement – the key figures among the 'smart boys'. Thus, in Miss A's 8th grade story of the class, she presents Isak as a very clever student. He returns in 9th grade as the smartest among the smartest, and the figure of 'the most clever boy' who is in a 'class of his own' emerges. Albert is also storied to be at another level, but he takes an accelerated pathway and is not really a consistent part of Class A. Even so, he is positioned in the same terms as Isak, also emerging as a figure of 'the most clever boy' similar to Isak but more like a shadow. Although they do not quite make this grade, Ross and Erik are mentioned several times by Miss A as having significant positions in the figured world of Class A, by virtue of their 'smartness'.

The gendered picture of mathematics in Class A

The group of boys identified in the students' 10th grade stories as central to Class A's reputation had already appeared in Miss A's 8th grade narrative, where their importance evolved from influencing each other in mathematics to affecting the rest of the class. By 10th grade, these boys have a particular position in Class A based on their acts as assistant teachers, and their employment of significant positions such as engaging in public dialogue with Miss A. It appears that these actions work together so that the tension between 'bildung' and achievement vanishes: when they are described as helping the others out - an act which is valued in the discourse of 'bildung' – this simultaneously acts as a sign of their mathematics competence.

The situation is very different for girls, however, and their achievement in mathematics is discussed differently from the boys'. The girls are storied as wanting to do well in school in general, and Miss A suggests that language and writing are, perhaps, more important to them. It seems as if the girls in the class tend to be mentioned when 'bildung' is on the agenda, rather than achievement. Only two girls are presented as high achievers in mathematics in Miss A's

narrative of the class - Kine and Emilia. They have a less prominent position, being mentioned either in the 8th grade (Emilia) or the 9th grade story (Kine), and their acts are described differently. Neither are described as interested in or having a particular focus on mathematics. Emilia is presented because she is a hard worker, while Kine is seen to be a fragile even though (or even because) she is a high-achieving student. Miss A says that Kine needs to trust herself, and it appears that she views her as occupying a stereotypical 'unconfident girl' position. She seems to have to make an extra effort to be positioned in the same way as the boys, and to be included in the privileged group that affects the rest of the class positively.

Understanding the fabric of the figured world of Class A

The students and Miss A entered Class A at the beginning of 8th grade and established this figured world with its rules, norms and values that organise the habitual acts of the classroom. Accepted actions and their interpretation have evolved through the years of lower secondary school. In this setting, the students and Miss A have jointly developed their sense of self, over time, within the frame of the mundane activities in Class A.

Analysis of the students' grade 10 stories, the focus groups at the end of grade 8, and Miss A's stories, has revealed the common shared story – the standard plot - of this figured world. Expected actions and their interpretations – what is seen as natural and common in this classroom, acts that characterise this particular class - are fuelled by the discourses that 'build' or structure this figured world. These discourses support the different norms, rules and values that affect everyday life in this particular classroom. However, the various discourses are not evenly distributed in terms of strength. The discourses and sub-plots of the figured world of Class A establish the meaning system in relation to each other; together, they constitute the fabric of Class A and the way that it shapes, and is shaped by, the acts and happenings that take place, and the different possible positions the students take up, actively or passively. They provide the context of students' developing identities and agency as mathematics students.

The discourses of Class A

Recall how the Norwegian curriculum focuses both on 'bildung' (combining to educate 'good citizens' with attitudes, beliefs and values as a good human), and on performance (which concerns grades and achieving the subject-specific goals in the curriculum). The intention of the curriculum is that these two aims will complement each other in promoting students' learning. As we have seen, both Miss A and the students draw on both discourses in their talk, not only as complementary discourses, but also as competing discourses.

Everyone considers Class A as a nice class, describing it as a whole-class unit scenario in which students frequently use the term ‘we’ and the discourse of ‘bildung’ seems to be on point. It is signalled by acts that urge fellow students to do the best they can according to their capability, to cheer each other on and to prize collaboration with all regardless of achievement levels. However, we know that this is not the whole story; the analysis has revealed another story about this class. The whole-class unit scenario, a dominant first impression, seems to crack when the students and Miss A start talking about achievement and grades, describing the class as divided into subgroups according to levels of achievement in mathematics and grades. The discourse of achievement is in the ascendent at this point. It is signalled by acts which aim to achieve high grades and working hard to improve those grades.

Maintaining the picture of a whole-class unit scenario while categorising the class into subgroups according to grades seems to be a challenging manoeuvre. It is difficult for the students and Miss A to explain acts inscribed in these two different discourses simultaneously. Even though the intention in the curriculum is that these two discourses should work jointly, the reality, at least in Class A, seems to be much more complex. The discourses of ‘bildung’ and achievement conflict in this classroom.

The analysis has also shown how the two discourses affect the class unevenly over time. The discourse of achievement seems to gain hegemony over ‘bildung’ as time goes by. Acts of achievement are much more prominent in 10th grade than in 8th grade. Perhaps the students bring a stronger sense of ‘bildung’ from their primary schools, which do not assess by grades. Perhaps performance gains hegemony because of the imminent high stakes assessment at the end of 10th grade which influences access to upper secondary school. Whatever the reason, the students in Class A are strongly influenced by the discourse of achievement as times goes by.

In addition to the discourses of ‘bildung’ and performance, yet another discourse lurks beneath the surface in this figured world and affects the class. Recall how the students’ stories revealed that mathematics is generally regarded as the most important subject in school. A shared truth among the students in Class A, its importance evolves over time, largely as a ‘ticket to a good life’. Adding the authoritative discourse of the importance of mathematics to the hegemony of the discourse of achievement gained during lower secondary school means that doing well in mathematics becomes increasingly important for the students in Class A.

Finally, there is an issue about popularity in Class A as well, recognised as deriving from a teenage culture surrounding the students’ everyday lives outside of school. This is not seen as

a major issue among the actors in Class A; nevertheless, it is mentioned by both Ross and Miss A and is something that seems to affect the students' positionality.

The cross-cut space of gender and discourse in Class A

The discourses which operate in Class A contribute to the 'unwritten rules' that underpin the way the students and Miss A both interpret acts and choose to act in this classroom. However, these values, norms and rules do not seem to affect the students equally.

For instance, behaving politely is an expected act in this classroom; however, a student doesn't become an important actor by doing this. The students' stories have shown how it seems to be more important to be a high-performing student, especially in mathematics. This doesn't mean that being a high-achieving student means being impolite but, rather, it points to how grades are a significant marker of positionality. As we have seen, however, students who get high grades and who are positioned as important actors in this class also perform other significant acts that signal their affiliation to this group: they act 'loudly'. Here, the girls seem to fall short. There is an established way of acting among the boys in Class A which doesn't allow or invite the girls into this group. This group seems to have privileges the others do not have: they act as assistant teachers, which includes discussing mathematics with Miss A and suggesting methods that are 'better' or 'quicker' when solving problems in plenary sessions, and they ostentatiously help other students. They position themselves as on equal terms with the teacher.

From the students' talk, we know that there is a gender dimension in Class A which is connected to high achievement in mathematics and its associated acts. This is reflected in Miss A's story, where the discourse of achievement is more present in her description of (and coining of the term) 'smart boys'. The contrast emerges when she speaks about the girls – the discourse of 'bildung' seems to be more present then. The authoritative discourse of the importance of mathematics matches the evolution of the hegemony of the discourse of achievement, which seems to create cross-cut spaces of positionality where gender plays a part.

The development of these patterns during lower secondary school is represented in Figure 8. It indicates subgroups of students: the smart boys, the sporty hard-working girls, the popular students, those who don't belong and the students who leaves Class A and attend Mr X's group. The sporty hard-working girls and the popular students are said to be 'the normal ones'. The colours of the different groups indicate the impact each group has on the rest of the class; the smart boys are dark green, and their impact on the rest of the class is indicated by its light green colour. The lines that surround the groups are either solid or stippled, indicating the accessibility

or permeability of the groups. A solid line indicates a closed unit, which is difficult to enter, while a stippled line indicates a more open access. The arrows indicate students who move between Mr. X's special mathematics group and Class A.

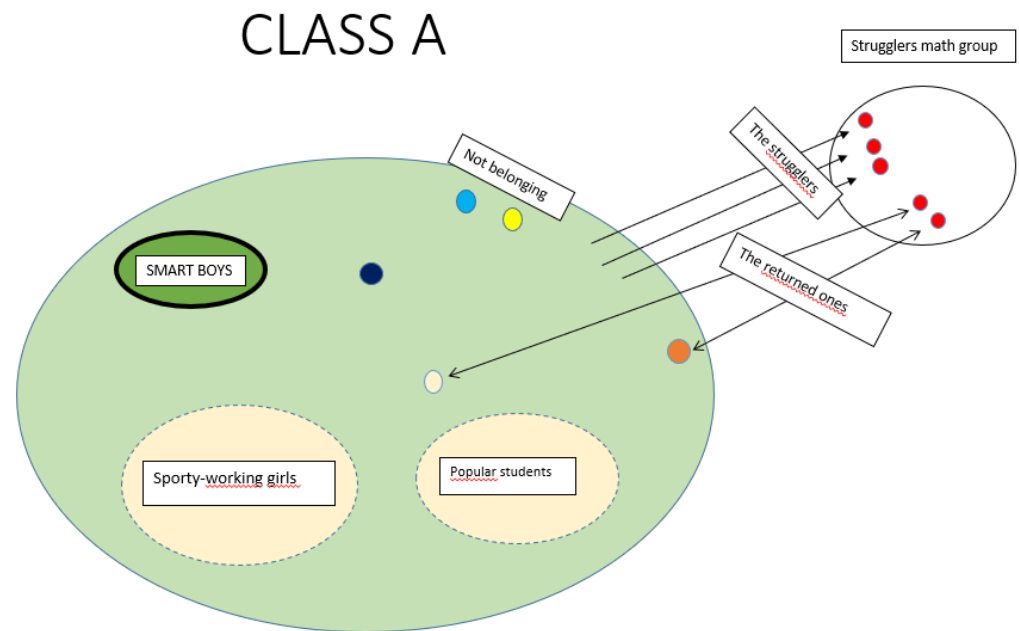


Figure 8. A visual representation of Class A, as it evolves during lower secondary school

Summary: the world of Class A

In this chapter I have introduced the figured world of Class A and presented how I have constructed meaning of the fabrics of this figured world. The first impression of an easygoing class, where everybody does their best in order to succeed in mathematics, have more to offer. The authoritative discourse of the importance of mathematics combined with the hegemony the discourse of achievement gain over 'bildung' and popularity during lower secondary school means that doing well in mathematics becomes important for the students in Class A. Moreover, this seems to create a cross-cut spaces of positionality where gender plays a part.

In the next three chapters, I focus on the six case study students, Ross and Alexander who are members of the 'smart boys', Emilia and Kine, who are high achieving girls, and Elias and Rikke, who do have struggles with mathematics. For each pair, I follow the structure of introducing the two students constituting the pair, through my eyes, before I present the analysis of the students' stories of themselves.

Chapter 6: Ross and Alexander - Two different ‘smart boys’

I now turn my attention towards two of the ‘smart boys’, Ross and Alexander. As we have seen, Miss A mentions Ross in 8th grade as having a particular interest in mathematics, and she has high expectations for him. In 9th grade, she views him as a central player among the smart boys, and it emerges that Ross holds a prominent position. Alexander is mentioned briefly in Miss A’s 8th grade story, where she characterises him as a hard worker. In 9th grade, she places him within the group of the smart boys, and adds her impression of Alexander as being among the popular students as well.

Based on Miss A’s assessment protocol, Ross and Alexander seem to be similar students. They both achieve top grades from the 8th grade onwards, with minor differences; however, their enactments of their place in the classroom present contrasting cases within this subgroup.

Introducing Ross



For an outsider visiting Class A, Ross would most likely stand out as one of the students getting attention. I find Ross impossible to ignore. He demands attention in the classroom, not because he is noisy but because he is an ‘ideal student’. Ross seems to do all the things a teacher would tell a student to do. He is on time and prepared for school, and he follows the rules for good

behaviour in the classroom. During lessons, he seems to be focusing on the mathematics. His mundane acts do not themselves demand attention in the classroom. It is the way Ross *performs* these acts that catches my attention. He acts like he has CAPS LOCK on.

How Ross acts during Miss A's whole-class plenary sessions illustrates this. He focuses on Miss A's talk and teaching; however, my impression is that his attitude is duplicitous. Ross is a student who always contributes, and a teacher could rely on his contributions in plenary sessions. Still, it seems that Ross has a need to ask questions, whenever Miss A supplies practical information or presents methods and mathematical concepts or solves a problem on the board. These questions are relevant, but at the same time, some seem to be 'unnecessary':

Autumn 10th grade:

During a plenary talk where Miss A gives an example, Ross says, 'We have never needed to show our thinking on tasks like this before'. Miss A explains her aim, and Ross exclaims, 'Couldn't you have said that at the beginning?'

Autumn 10th grade:

During a plenary talk where Miss A gives an example, Ross asks, 'Do I need to write this down?'

Autumn 9th grade:

Miss A informs the students about the maths test the class will take at the end of the week. Ross asks Miss A if she could put that information in 'It's learning', and she says she has already done so.

Mid-term 10th grade:

Miss A presents a 'formlikhet' [strategy] for finding the length of a side of a triangle for the first time for Class A. Ross raises his hand during her illustration of the method as though he is curious about something. When he is invited to speak, he asks if it is possible to do this the way he has done as well, arguing that it is quicker.

It is as though the act of asking questions is more important than the questions themselves. He asks with an air of entitlement, as though he believes he is allowed to interrupt Miss A and ask whatever comes to mind. My impression is that some of his questions are honest, straightforward questions, but they also seem to have the aim of demonstrating his mathematical ability and challenging Miss A's competence: he wants to show that he is in control.

I have noted an episode at the end of 9th grade in which Miss A discusses the most difficult problem in the end of year test. Clearly, Ross was able to follow a difficult explanation, but his interaction with Miss A suggests that there is more to it than this.

End of 9th grade

Miss A explains the final, most difficult, question in the end of year test. Several students seem to have given up, some others write down Miss A's explanations. I have noted: 'Ross is the only one confirming he follows the explanation. He asks short questions and says "okay" and "yes, now I understand". It seems like he controls the pace of the teaching'.

My final note about this situation is: "*Is this 'performance' made for him?*". Situations like this fuel my impression that Ross seems to act out a kind of authority or entitlement in the classroom.

In the individual practice part of the lesson, Ross assumes his given place in the classroom. When the students work on practicing problems individually, they choose from a range of problems according to their level. Ross always chooses the 'level 3' tasks, which are the hardest ones. If Miss A offers additional tasks that are 'more challenging', Ross chooses these.

Ross is a fast worker. I notice that he is quick to finish, something he may say out loud by asking questions, like: "*What am I supposed to do when I am finished?*"¹⁴ He seems to prefer to work with other students from the group of 'smart boys', and they often discuss mathematical challenges. My impression is that they enjoy the work, because they are in a good mood, laughing and energetic. If none of the smart boys is sitting near Ross, the mathematics conversation between the group is discussed loudly across the classroom. If Miss A admonishes them for being loud because they are disturbing the other students, a common counterargument is that their discussion is about mathematics, which from their point of view seems to legitimise being loud. If Ross is not able to work with some of the other smart boys, he seems to prefer working alone and more quietly. He may answer questions to help other students or allow the other students to compare answers with him, but it is noticeable that he does this 'without caps lock on'. His actions are quieter than when he works with the smart boys.

¹⁴ «Hva skal jeg gjøre når jeg er ferdig?»

Ross is quick to ask for assistance if he needs it. He seems to be eager to solve the problems he is given. I find it easy to help him. He knows concepts and methods, and he knows why he is stuck. Incidences such as the following illustrate his interest completing difficult tasks, but also that he is competitive about them.

Note on helping Ross, spring 10th grade:
Ross wanted help with a complex task involving Pythagoras's theorem and circles. We took some time to find a solution, and we tried out different perspectives. During this session, he was active and motivated to solve the problem. When we finally did, he was happy to have solved it. He told me that even Isak had trouble with finding a solution to this task. After the session, he told his peers that he finally solved that task, underlining that even Isak had struggled with it.

Note on dialogue with Ross, winter 10th grade:
Miss A brought copies for the students who want to work with quadratic equations. Ross works concentratedly on his own and raises his hand to ask me for assistance. He works on factorizing algebraic expressions using knowledge of the quadratic equations to reduce fractions.
Ross is focused and thoughtful in our talk, and our conversation concerns how he is supposed to know when to use quadratic equations. He gives an impression of both enjoying and understanding the conversation.

Based on my time in Class A, I understand Ross as a student who enjoys mathematics. He was in the first focus group interview I conducted in 8th grade. I was a bit surprised when he rated mathematics as his third least favourite subject; however, he agreed with my statement: *"I like maths"*. Ross talks about a divided attitude toward mathematics: *"I think it gets a bit easy and boring and repetitive when we work on such tasks as I think I can already do them quite well. But, then it gets a little dry, too. But, I also think it can be useful and interesting if we learn about new things."*¹⁵ In the focus group interview in 9th grade, Ross continued to express an ambivalent attitude toward mathematics. Along with other students, he says that he doesn't like it, but he agrees when others say that they like mathematics when it is challenging and like solving riddles. *"Yes, I agree, if it is (...). Yes, that's the only thing that's fun."*¹⁶ Ross repeats his rating of mathematics from 8th grade: *"Yes, maths is pretty far down for me."*¹⁷

Ross' attitude toward Miss A 'shines through' in the focus group interview in 9th grade. He is in the group with the boys who are considered to be the 'smart boys'. Ross seems not quite happy with Miss A's teaching, and he talks about how he thinks the teaching could be improved: *"It would have been nice, though...it might have been better if we had got more learning in class then and that Miss A went through things a bit better and that we don't just do problems*

¹⁵ «Jeg synes det blir litt lett og kjedelig og repeterende når vi jobber med sånne oppgaver som allerede jeg synes jeg kan ganske godt. Men, da blir det også litt tørt. Men jeg synes også det kan være nyttig, og interessant hvis vi lærer om nye ting.»

¹⁶ «ja det er jeg enig i, hvis det er (...) Ja det er det eneste som er gøy.»

¹⁷ «Ja, matte er ganske langt ned for meg.»

in our books. *It might have done that [stops because he is being interrupted].*¹⁸ In addition, he gives me the impression that he is questioning Miss A's mathematics competence. The students in the focus group discuss a specific task from the end of year test, which they found difficult. They say that Miss A had told them that they should be able to solve it and that it required independent and relational thinking. Ross contributes to the conversation: *"Yes, yes, but I've heard that someone has been trying to solve that task with Miss A, and she couldn't do it, either."*¹⁹ The exact nature of this critique is open to interpretation. What is significant is how Ross seems to position himself when surrounded by the smart boys. He comes back to comment on Miss A several times during the conversation, and mentions her the most during the focus group, mainly to say how he is not quite happy with the teaching: *"Yes, now, she is, like, when we learned about the golden ratio, she didn't say what the golden ratio was. She just said 'read what it says about the golden ratio and do the problems'"*²⁰ and *"when it's the exam, Miss A just says to practice the whole book."*²¹ Ross gives the impression that he thinks Miss A puts the responsibility for doing the mathematics thinking onto the students.

Although I do not see any change in how Ross acted as a mathematics student in Class A from 8th to 10th grade, he becomes more prominent in the classroom. His performance of entitlement seems to increase, and this is illustrated by how he assesses his work in his diary notes in 8th and 9th grades after the end of year tests.

Diary notes 8th grade:

1. I'm pretty happy and thought I did a pretty good job.
2. I used my time quite well and managed to follow my plan pretty well. I planned to be finished at 1300, which I did.
3. My ambition in this exam was to be able to answer all the questions, and I feel that I got to everything and got a pretty good grade.
4. I think my work was pretty good, but I feel I could have been a bit more focused during the test itself.
5. I really think I'm going to get 6 on this test, but I won't be disappointed if I get something less.

1. Jeg er ganske fornøyd, og syntes jeg gjorde en ganske god jobb.
2. Jeg disponerte tiden min ganske godt, og greide å følge planen min ganske bra. Jeg planla å bli ferdig kl 1300, og jeg ble ca det
3. Mine ambisjoner ved denne prøven var å kunne svare på alle oppgavene, og føle at jeg fikk til alt, og få en ganske god karakter.
4. Jeg synes arbeidet mitt ble ganske bra, men jeg føler jeg kunne vært litt mer fokusert under selve prøven.
5. Jeg ser egentlig for meg at jeg kommer til å få 6 på denne prøven, men jeg blir ikke skuffet hvis jeg får noe under dette.

¹⁸ «Det hadde vært fint om, det hadde kanskje vært bedre om vi hadde fått mer læring i klassen da, at Miss A gikk gjennom ting litt bedre, ikke bare at vi skulle jobbe med oppgaver i bøkene. Det hadde kanskje gjort at.. [stopper fordi han blir avbrutt]»

¹⁹ «Ja, ja men jeg har hørt at noen har prøvd å regne ut den oppgaven med Miss A og hun greide den heller ikke.»

²⁰ «Ja, nå så er hun jo sånn når vi lærte om det gyldne snitt, da sa hun ikke hva det gyldne snitt var, hun bare sa les det som står om det gyldne snitt og gjør oppgaver.»

²¹ «Når det er tentamen, da sier Miss A bare, øv på hele boken.»

Diary notes 9th grade:

1) What are you satisfied with after the semester test?

I am happy that I did what I could and that I got to do almost all the tasks.

2) How did you allocate your time and manage to follow your plan?

I used my time quite well, but I spent some time on the last problem, so I didn't get to look over part 2 that much.

3) What ambitions did you have with this test?

My ambition with this test was to understand and manage all the questions, and I feel that I got it right.

4) How do you think your work was?

I think my work was pretty good, except for the last problem. I got a mental block with it and did not quite understand what to do.

5) What grade do you think you will get?

I imagine I will get either a 5+ or a 6 on this test. I would have been a bit disappointed in myself if I got any worse.

1) Hva er du fornøyd med etter tentamen?

Jeg er fornøyd med at jeg kunne det jeg kunne, og at jeg fikk til å gjøre nesten alle oppgavene

2) Hvordan disponerte du tiden din og klarte du å følge planen din?

Jeg disponerte tiden min ganske godt, men jeg brukte litt lang tid på den siste oppgaven, så jeg fikk ikke sett over del 2 så mye.

3) Hvilke ambisjoner hadde du med denne prøven?

Ambisjonene mine med denne prøven var å forstå, og greie alle oppgavene, og det føler jeg at jeg fikk til helt greit.

4) Hvordan synes du selv at arbeidet ditt ble?

Jeg synes at arbeidet mitt ble ganske bra, bortsett fra den siste oppgaven. På den fikk jeg litt jernteppe, og forsto ikke helt hva jeg skulle gjøre.

5) Hvilken karakter ser du for deg at du vil få?

Jeg ser for meg at jeg enten får en 5+ eller en 6 på denne prøven. Jeg hadde blitt litt skuffet over meg selv hvis jeg fikk noe dårligere.

The way Ross describes his work, both in 8th and 9th grade, gives an impression of confidence in his own capability in mathematics. In the diary notes in 8th grade after the end of year test, he says that he thinks he will achieve grade 6, but adds that he won't be disappointed if he gets a grade lower. In 9th grade, he says the opposite. He thinks he will be assessed with a 6 or 5+, and he adds that he will be dissatisfied if he doesn't. His anticipation of his own achievement has increased. Furthermore, he says that the problem he experienced during the test in 8th grade was because of himself; he wasn't fully focused. In 9th grade, he stories his problems as 'jernteppe', a 'mental block', an expression students most commonly use to express how they suddenly don't remember something they normally know.

At the end of 9th grade, I made a brief summary of my impression each of the students in Class A. Of Ross I wrote:

High achieving boy, grade 6 so far. Asking critical questions of the teacher. I understand him as positioning himself as better than the other students. Sociable with both boys and girls, though mostly with boys, but he has a way of being a bit socially clumsy.

Introducing Alexander



My brief summary note of Alexander captures the contrast between him and Ross:

High-achieving boy. Soccer boy, handsome and nice, introvert. Not bragging about his achievement, always doing his work and he is actually focused in school.

Unlike Ross, Alexander's acts in the classroom will most likely not be noticed by an outsider visiting Class A. While Ross demands attention, Alexander goes 'under the radar'. It takes time to become aware of him. But once you notice him, he stands out.

Note from observing Alexander's work, winter 10th grade
Miss A has brought copies for the students who want to work with quadratic equations. Alexander works on his own on factorising algebraic expressions using knowledge of quadratic equations to reduce fractions.
I 'look over his shoulder' to see how his work is going. What he has done in his workbook seems to be correct, and he gives me the impression that he has no need for assistance. I leave him alone, and he continues working.

Like Ross, Alexander does the things a teacher would tell a student to do. He is on time, he is prepared for school and he follows the rules for good behaviour in the classroom. And like Ross, Alexander seems to focus on the mathematics during the lesson. Based on Miss A's

assessment record, Alexander's achievement score is at the top level, slightly better than that of Ross over time. Contrary to how Miss A talks about Ross, as one of the most prominent students in 8th grade, she only briefly mentions Alexander among the students who work well in 8th grade, but he becomes more prominent in her 9th grade story, where she places him among the smart boys, and adds that she sees him as being among the popular ones as well.

In the plenary sessions, Alexander rarely asks questions related to Miss A's explanations. I have no notes that show this; however, I have noted that he pays attention to her explanations by listening and sometimes taking notes. A typical fieldnote about Alexander is short, indicating that he 'pays attention', 'practices tasks' or 'works independently'. If Miss A asks him a question directly, he always has a good answer to her question, and he responds in a modest tone. Alexander sits in his given place in the classroom, and he either works alone or together with the student sitting next to him. He doesn't move around the classroom.

When Alexander works alone, he seems to be focused, and one could easily forget he is in the classroom. Like Ross, he chooses level 3 tasks, or the 'harder' tasks, if Miss A offers them. He rarely asks for assistance; he seems to figure out how to do the tasks himself. The note I made during the work on quadratic equations is illustrative of this. On some occasions, I discussed tasks with Alexander, and during our conversations, he seems to take time to think and to reason how to figure out and understand. Like Ross, he is easy to help.

Alexander seems to be flexible in working with other students. Below are notes from three different episodes when students are working individually.

<p>Alexander and Herman: Alexander: (Saying in a friendly tone) Herman, you need to help me out with Excel because I have helped you a lot with maths lately. Herman agrees, and they work together with Excel tasks quietly and effectively. Both of them seem to enjoy the work.</p>	<p>Alexander and Josephine: Sitting across from each other working on tasks together, the one Josephine wants to do. They have a slightly flirtatious tone. Josephine: How do you know all this? Are you a nerd? Alexander: No, I'm just clever.</p>	<p>Alexander and Emilia: Sitting next to each other working on the same tasks, Emilia compares her answers to Alexander's. They are efficient, and both seem to be in a good mood.</p>
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It is noticeable that these three episodes involve students from different subgroups in the class and both boys and girls. Alexander seems to tune into their ways of being in the classroom, and he is able to adjust his actions depending on who he works with. Miss A says in her 9th grade interview that Alexander is a student who others prefer to work with: *"The three boys there*

*[among the ‘popular’ group] prefer to work with Alexander because he is so good.”*²² My impression from my time in Class A and my conversations with the students and Miss A is that Alexander is the one student who most others in the class would choose to work with.

In the 8th grade focus group Alexander places mathematics far down his list of favourite subjects. He says that he sometimes finds it boring, but useful, and he both enjoys and doesn’t enjoy mathematics, depending on the tasks. In the 9th grade focus group, he was in the same group as Ross, consisting of students from the ‘smart boys’. Alexander is often interrupted by the other students, but he doesn’t fight to take the floor; however, he adds comments on several occasions, such as when the students talk about whether they like mathematics or not: *“Well, it depends a bit. Some topics can be a bit fun, so if it’s a bit challenging, then it can be a bit fun.”*²³ He illustrates: *“If there are tasks where you have to think really logically.”*²⁴

Alexander seems to be thoughtful about his work. When the students in this group discuss one of the hardest problems in the end of year test, Alexander is the one who is most able to describe his work and his answer: *“Wasn’t the answer $\frac{r}{2} \cdot \sqrt{5}$? I just tried to find a way in my rough work and probably wrote a page with lots of different solutions. ... It was something with Pythagoras’ theorem or something like that (...) I think my answer was like $\frac{r^2}{4} + r^2$, and then I didn’t know what to do.”*²⁵ Alexander’s answer is almost right as it turns out, he had just not added together the fraction and the r^2 , and he would need to take the square root of the sum. The other students talk about how they just gave up or tried to solve this with decimals.

²² «Begge de tre guttene der [blant de «populære»], de vil helst jobbe med Alexander for han er så flink.»

²³ «Jamen, det kommer litt an på. Noen tema kan være litt gøy, sånn hvis det er litt utfordrende, da kan det være litt gøy.»

²⁴ «Hvis det er tekstoppgaver som du må tenke sånn veldig logisk.»

²⁵ «Var ikke svaret $\frac{r}{2} \cdot \sqrt{5}$. Jeg bare prøvde meg frem på det kladdarket og skrev sikkert en side med mange forskjellige løsninger. ... Det var noe pytagoras eller noe sånn (...) Jeg tror jeg kom frem til sånn $\frac{r^2}{4} + r^2$ og da skjønte jeg ikke mer hva jeg skulle gjøre.»

Alexander assessed his own work in diary notes in 8th and 9th grade.

8th grade

1 I am satisfied with my own efforts and that I was not stressed. I am also pleased that I looked over it many times.

2 I spent my time doing the tasks and then reviewing twice. I did the same on part 2. I still finished before we were allowed to go.

3 My ambitions for this test were to get better grades than I had last year [in first semester]. So then I had to get a 6.

4 I think my work was good, but maybe I could show my working a bit more.

5 I imagine I will get a strong 5 or a weak 6.

1 Jeg er fornøyd med min egen innsats, og at jeg ikke ble stressa. Jeg er også fornøyd med at jeg så over mange ganger.

2 Jeg disponerte tiden min ved å gjøre oppgavene og så se over to ganger. Det samme gjorde jeg på del 2. Jeg ble fortsatt ferdig før vi fikk lov til å gå.

3 Mine ambisjoner for denne prøven var å få bedre karakter enn jeg hadde i fjor [til første semester]. Så da måtte jeg få en 6er.

4 Jeg synes at arbeidet mitt ble bra, men jeg kunne kanskje skrevet litt mer utregning.

5 Jeg ser for meg at jeg vil få sterk 5 eller svak 6.

9th grade

1) What are you satisfied with after the semester test?

I'm happy with part 1 of the exam because I felt like I did most of the tasks. I am relatively happy with part 2 as well, although I struggled a bit more there.

2) How did you allocate your time and manage to follow your plan?

I spent quite a bit of time reviewing the answers to Part 1, and Part 2 I had plenty of time, though.

3) What ambitions did you have with this test?

The ambitions of this test were to do as best I can.

4) How do you think your work was?

I think my work was pretty good. I did most of the questions, but there were some I struggled with.

5) What grade do you think you will get on this test?

5

1)Hva er du fornøyd med etter tentamen?

Jeg er fornøyd med del 1 av tentamen fordi jeg følte at jeg klarte de fleste oppgavene. Jeg er relativt fornøyd med del 2 også, selvom jeg slet litt mer der.

2)Hvordan disponerte du tiden din og klarte du å følge planen din?

Jeg brukte en del tid på å gå igjennom svarene på del 1, og på del 2 hadde jeg god tid selvom.

3)Hvilke ambisjoner hadde du med denne prøven?

Ambisjoene for denne prøven var å gjøre så godt jeg kan.

4)Hvordan synes du selv at arbeidet ditt ble?

Jeg synes at arbeidet mitt ble ganske bra. Jeg klarte de fleste oppgavene, men det var noen oppgaver jeg slet med.

5)Hvilken karakter ser du for deg at du vil få på denne prøven?

5

Alexander seems to be ambitious and reflective about his work. In 8th grade, he says that he could have been more thoughtful and showed more of his working. In 9th grade, he reports that some tasks made him struggle. Alexander seems modest when he assesses his own work, both in 8th and 9th grades, and he assesses his achievement as lower than his assessment by Miss A.

Ross' story

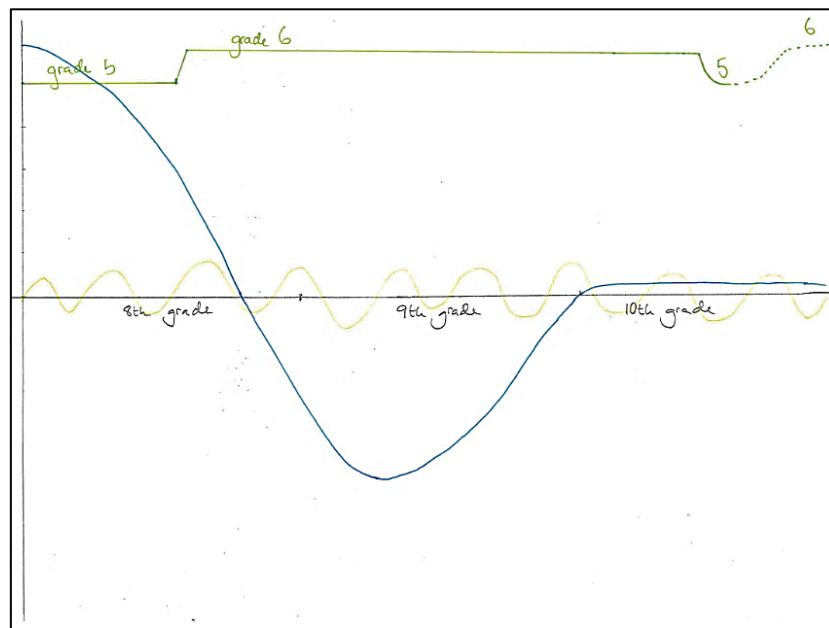


Figure 9. Ross' timeline: blue is feeling about mathematics, green is grades, yellow is effort

Ross' lower secondary school timeline presents a student who achieves very good grades in mathematics. Despite his high scores, however, Ross' account of his relationship with mathematics tells another story. Explaining the blue line in his picture, he describes how he enjoyed mathematics at the end of primary school and at the very beginning of lower secondary school, but that, during the first half of lower secondary school, his relationship with mathematics declined to a point where he didn't like the subject. He reasons that this is because mathematics was boring during that first period of lower secondary school. But in the middle of 9th grade the situation turns around, and his relationship to mathematics improves to a more neutral state in 10th grade. Ross explains that this is because new topics were introduced. However, analysis of Ross' narrative indicates that his story is more complex than that of a high achieving student who needs to work on new topics to avoid becoming bored.

"I am an advanced maths-person"

Mathematics has been an essential interest for Ross since childhood, he says, and he has been able to do mathematics ahead of his years from an early age. He tells me that mathematics matters to him *"because after all, I was doing equations in kindergarten somehow, and then it would have been a bit 'shit' [kjipt] not to do maths properly in secondary school."*²⁶ He self-

²⁶ «Det gjør egentlig det, for jeg drev jo med likninger i barnehagen liksom, da hadde det vært litt kjipt å ikke greie matte ordentlig på ungdomsskolen.»

authors as an advanced maths-person, who is both interested in, and capable of, doing mathematics beyond the ordinary level. It is within this storyline that Ross describes the reason for his declining relationship to mathematics in the 8th grade: *“In 7th grade, I did 8th and 9th grade maths and then I liked to learn new things and stuff. But then I could pretty much do the syllabus for 8th and 9th and as far as 10th grade.”*²⁷ So Ross’ way of storying his declining relationship to mathematics turns on being bored when he is working with topics he already knows; he is beyond these topics and he already knows what the teaching is about. Ross likes learning new topics, and he adds that his early school years were characterized by his liking for mathematics, which he even did as a hobby: *“From the beginning of primary school I really loved maths, I did maths in my spare time and stuff.”*²⁸

Ross stories himself as an “advanced maths-person”, a positioning of self in this figured world which is impossible to ignore. He not only has the interest, but also the capacity to deal with mathematics that is beyond the ordinary level for his age: he has the complete package for success, and it has always been so. His self-authoring is told as an everlasting case, this way from childhood on, and this provides a constant refrain in Ross’ story, echoed in his account of how he is positioned by his family in the same way.

Family expectations

Ross’ family has a clear role in his narrative, illustrated in the way he answers my question concerning his expectations for himself in mathematics; he refers to their expectations of him: *“My family also has expectations of me, because they know that I have always been very good at math and will continue to be.”*²⁹ It is noticeable how his family’s expectations are presented before his own and how they expect him to be *very good* in mathematics. Ross’ account of his positioning as ‘very good’ by his family stretches back to the past and into the future, just like the everlasting case he presents for himself: he has always been an advanced maths-person, and he “will continue to be”. There is no apparent tension for him concerning his positioning.

Family tradition seems to play an important part in general. Ross tells me that his parents and grandparents attended the same schools as him, and also the upper secondary school he plans to attend. He accepts my suggestion of how it is like a family tradition: *“It is a bit of a tradition to go to the school in the city-center, and he [his father] is also an engineer, so the plan has*

²⁷ «I 7. klasse da, da drev jeg jo med 8. og 9. klasse matte og da likte jeg jo å lære nye ting og sånn. Men da kunne jeg jo ganske mye av pensum for 8. og 9. og for så vidt 10.»

²⁸ «Helt på begynnelsen av barneskolen da var jeg veldig glad i matte, jeg gjorde matte på fritiden og sånn.»

²⁹ «Familien min har jo også forventninger til meg, for de vet jo at jeg alltid har vært veldig god i matte og skal fortsette å være det.»

always been to follow in his footsteps and do the same as him.”³⁰ To follow in his father’s footsteps, as an engineer, has always been “*the plan*” [planen] for Ross. The emphasis on “*the plan*” rather than “a plan” underlines the inevitability of Ross’ educational pathway. His father taught *him* mathematics when he was young – “*He taught me quite a bit of maths quite early*”³¹ and Ross will continue to follow “*the most difficult theoretical mathematics pathway*” in upper secondary school. His choice of doing “*the most difficult maths*” matches “the plan” perfectly. As Ross says: “*It pays off for the rest of your life if you take T and R maths instead of anything else.*”³² There is one plan in Ross’ narrative with one choice: to do advanced mathematics. It is as though it is a predetermined destiny written for him.

The need to be challenged

Being ahead of his years has caused Ross some problems as a mathematics student in the first part of lower secondary school. As we have seen, his explanation of his timeline is that mathematics became boring because he already knew the syllabus when he started. He needs to be challenged, and this problem of experiencing mathematics as too easy and boring needs to be fixed by having more challenges, in keeping with his self-authoring as an advanced maths-person; he needs more than ordinary teaching offers. Explaining the timeline, Ross talks a lot about not getting enough challenges at various points in primary lower secondary school:

*“Yes, I think it was fun, but eventually in primary school I didn’t think it was fun because I didn’t have enough challenges, but at the end of 7th grade it was more fun again because then I got enough challenges, then up here, but then it kind of went down a little in 8th grade, but yeah, we had some periods when we learned about new things and stuff and I think it was fun when I got to learn about new things that I didn’t know about, but then it went here. It was boring and repetitive (...) Because I felt like we just got the same thing over and over, and we didn’t learn anything new then.”*³³

Challenges are crucial if he is to experience mathematics as fun; without them, it is boring. He never elaborates on what he actually means by the term ‘challenges’, but the main theme seems to be that this is a question of learning about new topics. It is noticeable how he uses the passive

³⁰ «Det er litt tradisjon å gå på skolen i by’n, og han er jo også ingeniør, så planen hele tiden er å følge i hans fotspor og gjøre det samme som han.»

³¹ «Han lærte meg ganske mye matte ganske tidlig.»

³² «Det vil lønne seg for resten av livet og ta T og R matte i stedet for noe annet.»

³³ «Ja, jeg synes det var gøy, men etter hvert på barneskolen så synes jeg det ikke var så gøy for jeg fikk ikke nok utfordringer, men på slutten i 7.klasse ble det morsommere igjen for da fikk jeg nok utfordringer, da var det her oppe [peker på tidslinjen], men så gikk det liksom litt nedover i 8.klasse, men ja, vi hadde jo liksom perioder hvor vi lærte om nye ting og sånn og det synes jeg var gøy når jeg fikk lære om nye ting som jeg ikke visste om, men så gikk det hit [peker på tidslinjen]. (...) Det var kjedelig og repetativt. (...) For jeg følte at vi bare fikk det samme om og om igjen, og vi ikke fikk lære noe nytt da.»

voice in this speech, portraying himself as the object in the situation, a receiver. This is the language of entitlement: challenges are something he should be served with, by an unknown authority, a privilege he deserves so that he can do mathematics beyond the ordinary level, as an advanced maths-person. Placing responsibility outside of himself, his storying of himself as not the responsible actor is a recurring position in his narrative.

The idea of ‘challenges’ appears to be a significant marker in Ross’ account: receiving challenging tasks or challenging teaching is an affirmation of being a ‘smart’ student in two ways. The teacher should provide him with challenges in mathematics, because he needs and deserves this. Moreover, being seen to work on challenges beyond the ordinary level is a significant act in how Ross positions himself in Class A. Being a smart student is important in his narrative, and it is noticeable that Ross frequently describes how smart students act in this figured world – needing and receiving challenges is just one way of performing smartness.

Performing smartness

A main theme in Ross’ narrative is his concern with performance in the classroom, and several significant markers emerge when the conversation turns to how he sees Class A. Being seen as smart is of major importance for Ross. He tells me that Class A is divided into subgroups: *“There are those who aren’t smart, but who consider themselves a bit smarter, those who are popular and the others.”*³⁴ The term ‘smart’ is a major device for Ross when it comes to describing the subgroups, and a student is seen as smart or not smart, like a binary: *“There are many who, some who are seen as smart and some who are seen as not so smart.”*³⁵ Once again, he uses the passive voice (*“seen as”*), drawing attention to how students are positioned as smart/not smart by the other actors in the classroom. It is noticeable that he is concerned about perceptions, how students are seen through the eyes of others in this awareness of how to perform smartness: *“It is maybe based on grades and you just get the impression that those people are smart by how they behave in the lesson.”*³⁶ Grades are in this sense acts of smartness, central to being perceived as smart or not, but there are also important behavioural markers as he goes on to tell me: *“If you actively participate in the lessons, and if you contradict the teacher, then you can see a person as smart and obviously this is also based on grades.”*³⁷

³⁴ «Det er de som er ikke smarte da, men de som anser seg selv som litt smartere, de som er populære da og de andre.»

³⁵ «Det er jo mange som, det er jo noen som blir sett på som smarte og noen som blir sett på som ikke så smarte.»

³⁶ «Det er jo kanskje karakterbasert da og at man bare har fått inntrykk av at de personene er smarte etter hvordan de oppfører seg i timen, da.»

³⁷ «Hvis man deltar mye aktivt i timen, og hvis man skal motsi læreren så vil man jo karakterisere den personen som smart selv og selvfølgelig karakterbasert da.»

Ross describes these visible acts of smartness very precisely and confidently. He is conscious of which subgroup in the class he belongs to, the group of smart students: *“I’m not really sure, I think maybe I would place myself in the smart group, if it doesn’t seem cocky.”*³⁸ This is the only time he appears to be concerned about whether I might see him as bragging, and he goes on to tell me how the smart students constitute a minority in Class A: *“If we say that we are around 20 in the class then, I would say maybe maybe 5-6 are smart and help the others and stuff like that.”*³⁹ Here he confirms the students’ joint account in the previous chapter, that the smart students are a group of boys, privileged in the figured world of Class A. Ross positions himself as a member of this exclusive minority and raises yet another visible, significant marker: they help other students. He repeats this when I suggest that he belongs to this group because of his grade: *“It’s because I understand most of the maths lessons, I feel like there’s not so much I don’t understand and a bit because I tend to help others and stuff.”*⁴⁰

This is the only time that Ross talks about understanding mathematics. He is confident that he belongs to the group of smart boys, matching his self-authoring as an advanced math-person. This seems to be an uncontestable position in his story, until our conversation turns to grades.

Grades - a situation of near rupture

So far, Ross’ story is a story with one direction, one solution and a continuous flow. He is an advanced maths-person, he belongs to the smart minority in the class, and his destiny is to do advanced mathematics. Going back to the timelines and his grades, we know that he has not always been assessed at the top level, with the mark 6. When I ask him about his performance and if he always has got the top mark in mathematics, Ross explains:

*“It has something to do with what you remember somehow, because on the first exam in 8th I got a 5 somehow for that just because I had forgotten a lot of what we had gone through and then I just hadn’t practiced properly and then it wasn’t a 6 somehow.”*⁴¹

Later, he brings up the final test in 10th grade, where his grade declined. He explains this way:

“I don’t know really, I was a bit sloppy and stuff and there was something I had forgotten, and I made a few mistakes, so there were only those small mistakes, which I

³⁸ «Ehh, jeg er ikke helt sikker, jeg tror kanskje jeg ville plassert meg selv blant de smarte, hvis det ikke virker cocky.»

³⁹ «Hvis vi sier at vi er rundt 20 i klassen da, så vil jeg si det er kanskje sånn 5-6 som er smarte og hjelper de andre og sånn da.»

⁴⁰ «Det er fordi jeg forstår det meste i mattetimene, jeg føler at det ikke så mye jeg ikke forstår og litt fordi, jeg pleier jo å hjelpe andre og sånt.»

⁴¹ «Det har jo litt med hva med hva man husker liksom, for på den første tentamen i 8 fikk jeg en 5er liksom for da bare fordi da hadde jeg glemt mye av det vi hadde gått gjennom og da hadde jeg ikke øvd ordentlig bare og så hadde det ligget på 6 ere liksom.»

know how to do (...) The thing was that I didn't prepare for the exam, so that was just it."⁴²

I ask him if it was the same in 10th grade as in 8th grade, that he had not prepared. He replies:

*"That was probably it, but it was bad luck too, there's a bit of luck in it, depending on whether you write what the teacher thinks is right in relation to the question and things like that."*⁴³

Failing to get top marks presents a potential rupture in Ross' self-authoring and his (self-) positioning as an advanced maths-person. He is at pains to say that he is not worried about these incidents, and he has multiple rationales for why he didn't get grade 6: minor and careless mistakes, he "just forgot" some details, he had not prepared for the test. This is not about his mathematical capacity, and he never mentions lack of understanding or difficulties, or that he needed to think hard to answer the questions, he stories himself as an effortless achiever. This pre-prepared list rescues his positioning as one of the smart group and his self-authoring as an advanced maths-person. He stories the issue as one of minor details, where he takes minimal responsibility - not performing at the highest level could be totally outside of himself, down to bad luck in not meeting the teacher's preferred way of answering the questions. This leaves an impression, once again, of how he inscribes himself as the object in his own narrative.

Summary: The epic hero

The flow in Ross' narrative is strikingly smooth: everything he brings up during our conversation adds to his positioning as an advanced maths-person, in the past, in the present and stretching into the future. It is noticeable that how Ross is positioned by his family matches how he positions himself. There are no alternatives presented in this narrative of the inevitable other than that Ross will do advanced mathematics. He gives an established account of being beyond the average, he is *very* good in mathematics. It is as though he juggles the cultural model of a clever boy in mathematics; hard work is not necessary because of his natural gift in mathematics. Even getting lower grades than the highest level is not a problem in his story; he has a fully prepared list of reasons to resolve it.

The genre of Ross' talk is the opposite of 'modest' – his tone is rather self-important, and his talk about his mathematical ability and capacity draws the listener's attention to his sense of

⁴² «Jeg vet ikke helt, det var litt slurvefeil og sånn og det var noe jeg hadde glemt, og litt jeg hadde gjort feil, så det var bare sånne små feil, som jeg vet hvordan man gjør (...) Det som var at jeg ikke forberedte meg til tentamen, så det var bare det.»

⁴³ «Det var nok det, men det var uflaks også, det har jo litt med flaks å gjøre om du skriver om læreren mener det er riktig i forhold til oppgaven og sånn.»

entitlement to a diet of advanced mathematics. Only once during our conversation does he show concern about being seen as bragging. He appears to have little awareness of how he is perceived in our talk, in contrast to his obvious awareness of which acts are significant markers of being a smart student in the figured world of Class A.

Ross' use of the passive voice conveys this awareness of how he is seen through the eyes of others; it makes him the object rather than the subject in his own story. We can also see this in the way in which he places responsibility for his test performance outside of himself. It is not down to him or his effort; he just has a prewritten destiny to fulfill, and for him, performing smartness is very important.

In combination, these elements of Ross' narrative - the flow, his unambiguous positioning, his self-important style and his use of the passive voice – present a monoglossic story. There is little sense of an orchestration of voices in this story. He has just one mission to fulfill - to be a smart student in mathematics who will do advanced mathematics - leading to a restricted and narrow space of authoring in this figured world, 'compelling' him to act as an epic hero, with one destiny.



Alexander's story

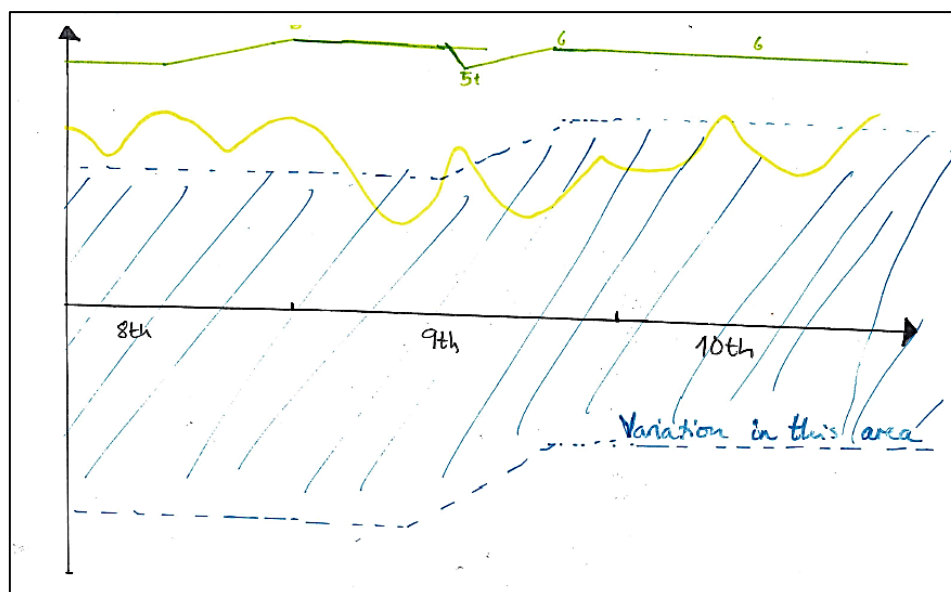


Figure 10. Alexander's timeline: blue is feeling about mathematics, green is grades, yellow is effort

Like Ross, Alexander's timeline presents a student who achieves very good grades in mathematics, but at the same time reports a relationship to mathematics which doesn't match the way he performs. Alexander says he is not able to draw an accurate line for how his feeling about mathematics has changed through these years, and he ends up marking an area rather than a line in which it varies. Like Ross, this line goes up in the midterm of 9th grade. However, even though Ross' and Alexander's timelines seem to present similar cases of two boys in the same mathematics class – Alexander is also one of the 'smart boys' - they tell sharply contrasting stories of their positioning in this figured world.

His self-authoring and positioning emerge

Alexander's narrative is modest in tone and he is rather taciturn; his positioning and self-authoring as a student in mathematics emerges slowly. This is illustrated in the way our talk of his performance in mathematics turns out: Alexander begins by saying he really appreciates his results, but he does not mention his actual grades. When I ask him if he could say more about this, he chooses to talk about his work, rather than grades: "I got, I just missed a mark, I made a calculation slip, in the semester test."⁴⁴ He interrupts me when I comment that this seems like a great effort, stressing how pleased he is with his results: "Yes, it was great. Yes, I was very happy with it."⁴⁵ During this discussion, he never comments on his grades in mathematics,

⁴⁴ «Jeg fikk jo, hadde en halv følgefeil, på tentamen.»

⁴⁵ «Ja, det var kjempe bra. Ja, jeg var veldig fornøyd med det.»

so that finally I bring it up by asking if he has got the top mark, 6, through all the years of lower secondary school. He just confirms my assumption and says “*Yes. I had an exam in 9th I think so, I got 5+, I think.*”⁴⁶

He seems to be reluctant to talk about his grades. His answers are mostly short, and I often need to encourage him to say more. His narrative finally emerges, and he tells me that he knew that he did well in the last semester test, because: “*There were some difficult questions that I spent a long time on and when I checked the answers, I realized that I was right.*”⁴⁷ He measures his performance by the effort he has invested, going on to say that if he hadn’t performed at the top level he would “*have worked more, to come back again.*”⁴⁸ Alexander places the responsibility for his grades inside himself, based on his effort – he is the subject in his story.

Positions himself among a minority

Unlike Ross, who is quick to tell about his family’s expectations for him, Alexander says little about his family. When I ask about their expectations, he dismisses the issue; expectations come from “*mostly myself, really.*”⁴⁹ This independence is noticeable throughout his talk. He says that it is unusual for him to discuss mathematics at home and his parents are not really concerned about his performance. He can ask his parents if he needs any help, but he never does.

During our conversation the case of subgroups in the class comes up. As we saw in the previous chapter, Alexander portrays the class as a single unit, but he talks about subgroups when I ask him where he belongs: “*I feel like I’m compatible with a few others, but I don’t feel like there are so many of us,*”⁵⁰ he adds that this is not a big group of students: “*It is a minority, yes.*”⁵¹ In so saying, he positions himself in a group which we know is an exclusive group with privileges in this figured world. However, Alexander does not describe this group any further – there is no talk of the markers that Ross is so concerned with, and it seems that performance in the classroom is not important for him.

Challenges require thinking

Alexander’s storying of himself as an active subject who achieves by working hard continues when the topic of challenge comes up, again contrasting with Ross’ narrative. Like Ross, he

⁴⁶ «Ja. Jeg har hadde en tentamen i 9ende jeg tror det, jeg fikk 5+ tror jeg.»

⁴⁷ «Det var noen vanskelige oppgaver som jeg brukte lang tid på og når jeg sjekket svaret så skjønnte jeg at jeg hadde riktig.»

⁴⁸ «hadde jobbet mer, for å komme tilbake igjen.»

⁴⁹ «Det er mest meg selv egentlig.»

⁵⁰ «Jeg føler at jeg står litt likt med noen andre, men jeg føler ikke at det er så mange andre som er der.»

⁵¹ «Det er nok en minoritet ja.»

says that challenge is important for the way he experiences mathematics in school: *“It’s good when there are challenges,”*⁵² although *“It often gets very boring, repetitive.”*⁵³ Alexander also feels that the presence or absence of challenges makes mathematics fun or not. This similarity with Ross continues when Alexander describes 8th grade *“I felt that we were ... spending the whole 8th grade going through what we learned in elementary school.”*⁵⁴ He also connects challenge with learning new topics, but the similarity with Ross starts to vanish when Alexander explains why he likes challenges: *“It’s probably that you have to think more, that’s really the thing,”*⁵⁵ and *“Yes, figuring out what to do first, then it’s a bit better.”*⁵⁶

Alexander takes up an active position in his talk about challenge: it is all about working hard: *“You want to do it then, so you try really hard.”*⁵⁷ He places responsibility for success inside of himself, and the best thing in mathematics is *“managing really hard tasks that you’ve spent a long time on.”*⁵⁸ Alexander seems to find intrinsic motivation in mathematics, and it is this theme that emerges in his self-authoring as a good, ambitious student in mathematics: *“I feel I have pretty good control of the maths, actually.”*⁵⁹ He seems confident in his own ability.

A plan

Like Ross, Alexander has a plan for his future education, and like Ross this plan includes doing mathematics. However, Alexander doesn’t volunteer his plan, as Ross does, it emerges in the course of our dialogue. He begins by telling me that he wants to take the theoretical mathematics pathway in upper secondary, because *“I think it’s going to be a bit, I don’t quite know, a bit more difficult then, more challenging.”*⁶⁰ This is why he likes mathematics, and this is his choice: *“I thought about it on my own, or discussed it a bit at home.”*⁶¹ Alexander is the main actor in his future plans, which are open-ended – he is as yet undecided: *“I’ve thought about it a bit, but not very much.”*⁶² However, when I ask him if he has considered other options, it turns out he has been thinking quite a lot about his educational future: *“I thought about sports a bit, but it was difficult to combine with science, physics and things like that.”*⁶³ Doing physics

⁵² «Jeg synes det er greit hvis det er utfordringer.»

⁵³ «Det [mattetimene] blir ofte mye sånn kjedelig, repetisjon på en måte.»

⁵⁴ «I hvert fall følte jeg at vi lærte, at vi brukte hele 8.klasse på å gå gjennom det vi lærte på barneskolen.»

⁵⁵ «Det er vel det med at man må tenke litt mer da, det er vel egentlig greia.»

⁵⁶ «Ja, å finne ut hva man må gjøre først, da er det litt bedre.»

⁵⁷ «Du vil jo klare det da, så du prøver jo ganske hardt.»

⁵⁸ «Å få til sånne vanskelige oppgaver du har brukt lang tid på.»

⁵⁹ «Jeg føler jeg har ganske god kontroll på matten, egentlig.»

⁶⁰ «Jeg tenker jo at det blir litt, jeg vet ikke helt, det er litt mer vanskelig da, at det blir mer utfordrende.»

⁶¹ «Det tenkte jeg selv, eller diskuterte litt hjemme.»

⁶² «Jeg har tenkt litt på det, men ikke veldig mye.»

⁶³ «Jeg vurderte idrett litt, men det var vanskelig å kombinere med realfag, fysikk og sånn. »

is the most important thing for Alexander, and he has a concrete reason for this: *“I’ve been thinking about going to NTNU in Trondheim [a high profile science and technology university], and you have to have physics to get into part of it, and I think it’s quite interesting.”*⁶⁴

Alexander’s plan is not presented as a plan as such; his ideas emerge as we talk. Although he thinks about his future education like Ross, his ideas are not finalised, and he considers various options, based on his interest in mathematics and physics. He has ownership of an open-ended and unrestricted plan which is not storied in terms of other people’s ideas.

Combining hard work and effortless achievement

Returning to the timeline, it is noticeable that Alexander suggests a higher assessment of his work-effort than Ross. He describes the way he works with mathematics: *“I’ve worked mostly at school, I haven’t done anything at home.”*⁶⁵ I ask him if he sometimes does some work at home and he says: *“Yes, I do the homework we have to do, and I checked before the semester test what we are supposed to know, and then I felt that I can do almost anything.”*⁶⁶ There is a tension here in Alexander’s talk about his work effort: he seems to play down the amount of work he does, even though he talks about being prepared for tests, and he also says that he doesn’t need to work: *“I haven’t really done much before the exam really.”*⁶⁷

Alexander draws on two contrasting voices here, the voice of results based on hard work versus that of effortless work. He says he works, but at the same time, he says that he doesn’t need to do much work, because he already knows it. Surprisingly, given his earlier diffidence, he seems to position himself as an effortless achiever in mathematics, contradicting his storying of his good results based on investment in hard work. His orchestration of these voices is apparent in his answer to my question of whether there are other students in this class that get equally good results as him. He replies: *“Not that work as little as me.”*⁶⁸ It seems that he needs to emphasize that he doesn’t do much work despite his good results - like a stereotypical ‘smart boy’.

Summary: The main character in a story with an open ending

Even though the tone in Alexander’s narrative is modest and his self-authoring is far more tentative than Ross’ story, there is a coherence in his narrative. The various elements all travel

⁶⁴ «Jeg har tenkt litt på å gå på NTNU i Trondheim, og du må ha fysikk for å komme innpå en del av det, og jeg synes det er litt interessant.»

⁶⁵ «Jeg har jobbet mest på skolen egentlig, jeg har ikke gjort noe særlig hjemme.»

⁶⁶ «Jaa, jeg gjør jo leksene vi må gjøre, og så sett før eksamen, sett hva vi skal ha, og da har jeg følte at jeg kan nesten alt.»

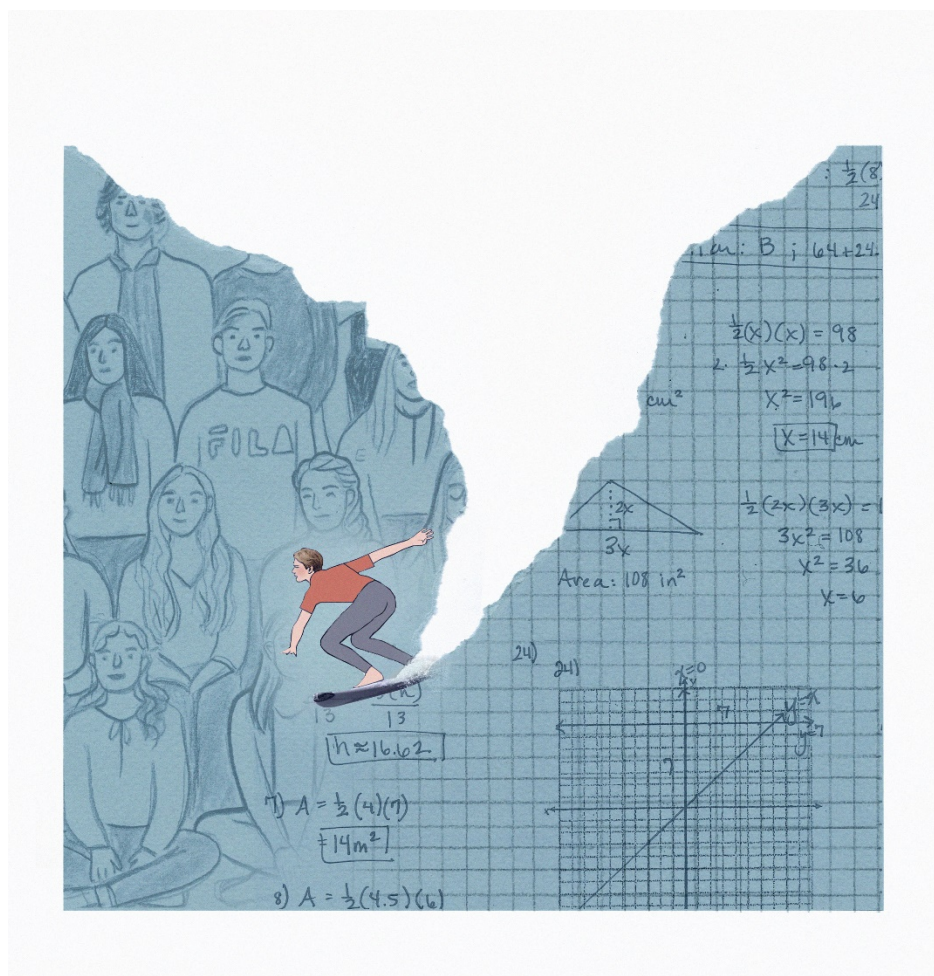
⁶⁷ «Jeg har egentlig ikke gjort noe særlig før tentamen egentlig.»

⁶⁸ «Ikke som jobber like lite som meg.»

in the same direction: Alexander is a student who is capable of doing mathematics, is interested in mathematics and he is a good student.

It is remarkable how Alexander is the main character throughout his own story. He is the actor in his self-authoring and very few others populate his story; none are more than shadows. There is no sense of how he might be positioned by others in this narrative, and he does not mention any significant markers. Alexander's story focuses on himself alone; he places the responsibility for his achievement inside of himself, based on his investment alone.

Both Alexander and Ross talk in terms of how they will do advanced mathematics in the future, as a natural progression. But whereas Ross' space of authoring feels highly restricted, Alexander's conveys a sense of expansion – he has options. This openness perhaps also leaves space for contradictory voices, as Alexander juggles the cultural model of a clever boy who does not need to work, but at the same time is keen to say that he is responsible for his own actions. In this sense, we can see Alexander's story as an open-ended story.



Alexander and Ross in the figured world of Class A: authoring 'smartness'

This chapter draws on interviews with two of the 'smart boys' in Class A, focusing on how they self author as mathematics students. Whereas Ross presents a perhaps stereotypical narrative of male power and privilege in the classroom, Alexander's narrative gives pause for thought about the nature of that power. Both talk in terms of how they will do advanced mathematics in the future, as a natural progression. But whereas Ross' space of authoring feels highly restricted, Alexander's conveys a sense of expansion – he has options. His heteroglossic account, characterised by the a more open nature, perhaps also leaves space for contradictory voices, as when Alexander suddenly inserts the cultural model of a clever boy who does not need to work into his narrative, although he is keen to say that he is responsible for his own actions. We can see Alexander's story as an open-ended story, in contrast to the monoglossia of Ross's narrative, and its suggestion of a centripetal force which propels him to a particular performance of smartness.

As we have seen in Chapter 5, the smart boys' positioning and behaviour impacts on other students in the class, but the contrast between Alexander and Ross suggests that the dynamics of their dominance may be more complex than they appear. I return to this complexity in Chapter 9, where I consider how Ross is subject to a hegemonic masculinity which mediates how 'being good at maths' is performed. Meanwhile, in the next chapter, I show how the smart boys play a part in Emilia and Kine's experience of Class A, and how Ross in particular plays a part in Kine's story.

Chapter 7: Emilia and Kine - representing the 'unknown' clever girls

Both Emilia and Kine have been described by Miss A as among the high performing students in Class A. However, they appear at different points in her account: while Emilia is the only girl she mentions among the clever students in 8th grade, Kine replaces Emilia as the only girl in this group in 9th grade. Although Miss A says that Emilia and Kine are among the clever students, but there is no public label for the clever girls in this figured world. Indeed, Miss A sees Emilia and Kine as members of two different subgroups, placing Emilia among the 'sporty, hardworking girls', and Kine among the 'popular' students. Miss A's assessment protocol indicates that both girls achieve high grades in mathematics. However, like Ross and Alexander, although Emilia and Kine seem to be similar students 'on paper', as 'real' students in the classroom, they appear are more different than alike.

Introducing Emilia



I attended Class A for almost a month before I conducted the first focus group interviews, but I had not really paid attention to Emilia until then. Her presence in the classroom was not striking, she didn't stand out in any way, and Miss A didn't mention her in our informal chats.

Before the focus group, I realised that I didn't know her name, but, this quickly changed: I noticed the way she talked about mathematics. In my notes, I marked her as a student to watch.

My general impression from the first focus group interview was that the majority of the students had a common attitude to doing mathematics, regardless of their achievement scores – they said they didn't enjoy it. In the second group, Emilia was one of two students who agreed with the statement '*I like mathematics*', and she put mathematics higher up her list of favourite subjects than most other students (in the middle). She was unaffected by their talk about not enjoying mathematics, and she continued to express her enjoyment of it despite being in a minority.

Emilia's acts in the classroom do not demand my attention. Like Ross and Alexander, she does the things a teacher would like students to do. Emilia is on time, she is prepared for school, and she is well-behaved. Emilia gives an impression of being an easy-going student, and she interacts easily with both boys and girls and with Miss A. My impression is that she stays in her usual seat, and she seems to be focused on her mathematics work during the lesson.

In 8th grade, I noticed that some girls in Class A were more interested in talking about other things than doing mathematics, which I labelled 'the social group'. Emilia was not a part this subgroup; she was too focused on her work. But in 9th grade, a new group - the 'sporty-hardworking girls' - emerged as a known subgroup, and my impression is that Emilia is a central figure in this group.

Winter 9th grade: New 'group of students': Sarah, Emilia, Maya, Eva and Susanne. Work-focused, ask each other, cooperate and ask Miss A and me if necessary.

The other girls in this group tend to seek to work with Emilia. She is not likely to move toward others; the others move toward her. When they work together, my impression is that they are helping each other, asking each other questions and discussing tasks. They do this quite quietly; they don't disturb the other students. They seem to enjoy working together, they are in a good mood and enthusiastic. If they need help, they happily raise their hands and ask. Emilia does not seem to be dependent on the other girls in this group. Sometimes, she works alone, or with the student she is sitting next to. Whether Emilia works alone or with other students, my impression is that she is a student who does her work and focuses on mathematics. Emilia maintains her easy-going attitude toward her fellow peers as they work.

Emilia and David sit next to each other. He is working on and off, and she seems focused and independent.

Alexander and Emilia: Sitting next to each other working on the same tasks, and Emilia compares her answers to Alexander's. They are efficient, and both seem to be in a good mood.

During my 'walk in the classroom' I noticed that Emilia chose level 2 tasks, and because my intuition was that she was able to solve level 3 tasks, I approached her, challenging her to do level 3. She accepted my suggestion and looked at the task 'forkorte flerleddede uttrykk' (simplify polynomial expressions) and asked me if she needed to 'faktorisere med parentes' ('factorise in parentheses'), which I confirmed. Then she solved the task easily by herself. When I left her, I noticed she continued doing level 3 tasks.

I also note that she switches between choosing level 2 and level 3 tasks, being hesitant to try the 'hardest' task without being completely sure of her ability.

Emilia generally asks for assistance when she finds something problematic. She uses different strategies for this. She may ask other students sitting near her, the teacher or me. I have noted that it is easy to help Emilia, she knows the concepts and methods, and she is concrete in her questions. If she needs help, it might be for 'long calculations', where she has got lost, if she doesn't see the next step or if she knows that her answer is not right.

During the plenary sessions of the lessons, Emilia seems to pay attention to Miss A. She takes notes, but she rarely asks questions on her own initiative. She may sometimes raise her hand to answer a question, but that is not my general impression. If Miss A asks Emilia a question directly, she mostly answers correctly. If she doesn't know, Emilia simply says that she is not sure or that she doesn't know. She sometimes 'whispers with her neighbour' during Miss A's explanations, perhaps to make sure that she has got it right. I have noted that Emilia sometimes raises her hand after Miss A's talk, to ask her individually about an explanation.

After Miss A's presentation of the method of reducing fractions with 'flerleddede utrykk' (simplifying), Emilia raises her hand to ask Miss A about something from the presentation.

My impression from attending Class A over time is that Emilia's way of acting in this figured world is more or less constant. However, based on her discussion of mathematics, some changes seem to emerge during 9th grade. Emilia's attitude toward her mathematics work is reflected in her diary notes after the end of year test in both 8th and 9th grades.

8th grade:

- 1) I started doing all the tasks I could and if there was one I struggled with I skipped it and went back later.
- 2) I had set myself a goal that I would get all the equations because it is brand new and that was perhaps what I practiced the most.
- 3) I think my work went very well. I think I got to all the assignments and I had plenty of time to look through the exam at the end.
- 4) I hope I get a 5 because that's what I got on the last exam, and it's not fun to go down any grades.

- 1)Jeg startet å gjøre alle oppgavene jeg kunne og hvis det var en jeg slet med hoppet jeg over den og gikk tilbake senere.
- 2)Jeg hadde satt meg et mål om at jeg skulle få til alle likningene fordi det er helt nytt og det var kanskje det jeg øvde mest på.
- 3)Jeg synes arbeidet mitt gikk veldig bra. jeg tror jeg fikk til alle oppgavene og jeg fikk god tid til å se igjennom prøven på slutten.
- 4)Jeg håper jeg får en 5er fordi det var det jeg fikk forrige tentamen og det er ikke noe gøy å gå ned noen karakterer.

9th grade:

- 1)What are you satisfied with after the semester test?
- 2) How did you allocate your time and manage to follow your plan?
I did all the tasks and if there was anyone I struggled with I skipped them and did them when I was done with everything else.
- 3) What ambitions did you have with this test?
Try to answer all the tasks and do as best I can.
- 4) How do you think your work was?
Good.
- 5) What grade do you think you will get on this test?
I think I get 4+.

- 1)Hva er du fornøyd med på tentamenen?
- 2) Hvordan disponerte du tiden din og klarte du å følge planen din?
Jeg gjorde alle oppgavene og hvis det var noen jeg slet med hoppet jeg over de og gjorde de når jeg var ferdig med alt annet.
- 3) Hvilke ambisjoner hadde du med denne prøven?
Prøve å svare på alle oppgavene og gjøre så godt jeg kunne
- 4) Hvordan synes du selv at arbeidet ditt ble?
Bra
- 5) Hvilken karakter ser du for deg at du vil få på denne prøven?
Jeg tror jeg får 4+

In her diary notes, Emilia describes her work in a straightforward and realistic way, and she describes her strategy during the test. It is noticeable that she assesses her work as similar to a previous grade she earned in 8th grade, but in 9th grade, she underestimates, believing she will earn a 4+, while her work is assessed as a 5.

I noticed this slight change in her attitude in the focus group interviews as well. In the 8th grade focus group, she is one of the minority who say they enjoy mathematics. She says she finds mathematics interesting, and she repeats several times that she thinks it is fun. She says that she enjoys mathematics when she is able to explain her thinking: *“The best thing is when I understand it without the teacher saying the answer, and I figure it out myself.”*⁶⁹ When I ask

⁶⁹ «Det beste er når jeg forstår det uten at læreren forteller svaret og jeg finner det ut selv.»

her what makes a good explanation, she says “*When I have to think for myself.*”⁷⁰ Understanding mathematics independently is important to Emilia.

In her focus group in 9th grade, my general impression is that Emilia’s outlook has become more nuanced and specific: “*I think it’s fun, but it’s like, it depends. It’s fun when I get it (...) I think equations and algebra are really fun, but fractions and percentages and stuff aren’t as much fun.*”⁷¹ I ask if it depends on the topics, and another student says it depends on the learning method. Emilia adds “*And it’s whether you get it or not. Is it something I can do? If I can sit and do tasks I think it’s fun.*”⁷² Emilia still enjoys mathematics in 9th grade, but she is more nuanced in her statements. The change in Emilia’s attitude toward mathematics is captured in my brief summary note at the end of 9th grade as well.

Same as Eva, she liked maths in 8th grade, but that has slightly changed. She is more nuanced. I think she is still high-performing. Still focuses on her work in the class without needing attention from teacher/peers. Nice way of communicating with the others. A quiet and popular girl. Very natural way of acting. Seems confident. Got a 5 on this year’s final test.

⁷⁰ «når jeg må tenke selv.»

⁷¹ «Jeg synes det er gøy, men er liksom, det spørs. Det er morsomt når jeg får det til (...) Jeg synes likninger og algebra er veldig gøy, men brøk og prosent og sånt er ikke like gøy.»

⁷² «Og det spørs om man får det til eller ikke, er det noe jeg får til kan jeg sitte å gjøre oppgaver fordi jeg synes det er gøy.»

Introducing Kine



Unlike Emilia, Kine was one of the students I became aware of early in my time in Class A, partly because of my informal discussions with Miss A in which she expressed concern for Kine's low self-esteem in mathematics even though she was doing well. Looking at Miss A's assessment protocol, it is remarkable that Kine performs steadily at a high level, at grade 5.

I noticed that Kine seemed to be well-adapted socially from 8th grade on. She was among the students I saw as 'the most teenager-like'. Kine didn't initiate discussion of issues from outside the classroom, but she was quickly included in this talk by the other students. She seemed to be popular, especially among the girls in Class A. In a sense, it was as though Kine had the complete package for success in both achievement and status among her fellow peers. But, based on the way she acted in the classroom during the mathematics lessons and on the way she talked about herself as a mathematics student, she could just as well have been a student who was struggling with mathematics.

Her diary notes from both 8th and 9th grades after the end of year tests serve as an example of how Kine describes herself as a mathematics student and how she assesses her work. This is a contrast to Emilia's diary notes. While Emilia wrote about her strategies for the test, described her work and assessed her work in a realistic way, this is absent from Kine's notes.

Diary notes from 8th grade:

(1) Something I'm happy with after the exam is that I managed to finish.
(3) I thought I should only work as fast as I could since I'm not very good at working fast on tests. I somehow managed to stick to it because I was done in the end.
(4) I wanted to try to do as well as I did on the previous exam, but I couldn't.
(5) I am not happy with my work since I get very stressed on tests that make me feel I am not showing what I can do.
(6) I think I will get either a -3 or 3.

(1) Noe jeg er fornøyd med etter tentamen er at jeg klarte å bli ferdig.
(3) Jeg tenkte at jeg bare skulle jobbe så fort jeg kunne siden jeg er ikke så veldig flink til å jobbe fort på prøver. Jeg klarte på en måte å holde meg til det for jeg ble jo ferdig til slutt.
(4) Jeg ville prøve å gjøre det like bra som jeg gjorde det på forrige tentamen, men det klarte jeg ikke.
(5) Jeg er ikke fornøyd med arbeidet mitt siden jeg blir veldig stressa på prøver som gjør at jeg ikke føler jeg får vist hva jeg kan.
(6) Jeg tror jeg får enten en -3 eller 3.

Diary notes from 9th grade:

1) What are you satisfied with after the semester test?
There is nothing special I am happy with. I am most pleased that I finished it and that I think I did not go terribly.
2) How did you prepare for the semester test?
I worked with an exercise book and worked on some assignments in the book with Dad.
3) How did you allocate your time and manage to follow your plan?
I was just thinking about working the whole time, so I worked on Part 1 until I had to give it in and the same with Part 2, so the plan was really just to use the time I had.
4) What ambitions did you have with this test?
I really just wanted to finish the whole exam on time since I found the syllabus quite difficult, so I don't have very high expectations for myself.
5) How do you think your work was?
I think my work was fine. I don't think it was very good but not too bad.
6) What grade do you think you will get on this test?
I actually don't know because it may be very bad and I might end up at 2 or 3, but it also may have gone pretty well and end up at 4 maybe 5, so I really don't know.

1)Hva er du fornøyd med etter tentamen?
Det er ikke noe spesielt jeg er fornøyd med, jeg er mest fornøyd med at jeg ble ferdig med den og at jeg tror den ikke gikk helt forferdelig.
2)Hvordan forberedte du deg til tentamen?
Jeg jobbet med øvingshefte og jobbet med noen oppgaver i boken med pappa.
3)Hvordan disponerte du tiden din og klarte du å følge planen din?
Jeg tenkte bare å jobbe ut den fulle tiden, så jeg jobbet med del 1 helt til jeg måtte levere og det samme med del 2, så planen var egentlig bare å bruke den tiden jeg hadde.
4)Hvilke ambisjoner hadde du med denne prøven?
Jeg ville egentlig bare klare å fullføre hele tentamen innen tiden var ferdig, siden jeg synes at pensum var ganske vanskelig så jeg har ikke så veldig høye forventninger til meg selv.
5)Hvordan synes du selv at arbeidet ditt ble?
Jeg synes at det at arbeidet mitt ble helt greit, jeg tror ikke det var så veldig bra, men ikke så altfor dårlig.
6)Hvilken karakter ser du for deg at du vil få på denne prøven?
Jeg vet faktisk ikke for det kan ha godt veldig dårlig og at jeg ender opp på 2 eller 3, men det kan også ha gått ganske greit og ende opp på 4 kanskje 5 så jeg vet virkelig ikke.

Kine's diary notes are fuller than most of the other students in Class A. It seems that she has something to say. She doesn't describe any strategies for her work, and she is not specific about particular problems or parts of the tests. Her words leave the impression that she simply wants to get through the test, she just wants to survive the situation. Her assessment of her own work in 8th grade is two grades lower than the grade she actually achieved; no other student suggests

such a gap between their own assessment and the teacher's. In 9th grade, it seems that Kine has no sense of her own competence; the quality of her work could be either poor or good. Knowing her consistently high scores, the way she talks about her work sounds as though she considers her good results to be simply a question of luck.

Kine's attitude toward mathematics comes through her talk in the focus group interviews. In the 8th grade interview, she says immediately that she dislikes mathematics, disagreeing with *"I like maths"* and adding *"Not at all."*⁷³ I am a bit surprised, though, that she rates mathematics in the middle of her list of favourite subjects. During the discussion in the group, some of the reasons for her dislike emerge. I ask the students if they agree or not with the statement *"I get more stressed on maths tests than in other subjects,"*⁷⁴ and Kine responds: *"Well, I really think so. But, I get really stressed out on many tests. But in maths, I feel that my nerves mean I can't show what I can do."*⁷⁵ She also says: *"I get tired quickly if I'm stuck, and then it's not so easy to continue."*⁷⁶ Kine expresses a general anxiety over tests, but she is most anxious about mathematics tests. Furthermore, if she meets problems, she says, she is likely to give up.

In the focus group in 9th grade, she is matched up with the girls from the sporty-hardworking group. This time, Kine rates mathematics at the bottom of her list along with science. I ask why she doesn't like maths, and she says, *"I just find it very boring."*⁷⁷ Her answer to my question of why is *"No, I have no clue. I just don't like it."*⁷⁸ Even though Kine performs at a consistently high level in mathematics, she is still negative about it. Her attitude toward mathematics and her achievement tell two different stories.

Kine's actions during the lessons are not particularly striking, but I find her more noticeable than Emilia. For me, Kine is a combination of a student who does as the teacher expects and who is focused on what is going on 'outside the classroom'. She is often involved in the talk about 'teenager stuff' in the classroom, but I don't see her as the driving force in this talk. She also seems well-informed about what is going on. I see Kine as being easily accessible to the other students, especially the other girls, and more specifically, the popular girls. When Miss A says that she thinks Kine is among the popular students, I understand why.

⁷³ «Ikke i det hele tatt.»

⁷⁴ «Jeg blir mer stressa på matteprøver enn i andre fag.»

⁷⁵ «Tjaa, jeg tror egnetlig det. Men jeg blir egentlig stressa på mange prøver. Men i matte så føler jeg at nervene gjør at jeg ikke får vist hva jeg kan.»

⁷⁶ «Jeg blir fort lei hvis jeg sitter fast så er det ikke så lett å fortsette.»

⁷⁷ «Jeg bare synes det er veldig kjedelig.»

⁷⁸ «Nei, jeg har ikke peiling. Jeg bare liker det ikke.»

During lessons, Kine most often works at her usual place, but I have noted that she may ask to move nearer someone she would prefer to work with. More often, other students move towards her, especially Sophie and Josephine. Kine is easily affected by the student she works with, and it seems to me that she adapts to the mood of her working partner. She may be focused if the other student is, or she may easily lose her concentration by talking about 'everything else'. If Kine works alone, she is generally focused on her work.

Episode with Ross

Ross and Kine work side-by-side. They both work on the list of tasks, choosing similar ones. Kine sometimes asks which answer Ross has got or what method he used. Ross replies briefly.

Episode with Eva

Kine and Eva work on the same tasks. Ask questions and explain to each other. Seems to be effective work.

Episode with Sophie

The last lesson before the end of year test. The general attitude in the class is to practice for the test. Sophie and Kine sit next to each other and just talk about everything but maths.

During Miss A's plenaries, Kine doesn't demand attention, and she is easy to overlook, because she is silent. I have noted that she pays attention to Miss A's talk and she takes notes. My impression is that she wants to follow Miss A's explanations and examples. I have no notes that indicate that she raises her hand to answer questions, and I believe she rarely does. If Miss A asks Kine a question directly, my impression is that Kine plays down her understanding of mathematics. She tends to reply to with a question mark in her voice, even though she is right.

It is during the individual work part of the lesson that she is most affected by the students she is with. On a 'bad day', she might take time to start; however, this may be the opposite on a 'good day'. When she is choosing tasks from the three different levels, Kine most often picks tasks from level 1 or 2. If she is doing tasks at level 3, my guess is that this happens when her 'working partner' challenges her.

Regardless of who Kine is working with, my general impression is that she seems to wait some time before she asks for assistance. Several times during my walk around the class, I observe that she is unsure of a task or that she doesn't know how to start; however, it takes some time before she asks for help. It seems like she is slightly overwhelmed by the feeling of not finding the solution to the task, or doesn't know how to start, for instance by moaning and groaning or giving this impression through her body language. If Kine works in pairs or groups, she is likely to let her partner call for assistance and ask the questions, connecting to the conversation only after a while.

Kine is easy to help. She tends to start asking for assistance below her competence level. It doesn't take much time before she realises that she knows the first step for solving the task, and most often, during a short conversation, she seems to realise how to solve the problem. Kine may be unspecific when she asks for assistance. If I have approached her when she needs assistance, she may just point to the book, and maybe add "*this one*" or "*I have no clue what to do here.*" My impression is that she plays down her knowledge of mathematics, but it may well be that she is uncomfortable in the setting. The impression Miss A gives me about Kine and her anxiety about mathematics contrasts with her consistently high assessment scores, which stay the same throughout my time in Class A.

My brief summary notes sum up my impression of Kine at the end of 9th grade.

Same situation as last year. Low self-esteem but getting grade 5. I am curious if that is really the picture now. She didn't like maths last year and still doesn't. Did more focused work last year. Still a solid 5!

Emilia's story

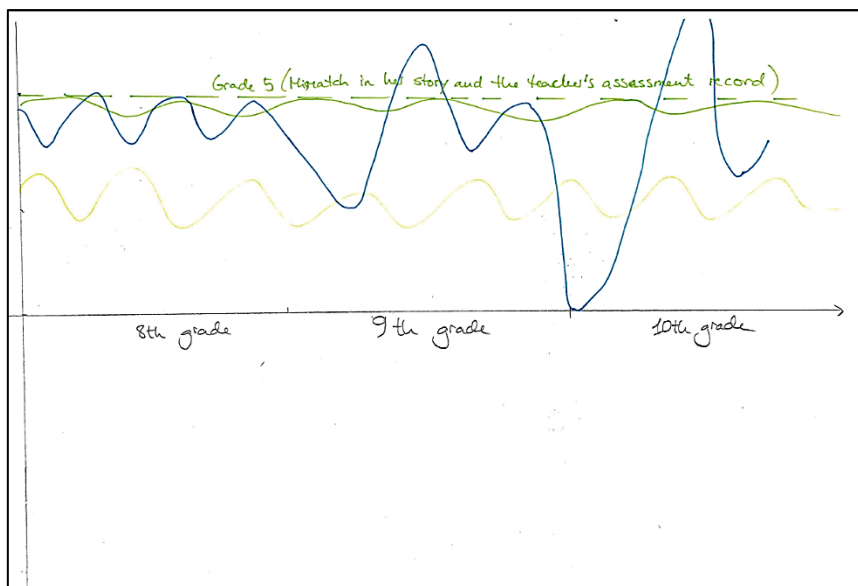


Figure 11. Emilia's timeline: blue is feeling about mathematics, green is grades, yellow is effort

Emilia's lower secondary school timeline presents a student with consistently high mathematics grades. It is noteworthy, then, how she draws the blue line of her relationship with mathematics, varying between very positive and more neutral throughout the years of lower secondary school. These variations cause the blue line to swing, and it is notable that the gap between high and low increases through the 9th and 10th grades. In contrast to Ross' and Alexander's accounts of their improving relationships with mathematics from the middle of 9th grade, Emilia's relationship with mathematics appears to be more unstable and to dip lower from this point on. Emilia's story provides an explanation for why the swings in her relationship with mathematics do not match her level of performance; for her, understanding is key, and it is access to understanding that determines the highs and lows. She emphasises that she has sustained her grades [in order to score 5 every year, a student has to improve in line with grade-appropriate input and development] because she understands mathematics better: *"I think it [the grades] has been pretty similar the whole way, but I've understood more of the maths. Got better at maths, but the [general] level has risen."*⁷⁹ Emilia's talk suggests that she feels that her increased understanding is not reflected in her grades. The contrast between her performance and the way in which her relationship with mathematics swings leads to a dualism in her talk which characterises her self-authoring as a mathematics student who needs to understand, leading to her particular experiences and choices in Class A.

⁷⁹ «Jeg tror den [karakterene] har vært ganske lik hele veien, men jeg har jo skjønt mer av matten. Blitt bedre i matte, men nivået har steget.»

A contrary way of describing her relationship with mathematics

Emilia's overall storying of her relationship with mathematics tells a different tale from the unstable blue line: *"I've always liked maths, I think it was really fun then [in elementary school], too."*⁸⁰ Emilia uses the term "always" and the past tense to describe her enjoyment of mathematics. As the conversation continues, she shifts to the present tense: *"I think it's that I really love maths and I think it's fun."*⁸¹ Her strong, positive feeling for mathematics is ongoing from her early school years until now, and Emilia even stories her positive relationship with mathematics as lasting into the future: *"I have always known that it's maths I want to do, I've always loved numbers, and the school advisor has helped me by saying that I should continue with it."*⁸² Emilia's relationship with mathematics is a constant positive, portrayed as an everlasting case of love of the subject, both in the words she chooses and her use of the past, present and future. She self-authors as a student who really enjoys doing mathematics.

However, this situation is not recognisable in her description of how her relationship to mathematics has developed over the years in lower secondary school. Now, a more unstable situation appears as Emilia describes the swings in the blue line. She pays attention to detail and the tone of her talk is thoughtful. She starts to describe how she enjoys mathematics when she can do it, clarifying that this does not necessarily mean that things must be easy:

*"I can be [on top] if there is something I find very easy and fun and kind of (...) not that it's easy tasks, but when there are harder tasks I feel can do."*⁸³

It is noticeable how she says that harder mathematics can be easy for her. However, feeling positive about mathematics depends on feeling that the topic is one she can do:

*"I'm probably on the positive side (...) in the middle of the positive (...) yes, that [line] has been pretty even. But it's kind of like it goes up if we work on topics I feel I can do, and it goes down a bit if there are things I feel are difficult, but it goes pretty much in the middle of it all the way."*⁸⁴

She elaborates on how her relationship with mathematics has shifted around with the topics:

⁸⁰ «Jeg har alltid likt matte, jeg synes det var veldig gøy da [på barneskolen] også.»

⁸¹ «Jeg tror det er at jeg er veldig glad i matte og at jeg synes det er gøy.»

⁸² «Jeg har alltid visst at det er matte jeg vil drive med, jeg har alltid vært veldig glad i tall, også har skolens rådgiver hjulpet med å si at jeg burde fortsette med det.»

⁸³ «Jeg kan være det hvis det er noe jeg synes blir veldig lett og gøy og liksom (...) ikke at det er lette oppgaver, men når det er avanserte oppgaver jeg føler jeg får til.»

⁸⁴ «Jeg er nok på den positive siden (...) midt på den positive (...) ja, den [linjen] har vært ganske jevn ja. Men det er liksom sånn at det går opp hvis vi har om ting jeg føler jeg får til, og så går den litt ned hvis det er ting jeg føler er vanskelig, men den går ganske midt på hele veien.»

“It [her relationship with mathematics] improved in the beginning, because then I remember we had equations and stuff, and I think it that was very easy, because then I got on well and then it went up, and then it went down, depending on what topics we had worked on, in a way... then I remember it was a period where it was a bit difficult, I can't quite remember what it was, but a small period I think was difficult, but then it went up again quickly, so it has really stayed a bit up and down all the way. (...) Yes, but I feel that the 10th grade has gone up and down a lot from here [INDICATES X ON THE TIMELINE], much more. (...) Yes, because here we have had varied things and a it's a bit more advanced.”⁸⁵

Emilia highlights here how the variation in the swing between high and low escalates in 10th grade, in relation to how demanding she finds the newly advanced topics. This time she is specific about what topics make her struggle:

“I struggle a lot with fractions and if there are advanced fractions, then I can go down a bit, then I can get very bored, but then I quickly go back up.”⁸⁶

Emilia confirms my suggestion that this is when fractions include algebra, which has been a topic through the first semester in 10th grade. She highlights that if the tasks are harder or more advanced, she might feel unable to do them, but at the same time she might do. Although the more advanced mathematics of grade 10 can be a challenge, she quickly bounces back to her normal positive relationship with mathematics.

Unlike Ross and Alexander, Emilia is reluctant to describe mathematics as boring if she experiences it as easy: *“Ehh, it might be, but I'm pretty good at challenging myself in a way, if I find it very easy.”⁸⁷* Emilia stories herself as the active subject in making sure that she doesn't experience mathematics as boring and so she never talks of mathematics as *too* easy. So, Emilia's earlier storying of her relationship with mathematics as an ongoing positive situation is an over-simplification: her positioning of self is not stable, the nuancing depending on the topics. It is noticeable that no other persons or incidences are storied as the reason for her difficulties. She is the subject in her story both in bad times when she experiences mathematics as hard, and in good times when she finds it easy. She seems to place the responsibility for the

⁸⁵ «Det [forholdet hennes til matematikk] gikk jo ganske opp i starten, for da husker jeg vi hadde vi om likninger og sånt, og det synes jeg var veldig lett, for da fikk jeg det bra til og så gikk det opp, og så gikk det ned, avhengig av hva vi har hatt om på en måte, også ..., da husker jeg det var en periode hvor det var litt vanskelig, jeg husker ikke helt hva det var, men en liten periode jeg synes var vanskelig, men så gikk det fort opp igjen, så det har egentlig holdt seg litt opp og ned hele veien. (...) Ja, men jeg føler at det 10.klasse har gått mye opp og ned her fra, mye mer. (...) Ja for her har vi hatt varierte greier og litt mer sånn avansert.»

⁸⁶ «Ja, men asså jeg, det var liksom, jeg sliter veldig med brøk og hvis det blir avansert brøk, da kan jeg gå litt ned under, da kan jeg bli veldig lei, men så går jeg fort opp igjen.»

⁸⁷ «Ehh, det kan bli det, men jeg er ganske flink til å utfordre meg selv på en måte, hvis jeg synes det blir veldig lett.»

situation, whether it is the problem or the solution, inside of herself. I ask her if her down-periods have affected her negatively and she says: “*But it hasn't been that long in a way.*”⁸⁸, and she plays down her problems with mathematics. In contrast to Ross’ and Alexander’s rather straightforward accounts of easy mathematics = boring versus challenges and new topics = fun, Emilia’s story is more nuanced, and she expresses more agency as a mathematics student, even when challenges which are not fun may temporarily cause her relationship with mathematics to be less positive. However, she expresses control over her own situation, and she finds a way to turn things round.

One way in which Emilia appears to resource this sense of control despite the difficulties is through an affinity with her father, who she says is an important influence: “*Dad has influenced me a lot. Because he’s also very fond of numbers, he works with numbers and thinks it’s fun. And he kind of helped me a lot with maths and it has made me feel better and understand it better.*”⁸⁹ Emilia describes her father’s relationship with mathematics with the terms joy and love, like her own relationship. Her own motivation for doing mathematics and her father’s way of relating to mathematics are storied as deriving from an inner motivation for them both. As we shall see, Emilia’s father returns as an important actor in this story. They both love and enjoy mathematics. She emphasises how her father has been important for her increased understanding and for making her ‘feel better’. The importance of understanding emerges as a constant refrain in Emilia’s narrative; it is what makes mathematics fun.

Future plans

Like Ross and Alexander, Emilia stories her relationship to mathematics as an everlasting case of love and joy. As we have seen, these boys are determined to do mathematics in their future education, and Emilia’s short-term plan is also to continue with mathematics, following the theoretical pathway in mathematics, mathematics for science (R-mathematics) in upper secondary. However, unlike them, her long-term plan is not to do mathematics and she explains why:

*“Ehh, it’s because I want to be a doctor, and then I have to have maths as a subject. Also, I think maths is really fun, it’s exciting.”*⁹⁰

⁸⁸ «Men det har jo ikke vart så lenge på en måte.»

⁸⁹ «Pappa har påvirket meg veldig. For han er også veldig glad i tall, han jobber med tall og synes det er gøy. Og han liksom hjulpet meg mye med matten og det har gjort at jeg har fått det bedre til og forstått det bedre.»

⁹⁰ «Ehh, det er fordi jeg har lyst til å bli lege, og da må jeg ha matte som et fag. Også synes jeg matte er veldig gøy, det er spennende.»

A contradiction emerges when Emilia talks about her long-term future plans in education. Her self-authoring as someone who is an everlasting joy for the subject somehow leads to a future dream of studying medicine. Choosing to be a doctor doesn't quite follow from her love and joy for numbers and mathematics. It would be logical if she were to talk about her interest in the human body or taking care of people. She never does. In fact, rather than supplementing her reason for wanting to be a doctor she focuses on her enjoyment of mathematics: *“Also, I think maths is really fun, it's exciting.”*⁹¹ Given her earlier story about the school advisor's suggestion that she study mathematics, the contradiction in choosing medicine becomes more obvious.

An emerging dilemma

*“I need to understand what and why I'm doing it somehow, I can't just do a task and then just 'that's right', I actually have to understand it for me to get it done and for it to be fun.”*⁹² For Emilia, understanding is a key issue for maintaining her enjoyment of mathematics, underlining her account of being intrinsically motivated to study it. Emilia says that not understanding makes her almost give up sometimes, as when she describes a ‘down’ in her timeline:

*“It's kind of like I get bored quickly, if there's something I don't understand, that it doesn't work for me, then I give up quickly, but then I have to try to understand it and then it works because I understand things very fast, things happen to me very fast and then I just have to make the effort to get it done and it's sometimes it gets very difficult and it can be very easy things, it's just me who doesn't get it, then it [the joy she might feel about doing mathematics] goes down fast, when I can't get the tasks.”*⁹³

Emilia's talk here has no continuous flow, and there are several ifs and buts. She reports that she gives up easily when she doesn't understand, but at the same time she says that she understands (really) fast. Furthermore, sometimes easy things may turn out to be difficult for her. These contradictions imply a fragility which causes her problems, a problem of not understanding which can affect only her. Emilia has a strategy for what to do when she experiences difficulties: *“I just have to get someone to explain it to me in a proper way, and then it's often Dad, because he's very good at explaining.”*⁹⁴ She also says that her fellow peers, her sister and the teacher may potentially help her out, as long as they can listen and respond to

⁹¹ «Også synes jeg matte er veldig gøy, det er spennende.»

⁹² «Jeg må forstå hva og hvorfor jeg gjør det liksom, jeg kan ikke bare gjøre en oppgave og så bare det gikk, jeg må faktisk forstå det for at jeg skal få det til og at det skal være gøy.»

⁹³ «Det er liksom sånn at da blir jeg fort lei, hvis det er noe jeg ikke forstår, at det ikke går opp for meg, da gir jeg fort opp, men da må jeg gidde å prøve å forstå det og da går det for jeg forstår ting veldig fort, ting går opp for meg veldig fort og da må jeg bare gidde å få det til, og det er noen ganger det blir veldig vanskelig, og det kan være veldig lette ting, det er bare jeg som ikke får det til, da går det fort ned, når jeg ikke får til oppgavene.»

⁹⁴ «Jeg må bare få noen til å forklare det til meg på en ordentlig måte, og da er det ofte pappa, for han er veldig flink til å forklare.»

her questions: *“I have to ask my questions during the explanations.”*⁹⁵ The importance of being able to ask the questions *she* needs to get answers to when she struggles to understand is the reason why she regards plenary teaching as not always useful:

*“if we're at the start, a startup, in a new topic, then it might be useful [to ask questions], but not if we're in the middle of a new topic and I don't understand it, because then, I don't know why, then I just don't understand it, because then it goes very quickly on the board, because then they go through it so fast.”*⁹⁶

The pace in plenary sessions restricts her from asking the questions she knows she needs to ask. She doesn't appear to see herself as entitled to disrupt the pace by asking questions when the plenary teaching is in full flow, since there are some others, an unknown they, who are the pacemakers, and who clearly do not include Emilia.

Emilia describes in some detail how she navigates the mathematics class in a way which will enable her to gain the understanding she longs for, in order to maintain her view of mathematics as fun. She thinks about who she should work with in order to help her understanding, and whether the level they work at is what she prefers and needs in order to improve her competence in mathematics. She explains why she prefers to work with peers rather than alone:

*“If it's a task we're stuck on, then you get disappointed and give up a bit and move on, or you sit on it for a long time, and then you don't get to talk to others about it, and it's not always like you want the teacher to help you, sometimes they explain it in such weird ways, in a way, that you should understand it right away, but if you ask a fellow student, they can explain in a bit more depth because they remember how they learned best.”*⁹⁷

Here, Emilia repeats her need for developing understanding in depth and explains how peers who are learning at the same time can explain in more detail than a teacher. She appreciates that the students in Class A can choose who they want to collaborate with: *“I like it the way we do now, because we know best who we like to collaborate with, and then we can choose more ourselves.”*⁹⁸

However, this autonomy causes her problems, because the level of mathematics tasks can differ depending on who she collaborates with, and this presents a dilemma. In one way Emilia prefers

⁹⁵ «Jeg må få stilt mine spørsmål underveis i forklaringen.»

⁹⁶ «Ja, men det er mer sånn hvis vi er på starten, en oppstart, i et nytt tema, da kan jeg ha brukt for det, men ikke hvis vi er midt i det og jeg ikke forstår det, for da, jeg vet ikke hvorfor da bare skjønner jeg det ikke liksom, for da går det veldig fort gjennom det på tavla, for da går de så fort igjennom det.»

⁹⁷ «hvis det er en oppgave vi sitter fast på, da blir man skuffa og gir litt opp, og går videre, eller så sitter du lenge på det, og da får du ikke snakket med andre om det, og det er ikke alltid sånn at du har lyst til at læreren skal hjelpe deg, de kan innimellom forklare det på sånn rare måter, på en måte, sånn at du skal skjønne det med en gang, men hvis du spør en medelev, så kan de forklare det litt mer i dybden for de husker hvordan de lærte det best.»

⁹⁸ «Jeg liker det sånn vi har nå, for vi vet jo bedre hvem vi liker å samarbeide med, og da kan vi velge mer selv.»

to work with her friends (the girls) because it makes her feel good: *“And then I help the others as well, then I don't work at my level, but I work with them, and I feel better then because I'm able to solve more, and then I help them as well.”*⁹⁹ Helping out not only contributes to helping others but also enables her to gain confidence/feel better about herself because she is able to solve problems others can't do. However, she is aware of that this choice comes with a price: *“But it might not be that smart, because I don't get to challenge myself that much.”*¹⁰⁰ Emilia places her mathematics ability at a higher level than that of most of her friends, but choosing to work with them means that she doesn't get to work at a level that might develop her own mathematical competence. At home, in another setting than in the classroom, she can choose a different task level, *“then I choose a bit more advanced,”*¹⁰¹ but in the figured world of Class A she struggles to find her space, torn between working with the smart boys, where she will find more challenge, or the girls, where mutual understanding is guaranteed:

*“You have, like, some of the boys are very smart, and like and sometimes I like to work with them occasionally because some of them have a lot more competence than many of the girls and then I find it quite fun to cooperate. But also, I like to work with the girls as well, because they are like more on my level then, and then we understand a lot more together.”*¹⁰²

Emilia seems schizophrenic about who to work with and how that affects her. If she chooses the girls, she loses access to more advanced mathematics – *“It might not be that smart, because I don't get to challenge myself that much.”*¹⁰³ This problem could be solved by working with the boys, but there is a risk attached: *“But I feel if I had done it in a way, [I would get] left behind, because then it might have been too advanced.”*¹⁰⁴. Recall how Emilia needs to ask her questions as she is working to really understand, that is what makes mathematics enjoyable. If she chooses the boys, she could lose access to understanding. Emilia seems to be caught between two stools; either she is worried about the level or she is worried about not understanding. So, she suggests a solution: the teacher should decide, even though students being able to choose who they work with is something that Emilia likes. She thinks it is

⁹⁹ «Og da hjelper jeg de andre også, da jobber jeg ikke med mitt nivå, men jeg jobber på dems, fordi da, jeg føler jeg meg bedre for da får jeg mer til, og da hjelper jeg de i tillegg.»

¹⁰⁰ «Ja, men det er kanskje ikke så smart, for jeg får ikke utfordret meg selv så veldig mye.»

¹⁰¹ «Da velger jeg litt mer avansert.»

¹⁰² «Du har jo liksom noen av guttene er jo veldig smarte, og liksom og det er innimellom jeg liker å samarbeide med de innimellom for de har , hvis noen av de har mye mer kompetanse enn mange av jentene og da synes jeg det er litt gøy å samarbeide. Men også jeg liker å samarbeide med jentene også, for de liksom mer på mitt nivå da, og da forstår vi mye mer sammen.»

¹⁰³ «Det er kanskje ikke så smart, for jeg får ikke utfordret meg selv så veldig mye.»

¹⁰⁴ «Men jeg føler hvis jeg hadde gjort det på en måte, falt mer av, for da kan det hende det hadde blitt for avansert.»

important that all the students should have the same access to topics and levels, even though some topics may be advanced, and she thinks that Miss A should organise groups:

*“Maybe to see different levels and maybe make small groups with those who are at a certain level, those who struggle with one thing to go through it with them. And those who are at a high level might learn something new. Miss A has done a bit of a stupid thing with that, the quadratic equations then, when she says that not everyone is skilled enough, then it’s difficult to learn such things yourself, and then it’s better if you take out the group that wants to learn it and then you go through it with them, because then they can reach their level.”*¹⁰⁵

Notice that she refers to the incident of the quadratic equations which also forms part of Ross’ story. Emilia tells me that she never learned about quadratic equations when I ask her about this incident: *“No I never understood it, but since we haven’t had any tasks with it, or we’ve had it, and then I found another way to solve it and then it went well.”*¹⁰⁶ It is obvious that she doesn’t know about quadratic equations, because it is not possible to find alternative solutions to these tasks, there are no alternative routes. She comforts herself, even though: *“But I’d love to learn how to understand maths better, but that’s not one of the most important things I’m thinking of now, because I know we’re going to learn it in high school.”*¹⁰⁷

Summary: A strong awareness of the situation as a student in mathematics

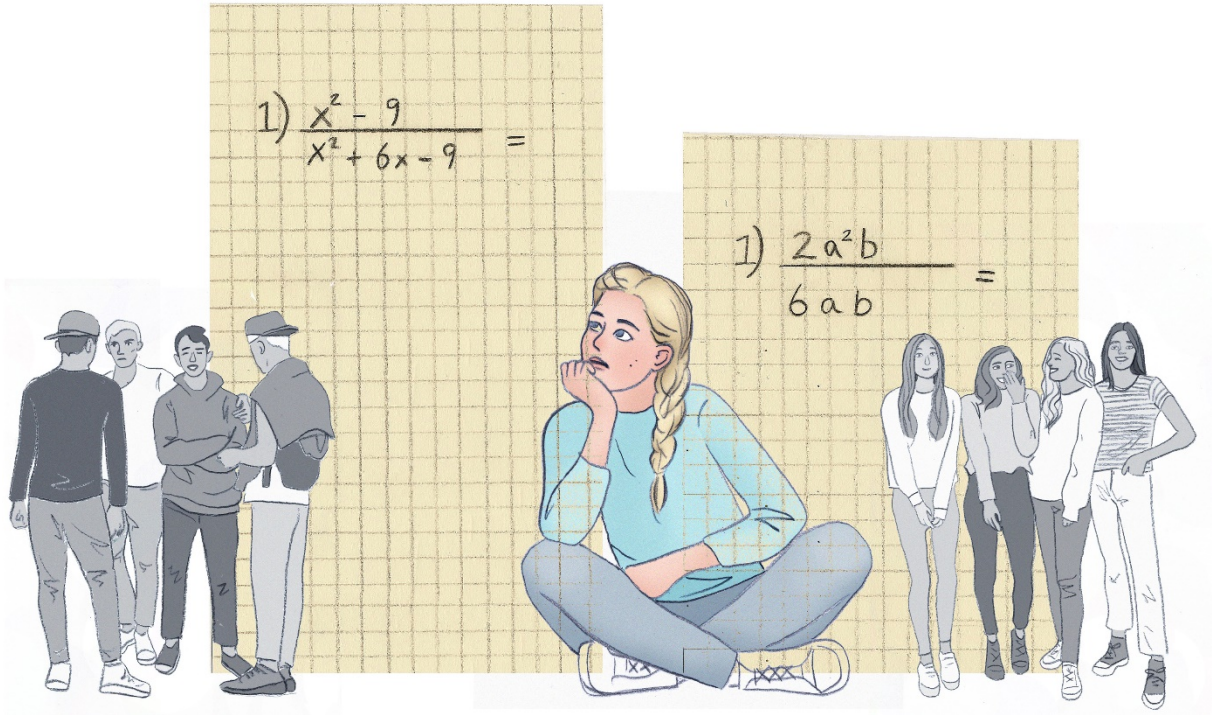
Emilia’s narrative is told with an awareness of herself as a learner of mathematics, in which she is concerned about her own situation as a student and her needs and preferences in order to develop her understanding. She is specific about incidences and events and expresses her need to understand mathematics as important in order to keep her enjoyment and love of the subject. She is consistently the main actor in her story, taking an active role in finding the solutions to her problems. Emilia keeps focused on the content, and pays little attention to performance in the classroom, neither by herself nor the other students in the class. Her dad is the most prominent “supporting actor” in her story, and he seems to play an important role in her intrinsic motivations towards, and her positive relations with, mathematics.

¹⁰⁵ «Kanskje å se forskjellige nivåene og kanskje lage sånne små grupper med de som er på hvilket nivå, de som sliter med en ting å gå gjennom med dem. Og de som er på høyt nivå kanskje lære noe nytt. Det har Miss A gjort litt dumt med sånn, kvadratsetninger da, når hun sier at alle ikke er på høy kompetanse, det blir vanskelig å lære sånne ting selv, og da er det bedre om du tar ut den gruppa som vil lære det og så går du gjennom det med de, for da kan de strekke seg opp til sitt nivå.»

¹⁰⁶ «Nei aldri skjønt, men siden vi ikke har hatt oppgaver med det, eller vi har hatt det, og da finner jeg en annen måte å løse det på og da går det greit.»

¹⁰⁷ «Men jeg vil jo gjerne lære det å forstå det på en bedre måte å løse matte på, men det er ikke noe av det viktigste jeg tenker på nå da, for jeg vet at vi kommer til å lære det på videregående.»

Emilia’s narrative is not told with a continuous flow; it contains contradictions and stops and starts. She self-authors both as a student with an everlasting love and joy of mathematics, at the same time as her self-positioning indicates a rather fragile situation. Her pathway as a student in mathematics in this figured world is not straightforward. Despite her high achievement scores, she reports that she might struggle with some topics and she strives to find a space in the classroom which combines her preferred level in mathematics and her need to ask questions in order to understand. Her story highlights how she is caught between a lack of access to understanding or a lack of access to challenge.



Kine's story

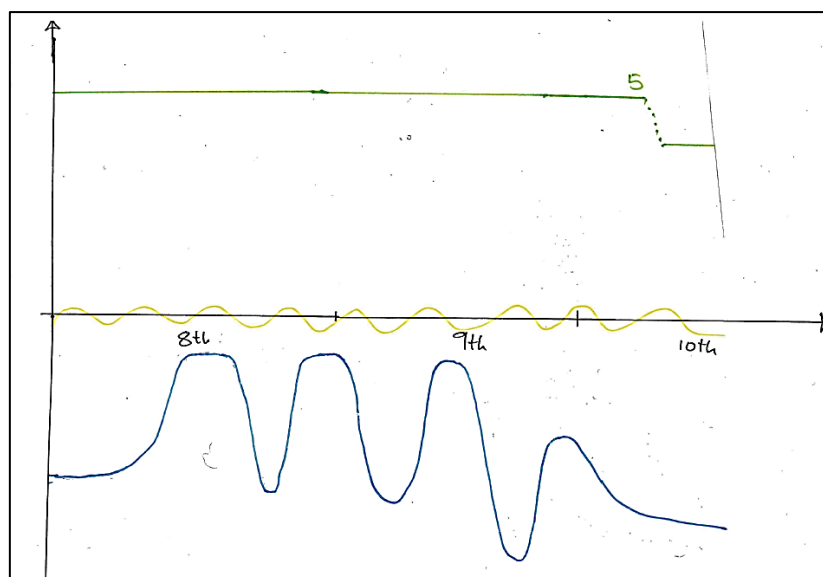


Figure 12. Kine's timeline: blue is feeling about mathematics, green is grades, yellow is effort

Kine's lower secondary school timeline presents a student who achieves good grades in mathematics. The green line shows that she performs steadily until 10th grade, when her grade drops almost a whole level. Like Emilia, there is a mismatch between Kine's relationship with mathematics and her grades, but it is far more extreme: she never enjoys mathematics despite her high achievement scores. The blue line swings between higher and lower but always in the negative area, indicating that Kine's relationship with mathematics improves sometimes for short intervals but never so much that it is positive. She explains these improvements in terms of having received good test marks, but this good feeling never lasts once the class moves on to new topics. Like the three previous students, Kine reports that there is a turning point in the middle of 9th grade. In her case, her overall relationship with mathematics declines at this point.

Overwhelmed by a negative feeling for mathematics

Kine's grades in mathematics are remarkably steady, until they suddenly drop. Kine draws the green line and describes how it develops: "Very straight because I've had one grade so far, so it had been here and then it went down in 10th grade, like this I think,"¹⁰⁸ and she confirms that her grade has been mostly a 5 until the drop. The drop in 10th grade is not a coincidence for Kine, and she says how she struggled with mathematics long before her grade dropped: "I don't know, it's just that what probably happened here then [in the middle of 9th grade], I felt like I didn't get it, that I didn't understand things, and if I didn't understand it, then what we started

¹⁰⁸ «Veldig rett for jeg har hatt en karakter helt til nå, så den hadde vært her og så hadde den gått ned i 10.klasse, sånn tenker jeg.»

in 10th grade wasn't so easy to understand either."¹⁰⁹ Kine reports losing confidence in the middle of 9th grade, choosing words to express an overall confusion - not getting it, not understanding and not expecting to be able to get it. These pronounced utterances describing her feeling about mathematics contrast starkly with her achievement scores. Because of her loss in confidence in 9th grade, her 10th grade situation became even worse, as a result of new topics combined with her pre-existing lack in confidence. Kine stories herself as insecure about her mathematical ability in general, and this sets the tone of her talk throughout our conversation.

Kine starts the interview with an announcement that she doesn't like mathematics and there is no doubt in her talk: *"I never liked the subject, I think it was tiring to work with, but in 10th grade both the grades have gone down and that I, I don't understand as much as I might have done before."*¹¹⁰ She describes a constant situation of never enjoying mathematics; it has never been easy, but she likes it even less since her understanding dropped in the middle of 9th grade. *"It's just what we've been doing in the last [10th grade] and the last six months [second half of 9th grade] and stuff, so I've just felt like it's been, I haven't felt I've been hanging on."*¹¹¹ Kine self-positions as a fragile student in this figured world, particularly since the middle of 9th grade.

Kine describes feeling that she never understands mathematics, even when she revises for the exam. Although this didn't affect her 9th grade exam mark, it did in 10th grade:

*"It was that I felt that I was getting nowhere. (...) And when I practiced for the exam and stuff, I didn't feel like I got anywhere either, but just that exam [in 9th grade] went fine and I managed to keep the grade, but what happened to this exam [in 10th grade] was that it happened the same (...) that I really didn't understand anything and did nothing, but it made an impact on how the exam went this time and it didn't last time."*¹¹²

Kine's sense of her mathematical understanding seems to be disconnected from her actual level of performance - her strong expressions of *"understanding nothing"* and *"not being able to solve a thing"* do not match the grade she gets, even in grade 10. It seems that her high marks are hidden by her overwhelmingly negative feeling about doing mathematics. During our talk

¹⁰⁹ «Jeg vet ikke, det er bare det at det som sikkert skjedde her da [i midten av 9.klasse], jeg følte at jeg ikke fikk til, at jeg ikke forstod ting, og hvis jeg ikke forstod det, så er jo ikke det vi begynte med i 10.klasse så lett å forstå heller da.»

¹¹⁰ «Jeg aldri likt faget, jeg synes det har vært slitsomt å jobbe med, men i 10.klasse så har både karakterene gått ned og det at jeg, jeg forstår ikke så mye som jeg kanskje gjorde før da.»

¹¹¹ «Det er bare det vi har holdt på med i det siste [10.klasse] og forrige halvår [andre halvår av 9.klasse] og sånn, så har jeg bare følt at det har vært, jeg har ikke følt at jeg har hengt med.»

¹¹² «Det var jo det at jeg følte at jeg ikke fikk til noen ting. (...) Og når jeg øvde til tentamen og ting, da følte jeg heller ikke at jeg fikk til noe, men akkurat den tentamen [i 9.klasse] gikk greit og jeg har klart å holde karakteren, men det som skjedde med denne tentamen [i 10.klasse] var at det skjedde det samme (...) at jeg forsto egentlig ingenting og klarte ingenting, men det gjorde utslag for hvordan det gikk på tentamen denne gangen og det gjorde det ikke forrige gang.»

she never uses expressions such as ‘fun’ or ‘interesting’ to describe mathematics, and Kine struggles to explain why she doesn’t like it, trying to find an explanation outside of herself for her problem of developing understanding; she has no sense of agency: “*I don't know, there are no particular topics or things that make me not understand, I don't know completely, maybe it's the way of learning, or we have gone a level higher of course.*”¹¹³.

Kine seems to be overwhelmed by her negative feeling about mathematics. The way she describes the feeling when her grades dropped is much more dramatic than the actual decline in grade suggests. She describes a constant fear, a fear of losing her high level in grades: “*Yes, very much more. (...) In a way it's what I have feared all the time, to go down, so then it will be much bigger.*”¹¹⁴ She says that she doesn’t know if she got 4, or 4+ at the her last assessment, because “*I didn't want to know, because I couldn't stand (...) I had a fever in the maths exam, so I didn't feel like it was going so well, so when I got it back it hadn't gone so well so then I wouldn't know.*”¹¹⁵ Even though there is a reason why she might not perform as well as usual, she chooses not to use it. Kine stories herself as destined to lose her high achievement scores, and seems to be a victim of a self-fulfilling prophecy. She self-authors as being remarkably insecure in her own mathematical ability with very little agency.

Losing a significant marker of cleverness – losing her space

Kine tells me that in primary school she had been in a group for strong students, but felt like she did not really belong:

*“I was in a maths group in primary school, in a group for those who were really good, but I never felt like I fitted in there, but the teachers said I had to, so I had to. I always felt that I was one of the weakest in that group.”*¹¹⁶

Kine stories as being a ‘victim’ of the teachers’ choice, making her the object in her own story. But being a member of a privileged group of clever students in mathematics gave her an indication that she was clever, and this changed when Kine started lower secondary school:

“That was when the [uncertain feeling] started, I was very unsure if I was still good, as I had been then [in primary school] in a way, because it was always the way that those

¹¹³ «Jeg vet ikke, det er ikke noe spesielle temaer eller sånn som gjør at jeg ikke forstår, jeg vet ikke helt, kanskje med læremåten, eller vi har jo gått et nivå høyere selvfølgelig.»

¹¹⁴ «Ja, veldig mye mer. (...) Det er jo det på en måte det jeg har frykta gjennom det hele, å gå ned, så da blir jo det veldig mye større.»

¹¹⁵ «Ville jeg ikke vite, for jeg orker ikke (...) jeg hadde feber på mattetentamen, så jeg følte ikke at det har gått så bra, så da jeg fikk den tilbake hadde det ikke gått så bra så da ville jeg ikke vite.»

¹¹⁶ «Jeg var på en sånn mattegruppe på barneskolen, på en sånn gruppe som var ordentlig flinke, men jeg følte aldri at jeg passet inn der, men lærerne sa at jeg måtte det, så da måtte jeg det da. Jeg følte alltid at jeg var en av de dårligste på den gruppen.»

who were good should go out of class and go to that group, and when [in 8th grade] it was like, am I really that good? I got tests and exams and stuff like that, and it was okay, of course, then I became more and more afraid of not doing that, yes, as I got 5 in the exam throughout 8 and 9 and then it was like, when you have had a [good] mark, then it is trying to keep it up that was so scary.”¹¹⁷

Kine describes how her insecurity about her mathematical ability emerged when she started lower secondary school, when the significant marker of being a clever student was taken away. Leaving the class to be in a special group worked as a valued action, providing a visible marker of cleverness. Losing this public marker of being clever led her to question her mathematical ability, even though her grades in 8th grade could confirm that she was doing well. In Kine’s narrative, the visible markers of cleverness in mathematics seem to trump test grades. Rather than gaining comfort from her high achievement scores, they caused her to worry about keeping her results up, making her “more and more afraid”. Kine’s self-positioning as not belonging in the ‘clever group’ in primary school, was replaced with a fragile positioning in the figured world of Class A. Without her visual marker of cleverness, Kine struggles to find a safe space as a mathematics student, despite her high levels of achievement.

No access to performing smartness in Class A – where is her space?

Kine is conscious of the group of smart boys in Class A. Although earlier in the interview she states that there are no gender differences in Class A, she talks about performance in these terms: “*In our class, there is a group of maybe 10 boys who are the best among all in 10th grade, somehow.*”¹¹⁸ She positions several boys as very clever, but the number she gives seems to be exaggerated, because of the actual number of students in the class – this is nearly all the boys. Kine is concerned about the extent to which this group of students sets the tone of the class when she describes her overall impression of it. Her description is thoughtful and detailed:

“I feel there are a lot of people who are very good, so you notice very easily, it's quite frustrating because it's like that, because I don't see how they work that way at home and things like that, it seems that everything is so easy for them, and it's a bit frustrating for me who has to work really hard to get a good grade, so I notice that with those who are very good. And, I feel like, we have quite like, I feel like there are like three groups, those who are very good, where I might be, those who are in the middle, just fine in

¹¹⁷ «Det var vel da det [den usikre følelsen] begynte, jeg var veldig usikker på om jeg fortsatt var flink, sånn som jeg da hadde på en måte vist meg frem, for det var jo alltid sånn at de som var flinke skal ut av klassen og gå på den gruppen, og da [i 8.klasse] var det sånn, er jeg egentlig så flink? Jeg fikk jo til prøver og tentamener og sånn, og det var jo greit selvfølgelig, da ble jeg mer og mer redd for å ikke sånn, ja, etter hvert som jeg fikk 5ere på tentamenen gjennom hele 8 og 9 og da ble det sånn, når man har hatt en karakter, da er det det å prøve å holde det oppe som var sånn skummelt.»

¹¹⁸ «I klassen vår er det en gruppe på kanskje 10 gutter som er de beste på hele trinnet liksom.»

many of the topics, also those who, there are a lot who don't care so much who don't bother to work. And then there are some who are in the [special] maths group and stuff, and you notice that quite easily because they're not there, they're not in the lesson.”¹¹⁹

Kine describes Class A as having several clever students, and as divided into four subgroups: the very clever, those in the middle, those who don't care and the ones that go out to get extra help. She places herself as belonging to those in the middle. Once again, her awareness of visual markers and performance of cleverness in the classroom is noticeable. This time her focus includes the others. Acting like everything is easy is a significant marker of cleverness for Kine. The way the others act, as effortless achievers, makes her feel annoyed, because she needs to work hard to achieve high grades. She draws a binary between the others - the clever ones - and herself. She describes why she thinks that the other students have an easier time:

“It's because they don't seem so focused because, well, it seems like they know everything, so they don't bother to work in class - they do, but they talk a lot and have fun and stuff and so I sit there and sometimes work really hard and understand nothing. That's why it seems so easy because it seems like they've learned it for some time and just can, but I'm just trying to think that they may have worked on this at home.”¹²⁰

Kine positions herself as not belonging to the group of clever students because she “*works really hard and doesn't understand a thing*”, she is not having a good time. She stories herself as a contrast to the clever students, both in her way of working and her mathematical capacity. It seems as though she doesn't see herself as having access to acts of cleverness in mathematics in this figured world. She tries to comfort herself by telling herself that the clever students may work at home, so that their effort is invisible in the classroom.

The impact of the ‘smart boys’ on Kine's self-positioning in the classroom is illustrated by a particular incident in her story. She enjoys working together with fellow students when she is doing mathematics, but who this is makes a difference to her: “*I like to work with people at my level*”¹²¹. She describes how she enjoys helping others and how they benefit from working

¹¹⁹ «Jeg føler det er veldig mange veldig flinke, så det merker man veldig lett, det er ganske frustrerende for det er sånn, fordi jeg som ikke ser hvordan de jobber sånn hjemme og sånne ting, så virker det som at alt er så lett for dem, og det er jo litt frustrerende for meg som må jobbe skikkelig hardt for å få en god karakter, så det merker jeg med de som er veldig flinke. Og, jeg føler jeg, vi har ganske sånn, jeg føler det er sånn tre grupper, de som er veldig flinke, der hvor jeg kanskje er, de som er midt på, sånn helt greit i mange av temaene, også er det de som, det er mange som ikke bryr seg så veldig som ikke gidder å jobbe. Og så er det en del som er på mattegruppe og sånn, og det merker man jo ganske lett for de er jo ikke der, de er ikke i timen.»

¹²⁰ «Det er for det at de virker ikke sånn veldig fokuserte, fordi at, det virker som at de kan alt, så de gidder ikke jobbe i timen, de gjør jo det, men de snakker mye sammen og har det gøy og sånn og så sitter jeg der og liksom jobber skikkelig hardt og forstå ingen ting. Det er derfor det virker så lett for det virker som de har lært det for lengesiden og bare kan det, men jeg bare prøver å tenke sånn at det kan jo hende at de har jobbet med dette hjemme.»

¹²¹ «Jeg liker best å jobbe med folk på mitt nivå.»

together: “We can sit and do it together, and we can solve it, and then it's like you get done faster, but then it's like “Yes, I can show you.”¹²² However, the situation is different when she has to work with one of ‘the smart boys’:

“But the one I sit next to, he's insanely clever and it doesn't feel good if we work together, and he understands things right away, and then I say, ‘I didn't understand this’ and then it just seems like he just wants to move on. (...) Then he started a new task, so then I feel more that I am such a bother, that I don't get very much out of it, because he explains quickly (...) Also it's that I just write what he got and move on.”¹²³

Kine describes how uncomfortable she feels in this situation. Positioning herself in sharp contrast to the clever students in the class, she focuses on how the boy can “understand immediately” – he is “insanely clever.” Unlike him, she needs to ask questions, but he doesn't want to linger. Kine is not in a position to benefit from this pair work, and she lacks the authority to make him slow down.

As we have already seen in chapter 5, there is a strong discourse of performance in Class A but grades are not a significant marker for Kine in positioning the other students: “I don't know, they don't talk about grades and stuff like that, so I don't know how people are doing.”¹²⁴ Scores are invisible for her and she is concerned with the visible acts of cleverness. Kine says that she is not sure how the other students position her:

“I don't know, someone else has to answer that question, that's a good question, they may think of me as I think of someone else, but yes, I usually sit and work, so I don't know how to interpret it.”¹²⁵

Kine feels that the way she acts have little value in this figured world, she doesn't employ any visible significant marker of cleverness in this classroom. She stories herself as invisible to the other students in Class A, and she says she feels like she is invisible to Miss A, as well:

“I feel like those who are in the [special] maths group and stuff, she makes sure they don't fall off and stuff like that, but she doesn't care that much about us in the middle,

¹²² «Vi kan sitte og gjøre det sammen, og hvordan vi kan løse det, og da er det sånn at en blir ferdig fortere, men da er det sånn «Å ja, jeg kan vise deg.»

¹²³ «Men han jeg sitter ved siden med, han er sykt flink, og det føles ikke så godt hvis vi skal samarbeide litt, og han tar ting med en gang, og så sier jeg, jeg skjønnte ikke dette og så virker det som at han bare har lyst til å gå videre. (...) Så var det sånn at han begynte på ny oppgave, så da føler jeg mer at jeg er sånn til bry, at jeg får så ikke veldig mye ut av det, for han forklarer fort (...) Også blir det sånn at jeg bare skriver det han fikk og går videre.»

¹²⁴ «Jeg vet jo ikke, de forteller jo ikke karakterer og sånne ting, så jeg vet jo ikke hvordan det går for folk.»

¹²⁵ «Det vet jeg ikke, det må jo noen andre svare på, det er et godt spørsmål, det kan jo hende at de tenker det om meg som jeg tenker om noen andre, men ja, jeg sitter jo oftest og jobber, så jeg vet ikke hvordan man kan tolke det.»

*then [those who are good] are like this: “Very good here, here you have more to work with”, and stuff like that, and we who are in the middle of it are not very important.”*¹²⁶

Kine feels left alone in the middle by Miss A. The students in the other subgroups are given attention, but she is not. Kine wants attention, but she is sympathetic to the teacher and tries not to blame her: *“I know, of course, that a teacher can’t follow a student so well when there are so many, but I feel in a way that is what you really need.”*¹²⁷.

Kine stories her time in lower secondary school in terms of not belonging, and her lack of access to the visual significant markers of cleverness seems to be a concern. She lacks both the attention and affirmation she needs in order to feel comfortable as a mathematics student in this figured world. In primary school, she was visibly marked as a clever student when she left the ordinary teaching to be in a special group, even though she felt that she did not belong. Now, there is no space for her. She is an invisible student in Class A.

An extrinsic motivation for mathematics

So far, Kine stories as a hard worker in mathematics, contrasting herself with the clever students, whose ability in mathematics is effortless. However, she is inconsistent in describing her work effort. As she draws the yellow timeline, she says: *“I don’t know, I don’t work any more than I have to,”*¹²⁸ and she says that she doesn’t work more at home than she does at school: *“I think it’s really even. I’m not very much committed to the maths lessons and like that, if it says [on the blackboard] that, do the tasks on those pages then I do it and am happy (laughs).”*¹²⁹ Kine reports having little motivation for doing mathematics in school, and that her work-effort is constant, just mediocre all the way. Now, she doesn’t story herself as “a hard worker”, even though this contradicts her earlier comparisons between herself and the “clever students”. It appears that this is due to extrinsic motivation only; however – as our conversation turns to the future, she says that she plans to improve her work-effort in mathematics if she is selected for examination [students are picked randomly for the national tests]: *“I’m pretty determined to work more this semester if I get the oral and written exam of course.”*¹³⁰

¹²⁶ «Jeg føler sånn, at de som er på mattegruppe og sånn, hun passer på at de ikke faller helt av og sånne ting, men hun bryr seg ikke så mye om oss i midten, da [de som er flinke] er det sånn: «Veldig bra her, her har du mer å jobbe med», og sånne ting, og vi som er sånn midt på vi er ikke så veldig viktig.»

¹²⁷ «Jeg vet jo at en lærer ikke kan følge en elev så godt når man er så mange, men jeg føler på en måte er det man egentlig trenger»

¹²⁸ «Jeg vet ikke helt, jeg arbeider ikke mer enn jeg må.»

¹²⁹ «Jeg tror det egentlig er jevnt. Jeg er ikke så veldig sånn engasjert for mattetimene og sånn, hvis det står sånn gjør de oppgavene på de sidene så gjør jeg det og er fornøyd (ler).»

¹³⁰ «Jeg er ganske innstilt på å jobbe mer på dette halvåret hvis jeg kommer opp i eksamen muntlig og skriftlig selvfølgelig.»

This theme continues as Kine goes on to talk about her educational plans. It turns out that it is not clear what she wants to do, there are several options and she sees no direction as more probable than others. In contrast to Ross, Alexander and Emilia, Kine says that she has not given much thought to what mathematics pathway she wants to take in upper secondary school: *“I don't know, and I clearly, I haven't thought so much about what maths to choose.”*¹³¹ What is noticeable is that even in her lack of plans for future mathematics, she expects to make progress: *“I hope they [the lines that show grades and her relationship to the subject] go up”*,¹³² and she explains why she thinks it is important to do well in mathematics:

*“I hope it can get up to where it was, I want to be good at maths then, it would be very nice thinking the future then, and to be sure of it. I hope that maybe I think I have to change my attitude a bit, because through kindergarten and secondary school I have never liked maths to be that ‘bleurgh’, so I might not have wanted to work on getting better then, so then I really have to change how I think about the subject.”*¹³³

Kine’s reason for making progress in mathematics is that it is a ticket to a better future. Once again her motivation for mathematics is extrinsic. However, to change the situation she needs to ‘pull herself together’. Contrary to how she previously storied herself as the object in the situation, this time she stories as the subject. Kine herself needs to take responsibility for the way she feels about mathematics, even though she knows that it won’t be easy. *She* needs to change *her* attitude to mathematics, but she has a safety net if she runs into trouble: *“Dad said at least that we plan to work a bit every week, it might help.”*¹³⁴ Kine’s dad emerges as important for her mathematics work; he has helped her ahead of every semester test and she says that he is her rescuer: *“He might have saved me sometimes, to put it like that.”*¹³⁵ There is a sense of hope in her story, and as seen in the timelines she tells of a hope to improve her situation in the future. However, it is noteworthy that Kine draws on resources outside of the figured world of Class A to be able to deal with mathematics. Her solution is outside of the classroom.

¹³¹ «Jeg vet ikke, og jeg klart å, jeg har ikke tenkt så veldig mye på hvilken matematikk jeg skal velge.»

¹³² «Jeg håper jo at de [linjene som viser karakter og forhold til faget] går oppover.»

¹³³ «Jeg håper at det kan komme opp til der hvor det var, også har jo lyst til å være flink i matte da, det hadde jo vært veldig deilig med tanke på fremtiden da, og å være trygg på det. Jeg håper jo på å kanskje jeg tror jeg må endre innstillingen min litt, for sånn gjennom barneskolen og ungdomsskolen har jeg aldri likt matte å være sånn ‘blæh’, så da har jeg kanskje ikke hatt så lyst til å jobbe med det å bli bedre da, så jeg må jo sikkert endre hvordan jeg tenker på faget da.»

¹³⁴ «Pappa har i hvert fall sagt sånn at vi har tenkt å jobbe litt hver uke, det kan jo kanskje hjelpe.»

¹³⁵ «Han har nok kanskje redda meg noen ganger for å si det sånn.»

Summary: An unconfident member of Class A

The overall theme of Kine's narrative is that hers is a story that seems destined to end in tragedy. She reports how she struggles, despite her high grades. Like Emilia, she expresses a need for understanding, but her story focuses on how she doesn't understand and doesn't believe in her own mathematical ability. Kine never uses positive words to describe her relationship to mathematics, even though her good performance could make that a possibility. She self-authors as a student who is unconfident and insecure in her mathematical ability, and as an excluded member of the figured world of Class A. She juggles the cultural model of a girl with little confidence in doing mathematics.

Kine shows an awareness of public acts of cleverness and performance in the classroom, and she is concerned about how her way of acting contrasts with that of the 'clever' students – she is "other". In primary school she was endowed with a significant marker of cleverness, even though she never felt that she belonged to that group of students. The affirmation that the special group brought is lost in lower secondary school, despite her high test scores. Kine focuses more on public performance in the classroom and she stories herself as not having access to enact the visual marker of cleverness - this makes her an invisible student. Her account of her own positioning in Class A is as a fragile student who struggles to fit in it and find a space.

Kine is often a passive actor in her own story, presenting herself as a victim of others' choices and actions, with little agency or impact on her own situation. She expresses little entitlement or authority as a mathematics student, with no more than an extrinsic motivation for success.



Emilia and Kine in the figured world of Class A: positions become dispositions

This chapter draws on interviews with two of the high-performing girls in Class A. In contrast to Ross' enactment of smartness and Alexander's easygoingness, analysis of these two girls' stories reveals a very different situation. Both express a need for understanding, and both describe constraints on their work with mathematics in Class A: Emilia complains about the impact of the pace which is forced by the smart boys on her ability to ask questions and Kine complains that the smart boys' positioning as effortless achievers makes her feel inferior.

Even though they seem to develop similar dispositions to doing mathematics in Class A, they meet these constraints differently. The broad venue of Emilia's space of authoring encapsulates her conscious of what she needs to do in order to keep understanding, requiring considerable identity work to maintain her narrative of a student with a continued love and joy for mathematics, even though her positionality is not in line with this strong self-authoring. As I will argue in Chapter 9, Emilia finds a way of navigating the dynamics of Class A through her development of an internally persuasive discourse which enables her to keep a positive relationship with mathematics within the constraints she experiences. Kine, on the other hand, seem to be more trapped by the hegemonic discourses of mathematics teaching and learning in this classroom as she juggles the cultural model of a girl who is anxious in mathematics. Interestingly, Ross himself is a part of her story, the 'insanely clever boy' who makes her feel inferior. She self-authors as someone who is the opposite of Ross, and who is doomed to fail.

The analysis of these two pairs, Ross/Alexander and Emilia/Kine, enables an insight into the identities of students who perform well in Class A. They each experience mathematics very differently, even though they all carry a significant marker of cleverness – good grades - which as we have seen has high value in this figured world. However, they differ in their positionality and how they self-author as mathematics students, both between and within each pair. I will return to discuss the complexities of identity formation in Chapter 9. But, first, we need to look at identity formation from a different point of view, in Elias and Rikke's stories. In contrast to the others, they struggle with mathematics.

Chapter 8: Elias and Rikke - 'Given the same cure for their problems in mathematics, but it only helps one'

Elias and Rikke could be called the 'returning students' because both were struggling with mathematics in 8th grade. Because of their problems, they were moved to Mr X's mathematics group in 9th grade. Both Rikke and Elias achieved grade 3 in the first semester of 8th grade, and the main impression from Miss A's assessments was that their grades were declining. After a year in Mr X's group, both were assessed to have improved their work with mathematics, and they returned to Class A in 10th grade.

By being moved to Mr X's mathematics group in 9th grade, Rikke and Elias were given the same 'cure' for their problems in mathematics in 8th grade; however, the 'medicine' seems to affect them differently. My observations in 10th grade show that Elias returns as a 'new student' with a renewed attitude to mathematics, while Rikke seems to have the same problems or, in fact, to have even more difficulty than in 8th grade. The cure seems to 'heal' Elias's problems in mathematics, while Rikke seems to become even more lost.

Introducing Elias



If an outsider were to visit Class A in 8th grade, my guess is that they would likely not pay particular attention to Elias. His actions in the classroom don't demand much attention, and on the surface, he doesn't stand out; he seems to be just one of the crowd in Class A. However,

my previous experience as a teacher of mathematics made me aware of Elias; he reminded me of one of my previous students, who nearly gave up mathematics even though his ability was good. This experience made me sensitive to the possibility that Elias might struggle with mathematics. My notes from my early observations of Class A include a red mark and an ‘OBS’ against his name, reminding me to notice Elias and what he does in Class A.

Elias’ participation in lessons was typically silent. He didn’t demand attention, either in the plenary sessions or when students worked individually. It was in the latter parts of lessons that his behaviour caught my attention, such as in the episodes presented below.

Elias seems to struggle with a task ‘praktisk oppgave om brøk’ (practical assignment on fractions). He sits ‘doodling’ in his workbook, not asking a fellow student or Miss A.

The students are practicing ‘prosentregning’ (percentage calculations). Elias slowly writes down rules and examples in his book. To me, it seems like he is avoiding starting work.

These notes gave me the impression that he wanted to hide in the classroom, away from the other students, Miss A and me. My notes show that he sits alone and include questions, such as ‘pretending to work?’ or ‘hiding his effort?’. According to my notes, he seems to be the passive partner when the students worked in pairs.

Susanne and Elias:
Don’t interact. Susanne does the work. Elias ‘hides his head’. Seems tired.

Elias and Sophie:
Does not interact. Both seem to give up. Sophie talks to Kine; Elias is looking in the middle distance.

In my few interactions with Elias, I felt it was difficult to approach him, and he exuded a sense of wanting to be left alone. His answers were short, his tone of his voice was indifferent and he seemed to avoid eye contact. I have noted the question ‘feeling like a mis-fit?’ next to his name at the end of 8th grade.

Despite these acts of avoidance in the individual parts of the lessons, the general impression from the focus group interview in 8th grade was that he was like many of the students: Elias says that he doesn’t like mathematics, and he rates it far down his list of favourite subjects. However, when he talks about mathematics and himself as a mathematics student, he catches my eye. He says that he struggles with mathematics, and he puts a label on himself: “*That’s because I’m not very good in maths.*”¹³⁶ His talk gives me the impression that he has low self-esteem in mathematics.

¹³⁶ «Det er sånn jeg er ikke kjempegod i matte.»

Elias seems to be sensitive to the teacher's assessment. He says that he finds it problematic when the teacher's feedback doesn't match his grades: *"If I get the grades, and she writes that I've done very well when I also get a bad grade, then I get so annoyed."*¹³⁷ Elias talks about having an unhappy time with mathematics in primary school as well; he couldn't do what the teacher asked: *"The teacher we had, she wasn't—she expected too much from us. On the tests she gave us, maybe there were maybe three students that could do most mathematics. They were the ones practicing at home with their parents and stuff."*¹³⁸ Despite his apparent negative attitude to mathematics, he never mentions the teaching in Class A, in either positive or negative terms. It is noticeable that he sees himself as responsible for his achievement in mathematics: *"It's like, it's kind of like that if you actually bother doing something in maths, then in a way, you can be good. And if you don't bother doing anything in maths, it's your own fault."*¹³⁹ He takes the responsibility for his achievement, and he acknowledges the importance of mathematics: *"Also, because maths is one of the most important subjects you can somehow learn, (...) because you use maths in everything."*¹⁴⁰

Elias' comments during the focus group interview leave an impression of a mixed attitude toward mathematics. He sees mathematics as one of the most important subjects, he talks about his problems and he says that he thinks the students are responsible for their own achievement. It seems that he blames himself for his low achievement in mathematics. In his diary notes after the end of year test, Elias shows a reflective attitude to his work.

1) I am happy that I managed to do almost all of the questions in Part 1 and that I remembered to write down how I arrived at the answer.
 2) I thought I was spending a little less time than I thought and the questions at the end of Part 2 I was not happy with.
 3) I wanted to complete the test or answer everything and I wanted to do well enough to get a 4.
 4) I don't think I did as well as I could have done, but I did get some questions right.
 5) I think I'll get a 3.

1) Jeg er fornøyd med at jeg klarte å gjøre nesten alle oppgaven på del 1 og at jeg husket å skrive ned hvordan jeg kom fram til svaret.
 2) Jeg syntes at jeg brukte litt mindre tid enn det jeg tenkte og oppgavene helt på slutten på del 2 var jeg ikke fornøyd med.
 3) Jeg ønsket å fullføre prøven eller å svare på alt og jeg ønsket å gjøre det bra nok til å få en 4.
 4) Jeg synes ikke at jeg gjorde det så bra som jeg kunne ha gjort det, men jeg fikk til litt.
 5) Jeg tror jeg får en 3 som får en karakter.

¹³⁷ «Hvis jeg får karakteren så skriver hun at jeg gjør det veldig bra også får jeg en dårlig karakter. Da blir jeg sånn irritert.»

¹³⁸ «Læreren vi hadde hun var ikke, det var sånn at hun forventet alt for mye av oss. På prøvene hun ga oss kanskje var det kanskje tre stykker som var sånn at de som kunne mest var de som øver hjemme med foreldrene sine og sånt.»

¹³⁹ «Det er liksom, det er litt sånn at hvis du faktisk gidder å gjøre noe i matte så er det på en måte kan du bli god. Og hvis du ikke gidder å gjøre noe i matte så er det din egen feil.»

¹⁴⁰ «Også, fordi matte er noe av det viktigste faget du kan på en måte kan lære, ..., fordi du bruker matte i alt.»

The questions Elias says he was “*not happy with*” (at the end of part 2) were questions Miss A marked as incorrect in her assessment record. Elias describes a hope of doing well in mathematics, and he wants to earn a good grade—grade 4. However, he expects grade 3, which turns out to be the grade he achieves. Elias’s words suggest that he is not happy with his results; because of the high level of achievement in Class A, Elias’ test grade is one of the lowest scores.

Miss A’s comments about Elias in her 8th grade interview do not indicate concern. She doesn’t place him among the students who struggle, and she sees him as a mediocre student in mathematics. Furthermore, she says that she considers him to be among the students who work well. However, I know from our informal discussions that she feels some concern for Elias because she views him as being cross and in a bad mood. Miss A says that she thinks that Elias performed better in primary school than in 8th grade. I asked if some students struggle with the transition from primary school, meaning whether she thinks that they might have occupied a more prominent position in primary school than in lower secondary school: “*Yes, I think Maya did, and maybe Elias did. Yes, they may be the two who stand out.*”¹⁴¹

When I returned to attend Class A in the autumn of 9th grade, Miss A told me that Elias was very unhappy and had had a breakdown during a mathematics test; he had not been able to complete any of the questions. He was transferred to Mr X’s mathematics group. Even though he was not a part of Miss A’s mathematics group during this year, she still mentioned him several times in our 9th grade discussion. Contrary to how Miss A described Elias in 8th grade, she now says that Elias is one of the students she worries about regarding mathematics. She sees him as being among the students who struggle, and she describes his work effort as low. She describes Elias and another student - a girl - as outsiders now: “*Yes, they are a bit outside. They don’t get the same contact in class; they are included, and everyone talks to them, but they’re not with the others during the breaks. Elias looks for someone else.*”¹⁴²

When Elias returned in 10th grade, I had not seen him in over a year. Initially, I felt he still avoided me a bit; however, I noted that his work habits in the lessons were different from 8th grade. He paid attention during the plenary discussions and took notes. During individual work sessions, he asked the students who were sitting nearby a question or compared answers.

¹⁴¹ «Ja, jeg tror Maya hadde det, og kanskje Elias hadde det. Ja, kanskje de to som utmerker seg.»

¹⁴² «Ja de er litt sånn utenfor, de får ikke helt den samme kontakten i klassen, de blir inkludert og alle snakker med dem, men de er ikke sammen med de andre i friminuttene. Elias søker til noen andre.»

Herman and Elias
Work together, interact during their work.

Elias and Hannah
Work on practicing a previous exam. Elias helps Hannah with Geogebra.

Elias's mood was lighter, and he approached Miss A for assistance if he got lost. My main impression was that he had a renewed motivation and attitude toward learning mathematics. I waited some time before I approached him in class. When I did, he was easy to help, and he asked concrete questions and was aware of what caused him problems.

Notes from walk in the classroom
The students worked on tasks with linear functions leading to the connection between the formula $y = ax + b$ and the graph.
Elias asked me if I could check his answers. In our talk, he was able to explain the connection between the intercept and the slope (konstantledd og stigningstall).

Notes from walk in the classroom
Elias works on algebra expressions like $(a + b)(a + b) + (a + b)(a + b)$. He asks if I could check why he didn't get the right answer. The problem was because of 'typos from one line to the next' ('skrivefeil fra en linje til den andre').

Miss A's assessment record indicated improvement as well. He performed steadily at a 4 during 10th grade. Miss A commented several times that she saw him as much happier and that she was impressed by his work. Elias seemed to have gone from being 'a mis-fit' in the classroom with the other students to being 'well-suited'. It seems that he had undergone a happy transformation.

Introducing Rikke



Giving a very different impression from Elias’s effort to avoid teachers and classmates and hide in 8th grade, Rikke was for me a highly noticeable student. An outsider visiting Class A in 8th grade would very likely pay attention to Rikke, mostly because of her typical ‘teenage’ acts: her clothing and make-up, and her ‘teenage’ talk, with its fancy expressions and tone of voice. Her acts suggested that she was conscious of the impression she made for instance, she used a fancy and expensive bag, not a school bag. Furthermore, Rikke would most likely be noticeable to an outsider because of her obvious lack of work effort.

As mentioned in Chapter 7, during my attendance in Class A in 8th grade, I became aware of a group of girls, who, as soon they had the opportunity, would shift their focus from mathematics to chatting. I labelled this subgroup of students ‘the social group’. Rikke was a central part of this group. I made some notes of typical interactions of ‘the social group’:

Group of girls are talking about what they are going to do after school when Miss A comes into the classroom. She needs to tell them twice to start the class.

Near the end of the lesson, Sophie, Josephine and Jessica keep discussing something from the ‘storefri’ (lunchbreak). Miss A tells them to keep working. They do, but some minutes later, they are back in the discussion.

Rikke and Josephine are late for the lesson, telling Miss A they had been talking to the ‘social lærer’ (social worker).

Typically, these girls were in a good mood and high-spirited. They seemed to be good friends, and if some of them had worries, these seemed to affect the entire group.

Like Elias, Rikke was a student I instinctively worried about, mostly because her focus was everywhere but her mathematics. For me, she was the ‘stereotypical teenager’, acting a somewhat ‘exaggerated’ role with her focus in several directions. She seemed to know all the students in the school. For me, she was easy to get to know, open and easy to talk to. Unlike Elias, who seemed to be unhappy and isolated in the classroom, Rikke interacted with other students. Socially, she seemed to enjoy being in the class.

Jessica, Rikke, Sophie and Kine did not start their work before Miss A approached them for the third time. Kine and Sophie started to work, Rikke was sitting doing nothing and Jessica was fixing her schedule.

Rikke and Jessica were ready for ‘friminutt’ (break time) long before the rest of the class. They had packed their bags and put on their jackets, just waiting for the bell and ready to run off.

During the plenary sessions, Rikke’s actions varied. She sometimes watched Miss A’s instruction with her fancy bag on her lap as though she was not prepared or ‘in the mood’ to pay attention to mathematics. Other times, she would pay attention by taking notes, looking like she was ready to learn. Rikke was never an active student in this part of the lesson. She never asked questions or raised her hand to answer questions voluntarily, but if Miss A asked her questions directly, Rikke answered happily if she knew the answer. If not, she would proclaim she really had no clue.

Miss A asks, ‘How do I make a 45-degree angle?’ She asks Rikke, and she answers: ‘Take half of a 90-degree angle!’.

During a plenary session about how to construct a square, Miss A asks Rikke directly, ‘What is the next step here?’ Rikke answers (straight out) ‘I really don’t have a clue’.

During individual work sessions, Rikke’s actions also varied from working on task after task to not focusing at all. I noted that she mostly chose level 1 tasks, and she rarely finished the list. During my walk in the class in 8th grade, I noticed that Rikke seeks to lean on other students during individual practice. At the beginning of individual sessions, Rikke would talk to her ‘neighbour’, apparently trying to do the work with the student sitting next to her. However, she easily lost focus, which could either result in doing little work or talking with someone nearby who had the same outlook. If the students could choose who to work with, she was quick to move to one of her friends. The impression I got was that this was not fruitful: they continued to talk about everything other than the mathematics they were supposed to do. If they were ‘caught’, Rikke easily admitted that they were not doing the work.

Notes from my walk in the class
Rikke and Josephine work together.
Occupied by talking. When the teacher or I
move in their direction, they suddenly talk
about maths and act like they are doing
maths.

Miss A asks Rikke and Sophie how they
are getting on with the work. Rikke smiles
and says, 'Not very well. Come on, let's
do some work'.
Some minutes later, they are back to
talking.

My impression of Rikke was that she was vulnerable to who she was working with. If the other student was working and focusing on the mathematics, she tried to follow; however, if the other student was not working, Rikke was easy to disturb. If Rikke was focusing, she could be eager to ask for assistance. She easily asked me for assistance and was open to my approach. Her questions could be unspecific, such as “*Here, I don't know what to do*” or “*I don't understand a single thing in this!*” or “*I don't remember how to do this.*” We most often needed to go a step back before I could help her. Rikke seemed happy when she was getting answers right. If she managed to do a task independently, she would sometimes look at Miss A or me with a smile or an expression that conveyed “*I did it.*” Other times, she would seem to be exhausted if she had done several tasks one after another, and her expressions seemed to convey, “*Now, I have done a lot of serious work. I deserve a break!*”

During the focus group interview in 8th grade, Rikke states that she doesn't like mathematics and explains that “*I'm not interested in it.*”¹⁴³ She is not sure where to rate mathematics on her list of favourite subjects: “*Ehh, I don't quite know which place, but it would be pretty far down.*”¹⁴⁴ She places it as one of the four least interesting subjects on her list. The students discuss when they do and don't enjoy mathematics. Rikke adds that “*maths makes me lose some motivation.*”¹⁴⁵ I ask the students to choose adjectives to describe mathematics, and in contrast to most students who contribute both positive and negative words, Rikke says: “*I would have chosen boring, tiring, challenging and dry.*”¹⁴⁶ All the words convey a negative attitude toward mathematics. When I sum up this part of the conversation, to see if the students can agree on something, I hint that it seems like they all agree that mathematics is useful. Rikke replies “*I haven't noticed that much lately.*”¹⁴⁷ She adds “*Eh, maths, I feel like the only thing we need is stuff like that in the store and stuff.*”¹⁴⁸ The majority of students in this group agree

¹⁴³ «Jeg er ikke interessert i det.»

¹⁴⁴ «Ehh, jeg vet ikke helt hvilken plass, men det hadde vært ganske langt ned,»

¹⁴⁵ «Matte gjør at jeg mister litt motivasjon.»

¹⁴⁶ «Jeg ville valgt kjedelig, slitsomt, utfordrende og tørt.»

¹⁴⁷ «Jeg har ikke merka så mye til det i det siste.»

¹⁴⁸ «Eh, i matte så føler jeg at det eneste vi har bruk for er sånn i butikken og sånt.»

that mathematics is an important subject, but Rikke says, “*It’s important, but I don’t feel like I need it,*”¹⁴⁹ and she underlines ‘I’.

Rikke describes herself as a mathematics student during the focus group interview. She says “*I can give up very easily. If I know I’m not getting it, I’ll go to the next one.*”¹⁵⁰ She added that mathematics tests are stressful: “*I’m afraid I’ll forget everything if I have crammed for a maths test. In the semester test, if I forget it, I often get very stressed, and then I sit and think hard about it, and I lose a lot of time and then I get stressed too, that I won’t complete it.*”¹⁵¹ She describes being uncomfortable when doing mathematics, and it is as though she stories herself as different from the majority of the class when she adds: “*We have that maths class feel.*”¹⁵² Rikke’s view of her work in mathematics is evidenced by her diary notes after the end of year test in 8th grade.

1) I’m not super happy, but I am happy with what I felt went well.
2) I spent quite a bit of time completing the assignments and the entire semester test, but that’s because I’m not thinking about getting done quickly or making a plan. I spend the time I need, and if I feel I have given everything I can or if I can’t do any more, then I stop.
3) My ambitions or goals for this test were to do my best and not give up on a task right away but try, and I felt that I managed that.
4) I think my work was fine, but I was just doing my best.
5) I hope I get higher than I got last year, I hope 3-4, but it’s a bit hard to get. I think it’s easier with a test that involves 1-2 sections, so I feel I do much better on small tests than on the semester test, on such large tests there is so much to remember

1) Jeg er ikke super fornøyd men jeg følte at jeg var fornøyd med det jeg følte gikk bra.
2) Jeg brukte ganske mye tid på å bli ferdig med oppgavene og hele tentamen, men det er fordi jeg tenker ikke på å bli fort ferdig eller legge meg en plan. Jeg bruker den tiden jeg trenger og hvis jeg føler at jeg har gitt alt jeg kan eller hvis jeg ikke kan mere så slutter jeg.
3) De ambisjonene eller målene mine for denne prøven var å gjøre mitt beste og ikke gi opp i en oppgave med en gang men prøve og det følte jeg at jeg greide.
4) Jeg synes arbeidet mitt ble helt greit men jeg gjorde bare mitt beste.
5) Jeg håper jeg får høyere enn jeg fikk i fjor, men håper 3-4 men det er litt vanskelig å få.
Jeg synes det er lettere med en og en prøve som innebærer 1-2 kapitler så jeg føler jeg gjør det mye bedre på små prøver enn på tentamen sånn stor prøver så er det så mye og huske.

Her attitude is straightforward, she talks about doing her best and trying not to give up. Rikke doesn’t mention any strategies but rather an attitude of trying. When she can’t do any more, she just stops. Rikke’s words indicate a hope for her grade to be better than it actually is, but she seems to admit that it is an unrealistic goal. The impression of being uncomfortable when doing mathematics is noticeable at the end of her notes. She explains that large tests make it difficult

¹⁴⁹ «Det er viktig men jeg føler ikke at jeg får så brukt for det.»

¹⁵⁰ «Jeg kan gi opp veldig lett, hvis jeg kjenner at jeg ikke får til går jeg til neste oppgave.»

¹⁵¹ «For jeg er redd for å glemme alt hvis jeg har pugga til en matteprøve, på tentamen, hvis jeg glemmer det blir jeg ofte veldig stressa og så sitter jeg veldig ofte og tenker veldig godt om også mister jeg mye tid og så blir jeg stressa for at jeg ikke skal rekke det.»

¹⁵² «Vi har sånn matteklasse føler jeg.»

for her to remember. Although other students may have felt the same, she is the only one to express this in her diary notes. My impression is that it was important for her to say this because she wanted to explain her problems with the end of year test.

Miss A is clearly concerned about Rikke. During the 8th grade interview, she expresses a general worry. She says that Rikke's work effort is low and adds that she is one of three students she assesses as having problems with mathematics. Miss A explains Rikke's problems: "*Rikke and Jessica have so much to do that I think they think it's an unrealistic workload.*"¹⁵³ Miss A is worried about Rikke's learning in the future as well. I ask her which of the students she would be concerned about regarding the exam in 10th grade: "*I have been worried about Rikke, and Hannah. Yes, those are the two.*"¹⁵⁴ Miss A is not worried for Rikke socially. She says that she sees Rikke as being among the popular students in the class.

At the end of 8th grade, a decision was made that Rikke would get extra help in 9th grade by joining Mr X's group of students who struggle in mathematics. I didn't meet with Rikke during the mathematics lessons in 9th grade, but Miss A talks about her during the 9th grade interview. Although she didn't mention it in 8th grade, she tells me that she thinks the pressure of grades affects Rikke more in 9th grade, and she mentions her as one of three students she is worried about: "*Rikke is pretty weak academically across the board, so she takes it hard now. (...) Yeah, so we are a little scared of losing her now because she has so many failures compared to her girlfriends.*"¹⁵⁵ Although she sees Rikke as still one of the popular students in the class, she says that her situation is different from the others. Rikke's problems in achievement are not shared by her friends. Miss A's concerns for Rikke now include her social position as well.

However, Miss A's talk about Rikke is not all negative. She tells me that being a part of Mr X's group in 9th grade seems to have been good for her: "*Jessica and Rikke have been in a small group, and it has helped them a lot. So, they have both improved one grade, from 2 to 3, and now they are coming into the class again from the fall.*"¹⁵⁶ (In fact, Jessica remained in Mr X's group in the 10th grade). However, in 10th grade, Rikke's situation in Class A changed. 'The sociable group' had lost two essential figures in the maths lessons in 9th grade, Jessica and Rikke. The rest of this group was marginalised, and vanished as a subgroup. My observations

¹⁵³ «Rikke og Jessica har så stor jobb å gjøre at jeg tror de synes at det er en uoverkommelig arbeidsmengde.»

¹⁵⁴ «Jeg hadde vært bekymra for Rikke, og Hannah. Ja det er de to.»

¹⁵⁵ «Rikke er ganske svak faglig over hele linja, så hun kjenner veldig på det nå. (...) Ja, så hun er vi litt redd for å miste nå for hun får som mange nederlag i forhold til venninnene sine.»

¹⁵⁶ «Jessica og Rikke har vært ute på liten gruppe og det har hjulpet dem veldig mye. Så de har gått opp en karakter begge to, fra 2 til 3 og nå skal de inn i klassen igjen fra høsten.»

of Rikke in 10th grade are that she is more of a silent and invisible student. She mostly occupies her usual seat in the classroom, and she doesn't move around much. She seems to me to be more isolated in the classroom and not as communicative with the other students as she was in 8th grade.

It is indicative that my fieldnotes from 10th grade do not mention Rikke often. The notes I have involve questions next to her name, such as 'given up?', 'lets her thoughts wander?' or 'does she think this is difficult?'. I have no notes of any mathematics conversations between me and Rikke, and my impression is that she doesn't often ask any more for assistance when she needs it. All this suggests that her attitude in the classroom has changed. She is far less noticeable in the classroom. Miss A's achievement record indicates that her grades are not improving; she still gets grade 2. Miss A was again concerned for Rikke, taking the initiative of asking the management for extra help for her. During the winter of 10th grade, Rikke was moved to Mr X's mathematics group again. Unlike Elias's renewed positive attitude toward mathematics when he returned to Class A in 10th grade and his improvement in his performance, Rikke became an invisible student in mathematics with no improvement in her achievement. It seems like there is no lucky transformation for her in this story.

Elias's story

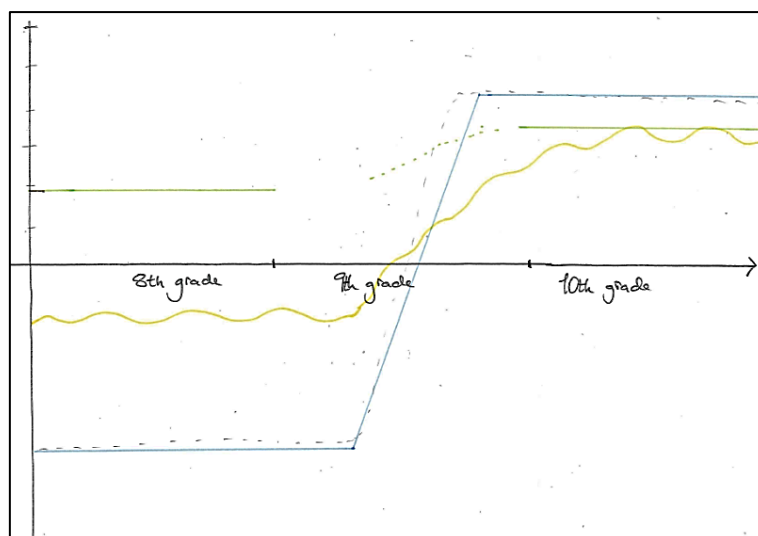


Figure 13. Elias' timeline: blue is feeling about mathematics, green is grades, yellow is effort

Elias's timeline presents a story of someone who seems to have gone through a major transformation. The blue timeline is marked by a very low straight line in 8th grade, indicating a problematic time with mathematics, jumping to a mirror-image high level 10th grade, showing that the situation has completely changed. The 9th grade is a period of change, and Elias describes how his relationship to mathematics, his work-effort and his result all improved by the end of 9th grade, when he was in Mr X's class. Elias talks about Mr. X as a key person in this transformation, but as the analysis of his story shows, particularly in terms of his positioning in the class and his self-authoring, his story has more to offer than just the importance of the teacher.

Elias's 8th grade situation - left alone

At the beginning of our conversation I ask Elias what is the first thing that strikes him, given our topic "Mathematics in lower secondary school." His immediate reaction to this is to talk about how he felt at the beginning of 8th grade, "When I first started in 8th grade then I couldn't do maths."¹⁵⁷ I ask if this was based on his situation at the end of primary school and he adds:

*"In primary school, I didn't understand very much, and the teacher we had was a good teacher but I just couldn't keep up with the class, what she was doing, and the maths tests we had in primary school, I knew nothing. But it got worse when we started 8th grade, there wasn't much I could do, so I only got grade 2 on the tests we had."*¹⁵⁸

¹⁵⁷ «Når jeg først begynte i 8.klasse da klarte jeg ikke matte.»

¹⁵⁸ «På barneskolen, så forstod jeg ikke veldig mye, og læreren vi hadde hun var en god lærer, men bare jeg klarte ikke å følge med i timen, på det hun gjorde, og matteprøvene vi hadde på barneskolen, jeg kunne ingenting. Men så var det når vi begynte i 8.klasse, så var det ikke så mye jeg kunne så jeg fikk bare 2-ere på de prøvene vi hadde.»

Elias takes direct and sole responsibility for his problems with understanding mathematics, emphasizing that the teacher was good, but it was he who “*couldn't do maths*” and “*didn't understand*”. As Elias draws the blue timeline and describes his relationship to mathematics, he tells me how this was constantly at a negative level in 8th grade, and he describes his feelings about mathematics at that point:

*“Well, when I was down there it was, I couldn't understand maths, I couldn't, it wasn't fun. After all, it's not fun to work with a subject when you don't know what to do.”*¹⁵⁹

Elias continues to use black and white expressions of how he wasn't able to do or understand mathematics in 8th grade; he says he had no strategy for how to deal with mathematics, and felt demotivated by this situation: “*because it's no fun to sit in the class in a lesson that's boring, because then I can't concentrate.*”¹⁶⁰ Elias's stories himself as having little motivation and little confidence as a mathematics student at this point. He self-positions as a student who is not able to do mathematics in 8th grade, and his talk suggests a limited amount of agency.

Elias's work-effort timeline reflects the same pattern as his relationship with mathematics, and he estimates his work effort in 8th grade as much lower than his 10th grade effort. However, he also sees it as much greater than his relationship to mathematics in 8th grade; he did at least try in the 8th grade: “*I tried in 8th grade, I didn't make it, but at least I tried.*”¹⁶¹ He draws the yellow timeline below neutral, and he repeats: “*But I tried*”¹⁶². It seems to be important to him to say that even if he couldn't do mathematics in 8th grade, he really did try: “*It wasn't like I didn't want to improve my situation, I tried a bit in class*”¹⁶³. Elias's words emphasise how he wanted to change his situation, there is a sense of motivation in his talk. He reports that his work effort was similar at home, although he “*just did homework*”¹⁶⁴. His work didn't pay off, but as Elias says, at least he didn't get worse: “*It [the situation] remained the same throughout the 8th grade, because I didn't get any worse in maths by trying.*”¹⁶⁵

However, when we come to the subject of his grades in 8th grade, the talk of motivation changes. Contrary to his emphasis on how he tried and didn't want to get worse, his attitude is very different when he talks about his grades. Describing how he tried to ignore the fact that his

¹⁵⁹ «Vel, når jeg var her nede så var det jo, det gikk ikke å forstå matte, jeg kunne det ikke, det var ikke noe gøy. Det er jo ikke noe gøy å jobbe med et fag du ikke vet hva du skal gjøre i.»

¹⁶⁰ «Ja, for det er ikke noe gøy å sitte inne i en time som er kjedelig, for da er klarer jeg ikke å konsentrere meg.»

¹⁶¹ «Jeg prøvde i 8.klasse, jeg fikk det ikke til, men jeg prøvde hvert fall.»

¹⁶² «men jeg prøvde.»

¹⁶³ «Det var ikke sånn at jeg ikke hadde lyst til å gjøre det bedre, jeg prøvde litt i timene.»

¹⁶⁴ «Men gjorde bare lekser.»

¹⁶⁵ «Den [situasjonen] var jevn i hele 8.klasse, for jeg ble ikke verre i matte av å prøve.»

grades were poor, he says: *“I didn't really care because I didn't like maths (...) Then I just got the grade and threw it away.”*¹⁶⁶ I ask if he was frustrated by this, and he says: *“No, I just didn't like it [maths]”*¹⁶⁷ and an indifferent attitude to mathematics emerges: *“In 8th grade, I didn't really care.”*¹⁶⁸ As he talks about his mathematics achievement in 8th grade, the tone of Elias's talk reveals no motivation for changing his situation, he doesn't care.

Elias stories as having little access to resources that could help him. His parents weren't involved: *“neither my mother nor my father was very interested in school in 8th grade,”*¹⁶⁹ and he didn't try to involve them in his problems, either: *“I kept it mostly to myself.”*¹⁷⁰ Elias's position in the class in 8th grade, also left him without help: *“In 8th grade, not everyone knew each other, there were a few small groups working together and helping each other.”*¹⁷¹ There weren't many students in the class who he was comfortable to work with, to ask questions and discuss with: *“It was like the ones I went to primary school with, maybe three people.”*¹⁷² Elias says that he didn't belong to a group in the class, and he couldn't ask just anyone if he was struggling with a problem. Elias's talk implies a fragile positioning in Class A, and he seems to have little access to help from the other students in the class.

Elias's talk about 8th grade suggests that he doesn't have much agency as a mathematics student. He conveys little confidence, he lacks strategies, he lacks resources to draw on both at home and in school, and his motivation is low. He self-authors as being lost in 8th grade, with little hope, and he doesn't benefit from potential resources surrounding him. He seems left alone.

Elias in the 10th grade – a new situation

However, when Elias describes his 10th grade situation, a contrasting picture of his positioning and self-authoring in Class A emerges. His new attitude to mathematics is obvious when he talks about which subject he would prioritise as the subject for his final written exam: *“I think I'll be happy if I can do my written exam in maths.”*¹⁷³ He explains why he would prefer to take mathematics for his written exam, rather than Norwegian or English:

¹⁶⁶ «Jeg brydde meg egentlig ikke om det for jeg likte ikke matte. (...) Da fikk jeg bare karakteren og kastet den bort.»

¹⁶⁷ «Nei, jeg bare likte det [matte] ikke.»

¹⁶⁸ «I 8.klasse da brydde jeg meg egentlig ikke.»

¹⁶⁹ «For det var, for hverken moren eller faren min var veldig interessert i skolen i 8 klasse.»

¹⁷⁰ «Jeg holdt det mest for meg selv.»

¹⁷¹ «I 8.klasse var det ikke alle som kjente hverandre, det var litt små grupper som jobbet sammen og hjalp hverandre.»

¹⁷² «Det var sånn de jeg gikk på barneskolen med, kanskje 3 stykker.»

¹⁷³ «Jeg tror jeg blir glad hvis jeg kommer opp i skriftlig matte.»

“It's a bit mixed, it's because I think it's more fun to do the semester test in maths, and also I think that the Norwegian exam will be both Bokmål and New Norwegian which will be stressful, and English won't be as stressful, and I think it's better to practice for mathematics.”¹⁷⁴

Elias uses the term “*more fun*” to describe the possibility of doing his written exam in mathematics, in comparison with other subject, and he describes the preparation he needs to do in advance of an exam in positive terms. Both of these comments imply a renewed motivation for mathematics in the 10th grade, and he laughs when he imagines how he would have felt in 8th grade about doing a written exam in mathematics: *“Then it would be quite the opposite.”¹⁷⁵*

The transformation in Elias's situation is obvious in the way the three timelines develop from 8th to 10th grade. As he draws the blue timeline in 10th grade he describes a positive attitude, rating it as 7 out of 10: *“I'm definitely up there on the positive side (...) from about the end of 9th grade.”¹⁷⁶* His obvious negative relationship to mathematics in 8th grade has changed completely to an unequivocally positive relationship. In contrast to 8th grade, he says: *“Yes, now I think maths is fun”¹⁷⁷*, and as he elaborates on this new attitude, several distinctions emerge:

“The further up it [the motivation] goes the more fun it becomes, because the more you can do the more tasks you can solve, because you use a lot of what you have learned earlier, and then it's not so long since you learned it, you can do it automatically”¹⁷⁸

Elias's 8th grade situation, storied as a lack of strategies, inability to do mathematics and the impossibility of understanding, is now renewed. Now, in 10th grade, he reports the opposite. He has knowledge, he understands, and he can do mathematics. His words reveal a new confidence, and indicate a self-positioning as an able student who has the capacity to do mathematics. He describes how things changed on his return to Class A after a year in the small group:

“It's a lot better now because I understand what we're working on from the start, and then I'm able to learn a bit more (...) Well, I try to understand it a bit better, I read it through, because that's how you know how to work out the answer before you begin the

¹⁷⁴ «Det er en liten blanding, det er fordi jeg synes det er morsommere å ha mattetentamen, og så føler jeg at norsk eksamen blir både bokmål og nynorsk, det blir stressende og engelsk blir ikke like stress og jeg synes det er bedre å øve til matte.»

¹⁷⁵ «Da ville det blitt helt motsatt.»

¹⁷⁶ «Jeg er definitivt her oppe på plussiden (...) fra ca slutten av 9 klasse.»

¹⁷⁷ «ja, nå synes jeg matte er gøy.»

¹⁷⁸ «Jo lengere opp det går jo morsommere blir det for du kan jo mer, du kan gjøre flere oppgaver for du bruker mye det du har lært, lært fra før da, da er det nyere for da kan du det automatisk.»

problem, I usually read through it a bit and understand it a bit and talk to someone else about it.”¹⁷⁹

Elias is capable of pushing himself onwards when he is doing mathematics, and he talks about his strategy in advance of solving a problem. He expresses a sense of agency in this situation as he describes how he reads through a problem and works out the calculations he needs to do in advance, discussing with other students. He is able to benefit from resources both inside and outside of himself, reporting on how he can collaborate with the other students when he needs someone to discuss with, regardless of who it might be: “*Now in 10th grade you can ask anyone for help (...) I can turn around in any direction to ask about a problem.*”¹⁸⁰ There is no more talk of obstacles concerning a lack of potential students he can work together with. His fragile position in 8th grade is gone, and he now positions himself as belonging in Class A.

Elias’s story now reveals a confidence and improved motivation as a mathematics student in direct opposition to his 8th grade situation. He partially accepts my suggestion that this feeling of accomplishment is central to his transformation, but he adds: “*It’s not that I manage to solve all the exercises, but it’s still fun to try to solve them even if I don’t get it.*”¹⁸¹ Elias is not just concerned to get the right answer, he expresses joy when he tries to solve problems; it seems that mathematics now holds intrinsic motivation for him.

Not only has Elias’s positioning in Class A completely changed in that he is no longer alone; he also reports a new involvement from his parents: “*My mom is pleased that I do homework and stuff, and my dad wants me to get my grades up a lot.*”¹⁸² Elias comments particularly on his father: “*Yes, he’s much more involved [in my work] now.*”¹⁸³ I ask him how he feels about his parents’ involvement, and he says: “*Actually, really good.*”¹⁸⁴ He also says that he gets other help with mathematics at home: “*We have a tutor at home, who can help me if I don’t understand.*”¹⁸⁵ He comments on how he benefits from the work he does at home, “*It does, it really helps to do homework.*”¹⁸⁶, emphasizing how he finds homework *really* useful.

¹⁷⁹ «Nå har det blitt mye bedre siden jeg først forsto hva vi jobber med, og så klarer jeg å lære meg litt mer (...) Vel, jeg prøver å forstå det litt bedre, jeg leste gjennom, for det er slik det sier litt om hvordan jeg skal beregne oppgaven før oppgaven begynner, jeg leser vanligvis litt gjennom den og forstår den litt og snakker med noen andre om den.»

¹⁸⁰ «Nå i 10 kan man spørre hvem som helst om hjelp (...) jeg kan snu meg hvilken som helst vei å spørre om en oppgave.»

¹⁸¹ «Det er jo ikke sånn at jeg klarer å løse alle oppgaver, men det er fortsatt gøy å prøve å løse oppgavene selv om jeg ikke får det til.»

¹⁸² «Moren min liker at jeg gjør lekser og sånt, og faren min vil at jeg skal få opp karakterene mine veldig mye.»

¹⁸³ «Ja, han er mye mer involvert [i arbeidet mitt nå] nå.»

¹⁸⁴ «Egentlig, veldig bra.»

¹⁸⁵ «Vi har en sånn hjelpelærer hjemme, en som kan hjelpe meg hvis jeg ikke forstår.»

¹⁸⁶ «Det gjør det, det hjelper *virkelig* å gjøre lekser.»

Elias also says that his work effort has improved, when he draws the yellow line in 10th grade: *“It’s definitely positive (...) I’m trying a lot harder.”*¹⁸⁷ He agrees with my suggestion that his attitude towards work has changed and he says that he is happy with his improvement as shown in his results: *“At the start of 10th grade I was assessed with high level of achievement, and on the semester test I got grade 4, and that was partly because the tasks we got weren’t quite what I had revised, so it was a bit ...”*¹⁸⁸ - he thinks that he could do even better than grade 4.

Elias’s situation as a mathematics student is thus totally transformed from 8th to 10th grade. In addition to the improvement in results, he talks about several changes in his relationship to mathematics: he has strategies for doing mathematics, and he is able to benefit from resources inside of himself, in the figured world of Class A, and at home. His previous self-authoring as lost with little hope is now exchanged for a portrayal as a confident member of the class who is in charge of his work and enjoys doing mathematics. He is intrinsically motivated and he expresses a sense of agency as he positions himself positively as a student in the figured world of Class A. This new attitude is seen in the way he closes our conversation. I ask if he wants to add anything, and he says: *“Yes, there is something about the best thing about maths, when you do maths, is that you can always solve the problem even if you don’t think you can.”*¹⁸⁹

9th grade – Elias’s year of change

At the beginning of 9th grade, Elias was transferred to a group for students who struggle with mathematics in the ordinary lessons. In this group there were around 4-6 students and one teacher, Mr X. Elias thus entered into a different figured world, with different norms, rules and values from those in Class A. Drawing the timelines, Elias describes his situation in the beginning of 9th grade:

*“It was a bit stressful trying to know something I couldn’t, learning something I couldn’t, because when I first started with Mr. X we started with equations, and I didn’t understand it at all at first, but we worked so much with equations that when we were here (Mid-term 9th grade) I started to understand it.”*¹⁹⁰

¹⁸⁷ «Den er definitivt positiv (...) jeg prøver veldig mye hardere.»

¹⁸⁸ «På starten av 10 klasse fikk jeg høy måloppnåelse, og på tentamen vi hadde fikk jeg 4 og det var litt fordi at de oppgavene vi fikk det var ikke helt det jeg hadde øvd på, så det var litt..»

¹⁸⁹ «Ja, det er noe med det beste med matte, når du gjør matte, det er sånn at du alltid kan løse oppgaven, selv om du ikke tror det.»

¹⁹⁰ «Det var litt stressende det å prøve å kunne noe jeg ikke, det å lære noe jeg ikke kunne, for det var jo når jeg først begynte med Mr X så begynte vi med likninger, og jeg forstod det ikke i det hele tatt på starten, men vi jobbet såpass mye med likninger at når vi var her ca så begynte jeg å forstå det.»

Elias doesn't report any immediate improvement of his situation as a mathematics student. Just as when he talks about 8th grade, he uses starkly negative expressions to describe his feelings at the beginning of 9th grade. However, as he goes on to talk about how the situation developed during the year, Elias starts to use words which suggest a renewed relationship to mathematics. His black and white talk from 8th grade is now replaced with a lot of details about how it all works. He describes how he starts to understand, suggesting new confidence due to the slower pace of the teaching. He has time to develop his understanding of equations, and a new tone in his account of 9th grade starts to emerge:

“Yes, because we worked with equations for a very long time, many months, even after Christmas. But then we had a few lessons with something else, but we kept coming back to equations. Equations were a fixed point.”¹⁹¹

Having time to develop a deeper understanding in this one topic seems to be important in Elias's relationship to mathematics. The “fixed point” of equations appears to fuel his confidence and his development of strategies for solving problems: mastering equations has spin-offs for his feelings about mathematics:

“But it was more like that, after we had learned equations we had to use different ways to do multiplying and plus and lots of things, and when we did several tasks, where we had to use all the four types of calculations in equations, it was much easier to use it in other types of tasks that we learned and then it was not as difficult to learn about it.”¹⁹²

A new tone appears in his talk as he describes how it was not difficult to understand, and how after half a year in the group the situation improved: *“I spent some time understanding it (...) It was around, it was a bit after Christmas that my grades started to go up.”¹⁹³*

He also reports that his work-effort changed around the same time: *“It was a bit before Christmas in 9th grade, it wasn't that hard to work on the further topics, I just had to get into the maths and I had to spend a lot more time than I thought.”¹⁹⁴* Elias describes how he benefited from the work with equations and accepts the work he needs to do with a new

¹⁹¹ «Ja for vi jobbet med likninger veldig lenge, mange måneder, til og med etter jul. Men så hadde vi noen timer med noe annet, men kom hele tiden tilbake til likninger. Likninger var et holdepunkt.»

¹⁹² «Men det var mer sånn, etter at vi hadde lært likninger så måtte vi bruke forskjellige måter og gange og pluss på og masse sånt, og når vi gjorde flere oppgaver, i vi måtte brukte alle de fire regneartene i likninger så var det mye lettere å bruke det i andre typer oppgaver, som vi lærte og da var det ikke like vanskelig å lære om det.»

¹⁹³ «Jeg brukte litt tid på å forstå det (...) Det var jo rundt, det var litt etter jul at karakterene mine begynte å gå opp.»

¹⁹⁴ «Det var litt før jul i 9.klasse, det var ikke like vanskelig å jobbe med de videre temaene, jeg måtte bare komme inn i matten og jeg måtte bruke mye mer tid enn jeg trodde.»

motivation - he accepts that there is no quick fix. He credits the teacher for the improvement in his attitude to mathematics, and he repeats several times how he made mathematics fun:

“It was maybe because Mr X did it in a more fun way, it wasn't quite like working with just maths. He also played a part, he showed a lot on the board, he explained it pretty thoroughly on the board.”¹⁹⁵

Elias's talk of 9th grade describes how he is a part of the teaching, he doesn't just try alone. In contrast to his time in 8th grade, when he found lessons boring and difficult to concentrate in, he enjoyed the mathematics lessons in the small group: *“Yes, it was nice. (...) It wasn't boring to be in his class.”¹⁹⁶* He repeats several times that the lessons were fun, and he describes a good relationship between the teacher and the students. Furthermore, Elias reports that he appreciates the variation in the way they work with mathematics in the group:

“That was the way Mr X taught maths, that is, the lessons were very varied, one lesson we did a lot of maths, another lesson we could take some time. So was a bit like that sometimes we made jokes, and then seriously other times (...) We did problems, but we didn't do problems from the book. He had problems he wrote on the board that we would solve.”¹⁹⁷

In contrast to how Elias positioned himself in Class A in 8th grade, he stories as being included the life in the figured world of the 9th grade group. He confirms my suggestion that his improvement in 9th grade is based on mathematics being fun, and the variety, that Mr. X used time to explain and it was an easygoing atmosphere.

Furthermore, his indifferent attitude to mathematics changes during 9th grade as well. Elias describes how, in assessments, students received feedback but not grades. His feeling of accomplishment rises: *“I managed at least several of the tasks that would have been if it was 8th grade. (...) I think it was great to actually know that I could manage to do it right.”¹⁹⁸* This feeling of accomplishment seems to lead to a new motivation for mathematics and he confirms my suggestion that to be able to deal with the mathematics meant something to him.

¹⁹⁵ «Det var det kanskje fordi Mr X gjorde det på en mer gøyere, det var ikke helt sånn at det var å jobbe kun med matte. Det var også hadde han en del, han viste mye på tavlen, han forklarte det ganske grundig på tavlen».

¹⁹⁶ «Ja, det var fint (...) Det var ikke kjedelig å være i timene hans».

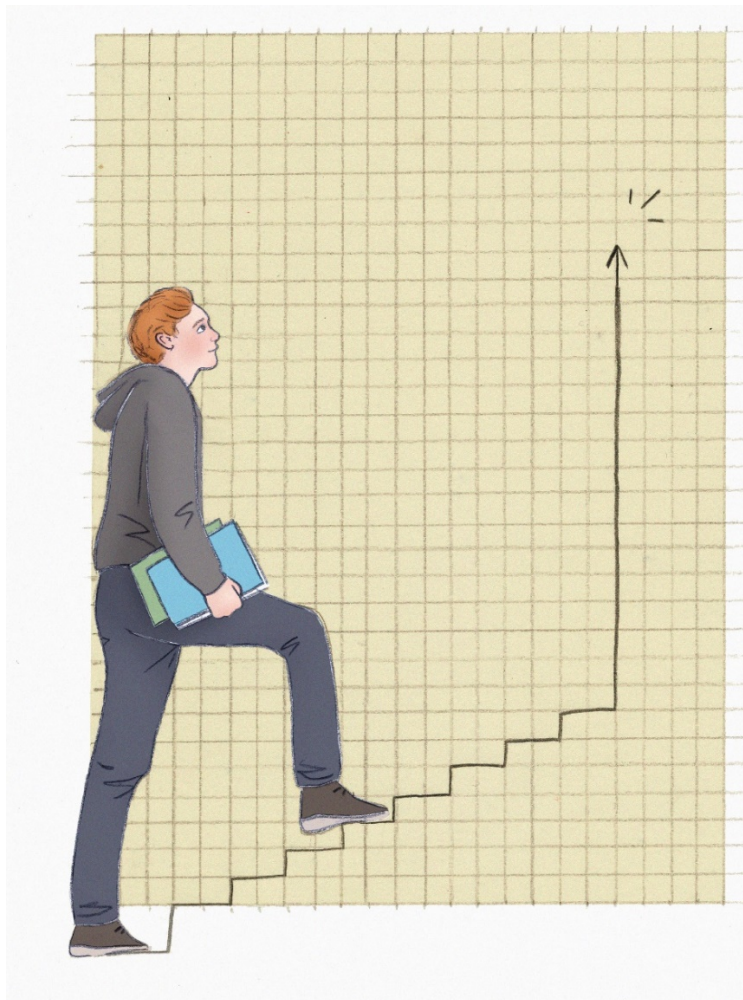
¹⁹⁷ «Det var måten Mr X lærte på, det var, timene som ble veldig varierte, en time kunne vi jobbe veldig med matte, en annen time kunne vi tulle litt. Så var litt sånn useriøst noen ganger, og så seriøst andre ganger (...) Vi gjorde oppgaver, men vi gjorde ikke oppgaver fra boka. Han hadde oppgaver ham skrev opp på tavla som vi skulle løse»

¹⁹⁸ «Jeg klarte i alle fall flere av oppgavene det ville ha vært, hvis det var 8 klasse. Jeg synes det var gøy å vite at jeg ville klare å få til oppgavene.»

Summary: A lucky transformation

Elias' story about change represents the scenario most would wish to go through if the situation in mathematics was difficult in the beginning of lower secondary school. As seen in his timeline, his situation transforms during 9th grade, and his talk about 10th grade expresses a new sense of belonging and a positioning of self, distinct from his fragile 8th grade positioning. Elias is the main character in his story, even in the problematic time in 8th grade.

Elias stories himself as gaining confidence and motivation during 9th grade. He describes how he benefits from the teaching in Mr. X's group, and this enables him to develop strategies for mastering mathematics. It seems as though Elias' change is about the content of mathematics. His new feeling of accomplishment accompanies his exchange of a lack of agency in 8th grade for a new agency as a mathematics student during 9th grade, as he moves from being in a hopeless situation towards a confidence in his own ability to do mathematics. This feeling remains even when he returns to Class A in 10th grade, and his lucky transformation during 9th grade is more than just a temporary feeling of improvement.



Rikke's story

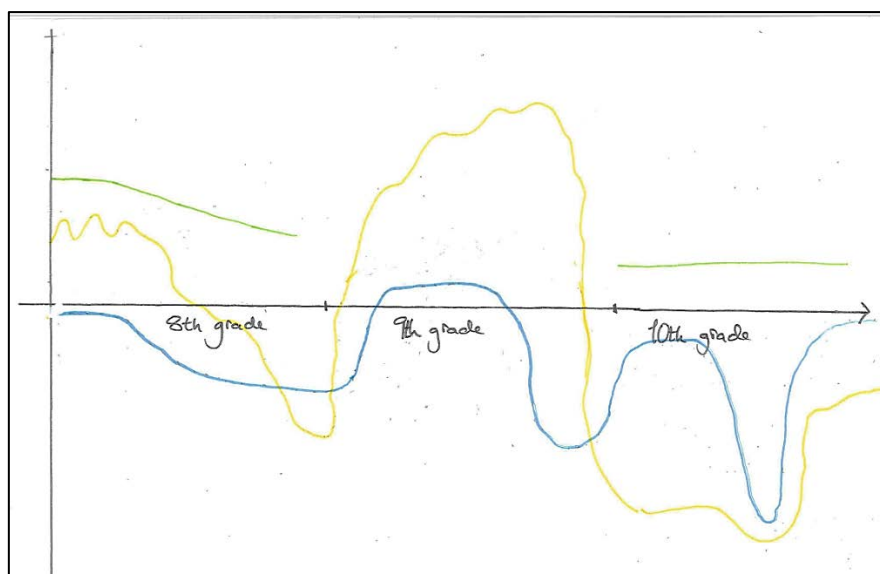


Figure 14. Rikke's timeline: blue is feeling about mathematics, green is grades, yellow is effort

Rikke's timelines as a student in mathematics in lower secondary school indicate a difficult time. Although they report improvement in 9th grade, there is no happy ending. Like Elias, Rikke describes a difficult time as a mathematics student in 8th grade, and also like him she is transferred to the 9th grade group with Mr. X, and this is when her situation in mathematics improves. However, she describes having a problematic time at the end of 9th grade in general, as seen in her blue timeline. Because of the improvement in her grades, she has to return to Class A in 10th grade, but unlike Elias, the improvement she has experienced during 9th grade doesn't last. Her problems from 8th grade return, and in the spring of 10th grade, she is once again transferred back to Mr. X's group. Unlike Elias, there is no happy ending, and Rikke continues to lack a place to be in mathematics – she can never belong.

Rikke – “this is me”

“Now, I think things are a bit bad with my maths, but I'm learning a lot from Mr. X, but it's a bit late to learn everything now, you see. After all, there's only one month left now.”¹⁹⁹ This is Rikke's first response to my presentation of the topic for our talk, “Mathematics in lower secondary school.” Rikke immediately sets a pessimistic tone in the way she stories as a mathematics student, as someone with little hope for her situation now she is so near the end of her time at this school. However, as she introduces Mr. X, her tone becomes rather brighter, and her introduction of him so early in her narrative underlines his importance for her. However,

¹⁹⁹ «Nå synes jeg det går litt dårlig med min matte da, men jeg lærer mye av Mr. X, men det er litt sent å lære alt nå, skjønner du. Det er jo liksom bare 1 måned igjen nå vel.»

despite the optimism associated with Mr. X in Rikke's talk, the general impression is that she struggles as a mathematics student in lower secondary school, and that it is too late for change.

The hopeless tone returns when she imagines how it will be if she has to do her written exam in mathematics in the end of 10th grade:

“Ahh, I don't know, I'm going to get very stressed because, well, that's when I think I'm going to get a 2, so then I'm not going to feel good about that, but I'm going to do the best I can, because that's always what I do in semester tests. Also, I think that if I can't do that problem, then I have to go to the next one, so I'm going to be a bit unhappy.”²⁰⁰

Rikke is emotional in her talk. She is anxious about getting a low grade, even though she will do her best. She stories as having no agency or authority in this situation, and it is as though she describes her destiny as a mathematics student as someone who will never succeed. Rikke's talk reveals that she is vulnerable. She is not indifferent to mathematics, it affects her feelings. The possibility that she might need to do a written exam in mathematics reveals her lack of confidence and motivation as a mathematics student at the end of lower secondary school.

However, as Rikke goes on to talk about how she feels about mathematics, the vulnerable picture disappears, as she claims not to be very bothered about it really:

“If I want to [be able to do math], I'll do it, but if I don't want to, I won't master it because I'm not bothered. I can be a bit difficult almost, because I don't bother (...) I'm the sort of person who doesn't get so emotional about things, I don't have that much emotion around just that (...) I've never thought of maths as a subject that I really want to master a lot, because I've never felt that I would be able to do it, so I've never had any such thoughts around it if you understand.”²⁰¹

Now, Rikke stories herself as not having any emotional investment in being able to do mathematics: she stories herself as having an indifferent attitude to it. She seems to be heteroglossic in the way she stories herself; her words portray someone who is emotional and vulnerable, but at the same time as she says she is indifferent. This dualism is confusing, although it does imply an underlying difficulty which is not easy to handle – Rikke seems to justify her indifference with the claim that she “*never felt she would be able to do it*” – and so

²⁰⁰ «Ahh, jeg vet ikke, jeg kommer til å bli veldig stressa, fordi at jeg, det er da jeg tenker at jeg kommer til å få 2, så da kommer jeg til å ikke føle noe for å gjøre det, men jeg kommer jo til å gjøre det beste jeg kan, for det er jo alltid det jeg gjør på tentamener. Også tenker jeg at hvis jeg ikke klarer den oppgaven, så må jeg gå til neste, så jeg kommer jo til å bli litt lei meg.»

²⁰¹ «Hvis jeg vil så klarer jeg det, men hvis jeg ikke vil, så mestrer jeg det ikke fordi jeg ikke gidder. Jeg kan være litt vanskelig nesten, fordi jeg ikke gidder (...) Jeg er en sånn person som ikke tar meg så nær av ting, jeg har ikke så mye følelser rundt akkurat det (...) Jeg aldri har tenkt på matte som et fag som jeg vil egentlig mestre veldig, for jeg har aldri følt at jeg vil kunne greie det, så jeg har aldri hatt noe sånn veldig tanker rundt det hvis du skjønner.»

any expectation that things might be otherwise is pointless. Rikke stories herself as being in a hopeless situation.

Returning to the timelines, Rikke gives a brief summary of her time in lower secondary school as she draws. She elaborates how 9th grade differed from the other years:

“In 8th grade, I’ve always struggled with maths from primary school, I went to an extra course, so I was a bit stressed when I started secondary school, [but] it went just fine, I don’t like maths. It went fine at first, maths is maths somehow, but then I realised that I didn’t learn anything, because I didn’t understand Miss A’s methods, and then it went down a little, and starting in 9th, I don’t quite remember when got Mr. X, it may have been late 8th or 9th grade and then it went up a lot, I learned quite a lot in the 9th I felt, and then we got to the 10th and then everything became very difficult.”²⁰²

Rikke’s summary of her time in lower secondary school tells in general of a problematic time, with one exception: 9th grade, when she is a part of Mr. X’s group. She stories herself as anxious about her capacity and skills in mathematics at the beginning of 8th grade, based on her struggle with mathematics in primary school. The tone of her talk of Class A is one of frustration; she doesn’t learn anything, and her problems from the past remain. However, when she talks about being in Mr. X’s group in 9th grade, her tone is filled with optimism and expresses a new agency in mathematics - her situation improved tremendously, and she learned ‘quite a lot’. But all this is undone when she returns to Class A in 10th grade: her situation is even more problematic – *“everything became very difficult”*.

Rikke never talks about getting help from outside of the classroom; she never reports on any involvement from her parents, and the only arena for learning in mathematics seems to be in school. Rikke seems to be very sensitive to the figured worlds that she is a part of, self-authoring in contrasting ways, depending on her presence in Class A, where she is vulnerable and powerless, or in Mr. X’s class, where she appears to have greater agency.

In what follows, I explore Rikke’s narrative of lower secondary school as she moves in and out of Class A and Mr. X’s group. Why doesn’t Rikke’s 9th grade progress last, when she returns to Class A in 10th grade, as Elias’s did? They were given the same ‘cure’ for their problems, but the outcome is not the same.

²⁰² «I 8 klasse, jeg har alltid strevd med matte fra barneskolen, jeg har gått på sånn ekstrakurs, så da jeg var litt stressa når jeg begynte på ungdomsskolen, det gikk liksom helt greit, jeg synes ikke noe om matte. Det gikk helt greit i starten, matte er matte liksom, men så skjønnte jeg at jeg ikke lærte noe liksom, for jeg klarte ikke Miss A sine metoder, og da gikk det litt nedover, og begynte i 9., jeg husker ikke helt når jeg fikk Mr X, det kan ha vært i slutten av 8. eller 9 klasse, og da gikk det veldig opp, jeg lærte ganske mye i 9. følte jeg, og så kom vi til 10. og da ble alt veldig vanskelig.»

Class A: a victim of the actions of others, left with one choice: to give up

On a general level, Rikke says that she is happy to be in Class A: “Yes, I do [enjoy the class], I think it's a good class.”²⁰³ She likes the ambience: “I think everyone works very well, it's a bit noisy, but it's because we communicate and we get to listen to music and it's nice.”²⁰⁴ However, cracks emerge in this cosy picture when the conversation turns to mathematics: “It's good in the maths lessons too, but I'm not doing anything.”²⁰⁵

Rikke stories as different from the other students in Class A, saying that “they go faster than me.”²⁰⁶ She sees herself as at a lower level in mathematics, and a contrasting picture of ‘self and others’ appears in her talk, underpinning a fragile positioning of self. She is concerned about the high level of achievement in the class: “Yes, [it's] a bit too clever (...) I feel the average grade is very high when it comes to maths.”²⁰⁷. She describes pressure over achievement and grades:

“People talk about their grades then. It's a lot like that, there's no pressure over grades, but everyone asks what you get on tests and then it becomes a bit much for me. (...) It might be, and there are a lot of people who are so “grades-grades-grades”, and I just get like that: ‘Stop thinking about it! Oh!’”²⁰⁸

Rikke's tone is clearly frustrated as she describes the level of achievement in the class. Although there is no overt pressure about grades, the students' actions tell another story, and she seems overwhelmed by this: “Yes, when we get tests it's like that, then people ask, and you don't always want to answer.”²⁰⁹ The students' focus on assessment in Class A makes Rikke uncomfortable, singling her out from the rest.

It is not just the pressure of achievement among the students that makes Rikke feel that she does not belong. She describes several other actions which make her feel uncomfortable: “There are a lot who are like that, “I want, I want, I want, I want to”, too, but then I just have to give up, there is no other way out, then I just have to go to something else.”²¹⁰ Rikke doesn't

²⁰³ «Ja, det [trives] gjør jeg, jeg synes det er en bra klasse.»

²⁰⁴ «Jeg synes alle jobber veldig bra, det er litt bråk, men det er fordi vi kommuniserer og vi får høre på musikk og det er hyggelig.»

²⁰⁵ «Det er bra i mattetimene også, men jeg gjør jo ingenting.»

²⁰⁶ «For klassen min er sånn at de tar det raskere enn meg.»

²⁰⁷ «Ja, litt for flink. (...) Jeg føler at snittet er veldig høyt når det kommer til matte,»

²⁰⁸ «Folk snakker om karakterene sine da. Det er veldig mye sånn, det er ikke karakterpress, men alle spør hva du får på prøver og da blir det litt mye for meg. (...) Det er jo kanskje det, og det er veldig mange som er sånn karakter-karakter-karakter, og jeg bare sånn blir veldig sånn: Stopp å tenke på det! Åh!»

²⁰⁹ «Ja når vi får igjen prøver da er det sånn, da spør folk, og det er jo ikke alltid man vil svare.»

²¹⁰ «Det er jo mange som er sånn, jeg vil, jeg vil, jeg vil, jeg vil jo jeg også, men så må jeg bare gi opp, det er ikke noe annen utvei, da må jeg bare gå over til noe annet.»

seem to be able to deal with the other students' push for progress, and their behavior forces her to give up, even though she did intend to try. Rikke's 'herself and others' story is about how she does not fit in, she is 'the victim' of the other students' actions, leaving her with no choice but to give up. She lacks agency and she struggles to find a space in this figured world.

Rikke's narrative reveals how she searches for a space in Class A, but fails: "*In class, you are friends, but people make groups. If you can work with the one you prefer, people sit in groups. I could sit with David and such, but I don't hang with them.*"²¹¹ Rikke doesn't see any student in Class A as someone who she might work together with in mathematics, so she just sits with her best friend: "*I sat with Josephine a lot, because she's my best friend, and then I felt safe. But everyone in the class knows I'm bad at math if you see.*"²¹² Her talk implies a feeling of anxiety in this figured world; she is aware of the eyes of the other students when she says that "*everyone in the class knows I'm bad at math if you see*". Rikke stories herself as the odd one out. Indeed, Rikke never talks about benefitting from the help of other students. She might ask them, but she struggles to understand the help they might give: "*I can just ask, but if I say it and just like that, 'blah, blah, blah', I just don't get it, 'I don't really understand what you're talking about, it's nothing to do with it'. Then I give up again.*"²¹³ Their help becomes exclusion for her, forcing her to give up.

It's not just the other students who are a problem. Rikke has problems with the teaching, too:

*"She [Miss A] has over 20 students, and it's hard to take all of them into account, (...) Miss A talks a lot about concepts and stuff I don't understand, and then she asks Isak and stuff and then just 'blah blah blah', and loads of stuff and can all the concepts and stuff and then I just lose it completely."*²¹⁴

Rikke is sympathetic to the teacher's situation; she has a lot of students to take care of. But she also finds it difficult in plenary sessions too, where she finds the language inaccessible and once again excluding her from understanding. She describes how the classroom talk is for the clever students in the class, not for her. I ask her if it is better when the students work individually,

²¹¹ «I klassen er det, du er jo kompis, men folk lager grupperinger ikke sant. Hvis du kan jobbe fritt, setter folk seg i grupper. Jeg kunne satt meg med Jonatan og sånn, jeg henger jo ikke med dem.»

²¹² «Jeg satt mye med Josephine, for hun er bestevennen min, og da følte jeg meg trygg. Men alle i klassen vet at jeg er dårlig i matte hvis du skjønner.»

²¹³ «Jeg kan jo bare spørre, men hvis jeg sier det og bare sånn bla, bla, bla, jeg bare skjønner det ikke, jeg skjønner faktisk ikke hva du snakker om, det er ikke noe å gjøre med det. Da gir jeg opp igjen.»

²¹⁴ «Hun [Miss A] har over 20 elever, og det er vanskelig å ta hensyn til en av hver, (...) Miss A snakker mye med begreper og sånn jeg ikke forstår, og så spør hun Albert og sånn og da bare bla bla bla, og masse sånn og kan alle begreper og sånn og da bare mister jeg hele greia.»

and she says: “*Yes, but then I'm not working.*”²¹⁵ She lacks motivation. Even Miss A’s attempts to help her ‘one to one’ fail: “*But, when Miss A explains then I can’t follow.*”²¹⁶

Rikke’s story of herself in Class A unveils a self-authoring with no hope, no agency, no strategies for learning, no confidence and no motivation. She has a fragile positioning of self and she stories as not belonging in this figured world. Rikke repeats that this leaves her with just one choice - to give up.

Rikke in Mr. X’s 9th grade group: “I felt welcomed”

In Mr X’s class, Rikke enters into a new figured world, and she reports that her situation changed dramatically: “... *it improved a lot, I learned quite a lot in 9th grade I felt.*”²¹⁷ Rikke’s talk of herself is renewed, it is now optimistic. She stories herself differently, exchanging the hopeless and incapable tone in her description of being in Class A for one which emphasises how much she learns with Mr X. Rikke says that she enjoys being in this group: “*Yes, because I always looked forward to the lessons.*”²¹⁸ Her talk reveals a new positive attitude towards mathematics, she is newly motivated, she is doing well. She describes her situation in 9th grade, as she draws the blue timeline: “*In 9th grade, I felt like I was at the top for some of the lessons, then it was really great, but pretty high up in 9th grade.*”²¹⁹

Rikke explains why she enjoyed her time in the 9th grade group in several ways. She describes the students in the group: “*There are kind of funny people there, like, not the kind of people I hang out with, but I felt welcome. After all, I knew everyone there, because I had gone to primary school with them.*”²²⁰ She expresses a feeling of belonging: “*But those who are in that room [with Mr X] they are at my level after all, so I sort of, it's the same problem for everyone.*”²²¹, Her words portray a positioning of inclusion in the 9th grade group, and its unity: “*But everyone is one group in the group Mr. X.’s group.*”²²²

²¹⁵ «Ja, men da jobber jo ikke jeg.»

²¹⁶ «Men når Miss A skal forklare da henger ikke jeg med.»

²¹⁷ «... og da gikk det veldig opp, jeg lærte ganske mye i 9 følte jeg.»

²¹⁸ «Ja, for jeg gledet meg alltid til timene.»

²¹⁹ «I 9. klasse, jeg følte at jeg var helt på topp i noen av timene, da var det skikkelig gøy, men ganske høyt opp i 9.klasse.»

²²⁰ «Det er liksom sånn morsomme folk der, liksom, det er ikke såne jeg henger med, men jeg følte meg velkommen. Jeg kjente jo alle der, for jeg hadde jo gått med de på barneskolen.»

²²¹ «Men de som er på det rommet (hos Mr X) de er jo på mitt nivå, så jeg liksom, det er samme problemet for alle liksom.»

²²² «Men alle er èn gruppe i gruppa til Mr X.»

Rikke also describes Mr. X very positively: *“He’s in a very good mood, but he can be in a bad mood, but he wants us to learn, I see him as being like ‘you can do this.’”*²²³ She reports a feeling of accomplishment in her work with Mr. X, and his belief in her ability to do mathematics makes him a significant figure in her story:

*“He did like that, he is kind of a happy-person, but he could say that ‘now you must not disturb’, he can be very short in his replies somehow, but when he said like “this is great” then just, wow, I was really proud.”*²²⁴

Rikke’s relationships with the students and the teacher in this figured world led her to change how she acted as a mathematics student: *“And then I got a good relationship with Mr. X and the other students, and then I started to raise my hand, it’s like that and I showed it to Mr. X and he said it was right.”*²²⁵ She had a new sense of agency: *“The thing was that it was fun to be there, I put my hand up in lessons when I thought it was right, and it was, and then I got a sense of mastery (...) In Mr. X’s lessons, I contributed and had things to say.”*²²⁶ Being in Mr. X’s group makes a difference for Rikke. She stories to be capable of understanding and being motivated for learning and she is included in the activities in the classroom.

In contrast to her frustrations with the pressure in Class A and her sense of exclusion by the language there, she appreciates the freedom Mr. X enables:

*“He cares about his students (...) he has a kind of childish method somehow. He’s very relaxed, he gives you some freedom (...) There’s no pressure you see, because in class, I never dared to go up to the board to do a problem, but there, we kind of have fun, even when we are learning something. Also, he’s really cool, because all of a sudden, we go out and throw axes, because he thinks we need to do something else now and then.”*²²⁷

Mr. X’s teaching helps her understand *“Yes, talk, and Mr. X drew a lot on the board and then he stopped and said we had to do the rest. Yes, he helped us get started.”*²²⁸ Rikke stories Mr.

²²³ «Han er veldig godt humør, men han kan jo være i dårlig humør, men han vil at vi skal lære da, jeg ser på han at han er sånn at ‘dette kan du jo’»

²²⁴ «Han gjorde sånn at, han er jo glad-menneske liksom, men han kunne si at nå må du ikke forstyrre, han kan være veldig rask i replikken liksom, men når han sa sånn dette er kjempe bra da bare, wow, jeg ble skikkelig stolt.»

²²⁵ «Og så fikk jeg et godt forhold til Mr X og de andre elevene, og da begynte jeg å rekke opp hånda, det er vel sånn og viste det til Mr X og han sa at det var riktig.»

²²⁶ «Det som var var at det var gøy å være der, jeg rakk opp hånda i timene og når jeg trodde det var riktig, så var det det, og da fikk jeg mestringsfølelse. (...) I Mr.X sine timer deltok jeg og jeg kunne bidra.»

²²⁷ «Han tar veldig hensyn til elevene sine (...) han har en mer sånn der barnslig metode liksom. Han er veldig avslappende, han gir deg litt frihet (...) Det er ikke noe press hvis du skjønner, for i klassen, jeg hadde aldri turt å gått opp å tatt en oppgave på tavla i matte, men der, der har vi det liksom veldig gøy, selv om vi lærer noe også. Også, han er veldig kul, for plutselig så går vi ut og kaster øks, for han mener vi trenger å gjøre noe annet innimellom.»

²²⁸ «Ja snakke muntlig, og Mr X tegnet mye på tavla og så stoppet han og sa at vi måtte gjøre resten. Ja, han hjalp oss i gang.»

X like a magician: *“He only has to say something, and I understand it. Everything like that.”*

²²⁹ When I sum up that it seems to be good for her to be in his group, she confirms this – *“Yes, really.”*²³⁰

In the figured world of Mr. X’s class in 9th grade, Rikke’s positioning and self-authoring is renewed. Her previous talk of being not able to do or understand mathematics has vanished, and she stories herself as someone with confidence and motivation for doing mathematics. She expresses agency and authority over her own situation, leaving behind her previous struggle to find a space in Class A. Rikke self-authors as an active student who learns mathematics. During 9th grade, she self-positions as included member in the mathematics class she is a part of.

10th grade, Rikke’s problems return and she gives up

Like Elias, Rikke’s achievement in mathematics improved during 9th grade and so she went back to the ordinary teaching in Class A in 10th grade. Unlike Elias, her positive attitude to mathematics from the 9th grade group vanished when she returned to Class A. She describes her feeling at the beginning of 10th grade:

*“I didn’t think about it then, until I came to class, and realised that I can’t do any of what they do, because they work with other chapters, and I got a bit stressed out, and I just thought, ‘how’s this going?’ Because I had never been in the maths class and people just, ‘why are you here’ and that. No, I don’t know.”*²³¹

The confidence Rikke gained in the 9th grade group, seems to be gone the moment she returns to the figured world of Class A. She reports being anxious, and describes an immediate feeling of not fitting in. It seems like the feeling of ‘self and others’ returns. Rikke says that she is not able to do what the other students do, and she doesn’t even have an answer for why she is in the class. Her account tells of an immediate awareness of the eyes of the other students, and how she feels like the odd one out. Her fragile positioning returns, and she keeps storying as not belonging in Class A.

Rikke draws the timelines and describes 10th grade: *“10th grade, then I try again, like, also I don’t know, then it goes down and down and down, it really goes a bit further down.”*²³² She says that she didn’t tell her teacher about her problems: *“I just sat completely quietly, because*

²²⁹ «Han kan bare si noe, også forstår jeg det. Alt liksom».

²³⁰ «Ja, veldig!»

²³¹ «Jeg tenkte ikke på det da, før jeg kom på klassen, og innså at jeg ikke kan gjøre noe av det de gjør, fordi de gjør det med andre kapitler. Og jeg ble litt stresset, og jeg tenkte bare, hvordan går dette? Fordi jeg aldri hadde vært i mattetimer og mennesker, hvorfor er du her og det. Nei, jeg vet ikke. ”

²³² «10 klasse, da prøver jeg på nytt ikke sant, også går det ikke kjenner jeg, da går det ned og ned og ned, det går egentlig litt lenger ned,»

I felt Miss A, because I noticed Miss A couldn't help me, it's not against Miss A, but it's just about the way of teaching.”²³³ Rikke portrays herself as wanting to be invisible to her teacher, she has no hope of being capable of understanding mathematics together with Miss A. Even so, Miss A tries to help her:

*“After Christmas, Miss A has been just like that: ‘do you need help’ and so for the semester test, she was like that. First semester test before Christmas she made her own syllabus and stuff for me to follow, but I never got any feedback on it. I have a stepfather who can help me, and he helped me, and I felt that I could, I sat and did maths for quite a long time, and I also came to the semester test and I just can’t do anything!”*²³⁴

Even though Miss A tries to help Rikke, and her stepfather does as well, it doesn’t actually help. She is unable to benefit from the help Miss A tries to give her, and resources outside of the figured world that might help her are scarce. Rikke seems to be trapped in her destiny as a mathematics student: to not succeed.

Once again, Rikke is transferred to Mr X.’s group, at the end of 10th grade. In contrast to how it was in 9th grade, she reports on problems in this group as well:

*“It was easier in the 9th, that's what it was, and at the beginning of the 10th, I didn't get anything, and this period I didn't get anything, so what we're doing now is difficult because I don't understand anything there”*²³⁵

Rikke ends our conversation stating: *“Yes, I gave up.”*²³⁶

Summary: The improvement that didn’t last

Rikke’s narrative of being a student in mathematics is a story with little hope, despite her improvement in 9th grade. She starts in lower secondary school with a hope of keeping track with mathematics, but this hope doesn’t come true. However, leaving Class A and becoming a part of Mr. X’s 9th grade group, is another story. Her lack of agency disappears, and she stories herself with new words which describe a renewed self-positioning. Rikke is not the main actor in her own story, she stories her situation as a result of the other students’ acts. She has a strong awareness of the eyes of the others, and she focuses heavily on relationships.

²³³ «Jeg satt bare helt stille, for jeg har jo følte at Miss A, for jeg har jo merket at Miss A ikke klarer å hjelpe meg, det er ikke noe mot Miss A, men det er bare noe med læremåten.»

²³⁴ «Etter jul har Miss A bare vært sånn; trenger du hjelp og sånn også til tentamen lagde hun sånn. Første tentamen før jul da lagde hun egen pensumliste og sånn til meg som jeg skulle følge, men jeg fikk aldri noen oppfølging på det. Jeg fikk den også har jeg jo en stefar som kan hjelpe meg, og han hjalp meg, og jeg følte at jeg kunne det, jeg hadde sittet med matte ganske lenge, også kom jeg på tentamen også bare klarer jeg ingenting!»

²³⁵ «Det var lettere i 9., det var det som var, og i starten av 10. fikk jo ikke jeg med meg noen ting, og den her perioden fikk jo ikke jeg med meg noen ting, så det vi driver med nå er vanskelig for jeg forstå ingen ting der.»

²³⁶ «Ja, jeg ga opp.»



It's not difficult! You just take ... and ... then you get ... Understand?

Elias and Rikke in the figured world of Class A: moving on different trajectories

This chapter draws on interviews with two students in Class A who struggle with mathematics, and who are consequently moved to another 'remedial' group in 9th grade. The analysis of their stories enables us to look at identity formation from a different perspective from the previous cases. Their stories reveal how it is to be a part of this high achieving class but not get high grades. Both Elias and Rikke report that their relationship to mathematics improves when they are part of Mr. X's group, and he seems to play an important part in both stories. Although I did not have the opportunity to observe Mr. X's group or to interview him, Elias' and Rikke's story give glimpses of the figured world of his group. Certainly, they report that teaching and learning in mathematics in this group contrasts to how it is in Class A, with a different pace of teaching and less pressure on grades, and the students seem to be positioned on more equal terms.

Both Elias and Rikke emphasise how Mr. X motivates them, but they describe his importance in different terms. Elias describes how Mr. X gives him mathematics tools and offers him useful strategies which he learns to use autonomously. Returning to Class A in 10th grade, Elias

maintains the improvements gained from his time in Mr. X's group, and he belongs once more in Class A. Drawing on resources from outside to support him, Elias self-authors in 10th grade as one who is capable of doing mathematics – he has greater agency now. As I will argue in Chapter 9, this renewal is based on an internally persuasive discourse that enables him to keep working with mathematics the way he needs in this high achieving classroom. In contrast to Elias, Rikke stories her improvement in Mr. X's group in terms of relationships, rather than the mathematics itself. Mr X makes her feel good about mathematics, but her new-won agency and stronger self-positioning vanish the moment she returns to Class A. In Chapter 9, I explore the implications of Rikke's loss of her 8th grade peer group, and of the fact that she appears to have no resources to draw on from outside of Class A.

Exploring these three pairs of students' narratives of self enables an insight into how it is to be a student in Class A from within different positions within the same classroom culture. This analysis has focused on their developing identities in relation to the context and to each other, and how they draw on the discourses of this figured world and its surrounding worlds and their own histories in person. Together with the analysis of the figured world of Class A in Chapter 5, these stories begin to answer the research questions of this study. In Chapter 9, I will bring it all together.

Chapter 9: Discussion – the mechanics of mundanity in the figured world of Class A



In this chapter, I bring the six students in Chapters 6, 7 and 8 back to their location in Class A and address my research questions in the context of the literature reviewed in Chapter 2. The main aim of this thesis has been to understand how students develop their sense of self as students in mathematics during their time in lower secondary school, taking a Bakhtinian-sociohistorical perspective on identity formation. As Holland et al. (1998) state, “Persons develop through and around the cultural forms by which they are identified, and identify themselves, in the context of their affiliation or disaffiliation with those associated with those forms and practices” (Holland et al, 1998, p.33). They present an alternative vision of identity formation, accepting the social and the subject as equally important, these two sites of identity being interwoven in a continuous and complex interplay. To understand this self-fashioning, Holland et al. (1998) draw on Vygotsky and Bakhtin to highlight the possibilities of human agency in a social world, emphasising how the individual and the collective are tightly interwoven by inner speech and the dialogical interplay of self and others. This approach means

that it is not possible to understand how students develop their sense of self as mathematics students without treating the social cultural world of Class A and their individual stories as equally important. Hence, this study answers Francis (2012) reminder that we need to recognise local context; understanding students' negotiation of agency, and the ways in which they employ identities within a classroom culture, makes it possible to reveal how gender is played out in the locality of Class A.

RQ1: What are the dynamics of mathematical identities in a classroom?

To understand students' identity formation as mathematics learners in Class A, my first step has been to understand how the fabric of their figured world is constructed, which is necessary in terms of taking Francis (2012) reminder 'seriously'. As Holland et al. (1998) remind us: "The first context of identity is the *figured world* . . . the frames of meaning in which interpretations of human actions are negotiated" (Holland et al., 1999, p. 271). Class A is a figured world in which interpretations of the students' acts as mathematics students take place, and in which the students and Miss A are jointly engaged as agents in the activity of learning classroom mathematics. They are moved by several forces, including competing discourses and cultural models, and the significance of particular figures and artefacts.

The frame becomes the world

In this section, I elaborate on how the tools of figured worlds have revealed the discourses, figures, positions, cultural models, norms, values and significant acts which constitute the frame of the world of Class A. This becomes the world in which the students develop their sense of self as mathematics students, in a world which is never finalised: "The world itself is also reproduced, forming and reforming in the practices of its participants" (Holland et al., 1998, p. 53). Here, I highlight the dynamics of the forces in operation in Class A, and how these develop and change over time.

As seen in the vignette and in chapter 5, a first impression of Class A is that it is an easy-going and happy class, based on my observations and informal chats with other teachers in the school. Indeed, this is a shared story in the students' talk about their class, in which they draw on a common genre which depicts the class as a unit whole – it seems to be a common choice to use 'we' when describing how the students in Class A act. Furthermore, the students tend to describe Class A as a place where everybody does their best in order to succeed in mathematics:

the students focus on learning mathematics, and they cooperate with each other. These descriptions convey the norms and the publicly shared values of Class A.

However, if we look more closely at these accounts of the easy-going nature of Class A, there are some ifs and buts, portraying a more complex story than the first impression suggests. As the students say, they cooperate *despite* differences in attainment levels. The more students' stories are presented, the more obvious it becomes that there is more to the story of Class A than first meets the eye. What emerges is how much grades and achievement matter, and how Class A has a reputation for being a high-achieving class. Getting good grades matters to the students in Class A, as well as in this school in general, and this seems to be particularly so in mathematics. There is a common agreement that it is the most important school subject, reflecting a wider dominant discourse regarding the role of mathematics. Sometimes, they make it clear that this is an opinion voiced by their parents. Being good at mathematics and achieving good grades is storied as the ticket to a good life or a good future, and this emerges as a significant value in this figured world, competing strongly with the more easily voiced values of collaboration and appreciation of others regardless of their attainment.

This close inspection of the students' stories together with my observations reveals traces of an uneven distribution of power and privilege in this figured world, where grades matter. Adding Miss A's stories leads to an even more comprehensive understanding: she is a significant actor who mediates between national Norwegian education policy and guidelines, their interpretation locally at this school, and the 'life' of the students in Class A. In particular, Miss A's story exemplifies a tension between the discourses of achievement and 'bildung'. Her stories draw attention to frictions within the national curriculum which are played out in this figured world: in keeping with the discourse of 'bildung' in the Norwegian curriculum, she describes how the students in Class A take care of each other, cheer each other on, and do the best they can regardless of attainment level, matching the whole-class unit scenario presented in their stories. But the discourse of achievement is heavily present in the curriculum as well, and it is obvious that performance is high stakes in Class A. Again, Miss A's story of Class A as a high-achieving class reflects the students' stories; despite the prevalence of the discourse of 'bildung', it is the authoritative discourse of the importance of good grades in mathematics that dominates. The significance of grades in this figured world becomes even more pressing when students do not achieve a satisfactory level in mathematics. The organisation of teaching in this school includes a special 'diet' for these students: they are moved out of the mainstream class into another mathematics group, Mr. X's group. There is no space for students who fail in Class A.

Figured worlds distribute people differently, according to status, power and privilege. Holland et al. (1998) describe a figured world as “a social reality that lives within dispositions mediated by relations of power”, where the actors see themselves as ‘actors of more or less influence, more or less privilege, and more or less power in these worlds” (Holland et al., 1998, p. 60). The importance of getting high grades is a significant value that distributes power and privilege within this figured world, and Miss A’s stories give us particular insight into this. She talks about the subgroups in the class, ‘the smart boys’, ‘the sporty hardworking girls’, ‘those who struggle’ and ‘the popular ones’. The ‘smart boys’ hold a prominent position; the story goes that they affect the other students positively in mathematics – they are ‘a driving force’. However, this is only a partial truth: the emphasis on achievement, and the educational capital that the smart boys wield, is both an advantage and a disadvantage in this figured world, and Kine’s and Rikke’s stories – and perhaps Ross’ - reveal the complexity of this pressure.

In addition to the role of high grades in the distribution of power and privilege, complicated traces of a gender issue also emerge. The students are not explicit about this. Like Miss A, they describe how some boys in this class seem to hold a significant position in mathematics. But at the same time, they tend to argue against the idea of gender differences. Just as Miss A does, they describe this group of boys as at another level from the rest, but they flesh out the details of how they are seen to act in a particular way which signals their mathematical ability, and we see that they have the power to affect the agenda when it comes to teaching and learning mathematics in Class A. This resonates with much of the literature reviewed in Chapter 2; for example Bartholomew (2000, 2002) notes boys’ ‘laddish’ behaviour in top sets, Boaler (1997a, 1997b, 1997c, 1998, 2002) noticed that boys turned school mathematics into a competitive game, and Solomon (2007a, 2007b, 2009) reports that boys are on their ‘home ground’ in high achieving teaching environments, while girls lacks an identity of participation. Similarly, Mendick (2005a, 2005b, 2006) argues that the discourse of classroom mathematics teaching is an easy fit with masculinity, while Black (2004a) and Black and Radovic (2018) notice how a teacher may allow this to happen. These hints of gender differences expand in the students’ narratives of self, identifying gendered differences in power and privilege in this figured world.

As we have seen, acts connected to the smart boys such as being ‘assistant teachers’ set the agenda in whole-class plenaries in Class A, impacting on the pace of teaching and the level of mathematical questions and problems that are addressed. The smart boys claim this power, which is approved and granted by the other actors, in the sense that they do not oppose or resist it; furthermore, it affects the other students’ actions. As Emilia says, “... *it goes very quickly at*

the board, because then they [the group of boys who are the pacemakers] go through it so fast"; this power causes her to wait to ask questions after the plenary session. Within the dynamics of Class A, rights to set the agenda are reserved for the 'smart boys', and are linked to their performance of smartness and what this signifies. As Ross says, "*If you actively participate in the lessons, and if you contradict the teacher, then you can see a person as smart and obviously this is also based on grades*".²³⁷ As the students' stories show, these acts are not open to all, echoing Walkerdine's (1989/1998) argument that girls are 'counted out' of mathematics. In particular, there appears to be no figure of 'a smart girl', in terms of positionality, among the stories of Class A. In Miss A's story, Kine and Emilia are potential candidates for such a label, but her description of them as high-performing girls is qualified. Like the teachers described by Walkerdine (1989/1998), Mendick (2005a, 2005b, 2006) and Jaremus et al. (2020), she describes Emilia as (just) a hard worker. Kine, on the other hand, needs to 'trust herself'. The way in which the positional force of gender seems to cut across the dynamics of the figured world of Class A is particularly seen in Miss A's 8th grade story, when she describes how the girls like to do well *in general*, but when she talks about 'the smart boys', the discourse of 'bildung' seems to vanish, and the focus is set on mathematical achievement.

Indeed, analysis of the figured world of Class A raises the question: Is there actually an available space for being a smart girl in this class? Where this is missing, being a high achieving girl demands identity work, as Foyn et al. (2018) and Mendick (2005a, 2005b, 2006) argue, or perhaps invisibility, as suggested by Walls (2009b). Radovic et al. (2017) show that subgroups, or peer clusters, can work as a source of identity within a classroom culture, and this is also the case in Class A. However, unlike Radovic et al's study, where alternative *positive* mathematical identities were available, the subgroups in Class A are distributed differently according to power and privilege. Certainly, the subgroup of 'the sporty hard-working girls' does not have access to the same power and privilege as the 'smart boys', even though their scores in mathematics are almost at the same high levels. While popularity is embedded in the teenage culture that surrounds the students' everyday lives, as is particularly evident in the analysis of Ross, Alexander, Kine and Rikke, figured worlds are never finalised, and time also needs to be acknowledged as a dimension of Class A. As Chapter 5 showed, the relative strengths of the discourses which circulate in Class A are neither equal nor constant; just as the discourse of 'bildung' loses ground by grade 10, popularity also seems to lose its relative strength – or at

²³⁷ «Hvis man deltar nye aktivt i timen, og noen ganger skal motsi læreren for eksempel så vil man jo karakterisere den personen som smart og selvfølgelig karakterbasert, da.»

least its particular signification through ‘the social group’, with serious consequences for Rikke, it seems. Class A appears to be dominated by the smart boys and their embodiment of the discourse of achievement, which has become increasingly hegemonic by 10th grade. Although it is not possible to generalise about boys and girls on this basis, it is perhaps no surprise that Ross, Alexander and Elias all report that their relationship to mathematics improves during 9th and 10th grade, while Kine, Emilia and Rikke report a decline in the same period.

The world must be answered; authorship is not a choice

As in Radovic et al’s (2017) class with its different peer clusters, the ‘stories of Class A’ tell of a heteroglossic world. Holland et al. (1998) emphasise that there is a continuous struggle between heteroglossia and monoglossia, as centripetal forces push towards monoglossia while centrifugal forces leads to heteroglossia. Within the figured world of Class A, there are several forces at play: popularity, ‘bildung’ and the discourses of achievement and the importance of mathematics, and the cross-cut force of gender. However, as Holland et al. remind us, “In a situation of heteroglossia different languages and perspectives come inscribed with differing amounts of authority, which suggest how they might be orchestrated” (Holland et al., 1998, p. 182–183). In Class A, the discourse of achievement combined with that of the importance of mathematics, works as a centripetal force, embodied by ‘the smart boys’. Being a student in mathematics in Class A means dealing with being a part of this well-known high-achieving class; the commonly shared narrative holds a monoglossic force that the students cannot escape and which, as Holland et al. point out, in Bakhtin’s terms, must be answered.

Analysing the students’ responses to the figured world of Class A and their orchestration of the voices within it brings us to the discussion of research question 2. To understand identity formation in a mathematics class, we need to build on the first context of identity, the figured world. The next step is to explore the second and third contexts, positionality and self-authoring, to understand how students negotiate agency and identity as mathematics learners in this world.

RQ2: What is the nature of students’ agency in their employment of identities?

In this section, I explore the three different layers of Class A, revealed in the analysis of each pair of students in chapters 6, 7 and 8: Ross and Alexander, Kine and Emilia and finally, Elias and Rikke. As in Barnes’ (2000) and Radovic et al’s (2017) analysis, we see that differences between subgroups are important, but here I also consider differences within the subgroups, highlighting the complexity of identity formation both between and within these three pairs.

Their stories present the possibility of six very different trajectories of identity formation within the same context; it is not possible to predict identity formation, not even in the same class or within the same subgroup.

Understanding this depends on key concepts in Holland et al.'s (1998) framework. As seen in Chapter 3, the space of authoring is central to the negotiation of agency and identity within a figured world; as Holland et al. (1998) remark, this is the broad venue for self-fashioning, and it is within this space that the construction of meaning among the magnitude of voices/dynamics takes place. As seen in the discussion of RQ1, in this figured world, there are both centripetal and centrifugal forces at work. Because authorship is not choice, the students are forced to find a way to negotiate agency and identity; as Holland et al. (1998) say, the world must be answered.

“It is a folly to assume that members of a group are uniform in their identities”

Many researchers note that there are alternatives to predetermined female and male trajectories in mathematics, although within a given figured world, the range of available spaces constrains actors' choice of acts, and to act outside of the available spaces requires a special effort. Nevertheless, Francis (2012), Black et al. (2015) and Solomon et al. (2016) argue that there are possibilities for negotiating agency within these constraints. Holland et al.'s framework allows more alternatives than just binaries, stressing that there are no assumptions/expectations of a uniform identity formation for the actors in a figured world, either within the world or within its subgroups; they see discourse and the significance of particular artefacts as sources not only of possible entrapment but also of possible liberation from what might seem to be predetermined anticipations of acts. As Radovic et al. (2017) concluded, their girls drew on peer relations in mediating their agency, that both worked as liberation from the traditional girls' position, seen in the case of the girl who storied herself as an effortless achiever, and also an entrapment, in the case of storying success in terms of effort. In this study, self-authoring is the response to the paradox posed by the dominance of discourse. Addressing the question of the nature of the students' agency entails analysis of the apparent homogeneity of Class A and its sub-groups, thus going one step further than Barnes (2000), who noted differences with the subgroups in her study, but did not investigate the potential variety of acts and experiences further. To pursue differences in the way students act within a subgroup, I follow Francis' (2012) emphasis that students act in a heteroglossic world. As Holland et al. (1998) say,

It is folly to assume that members of a voluntary group, or even members of an ‘involuntary’—an ethnic or racial—group are uniform in their identities [...] There may be far less to participation than meets the eye. In other cases, there is more to participation than might be suspected (Holland et al., 1998, p. 190).

Importantly, as we have seen, power and privilege are unevenly distributed, and the significance of grades distributes people differently. The first pair of students, Ross and Alexander, are both high-achieving students. However, their stories are by no means similar. The analysis unveils a first layer in the process of identity formation in the figured world of Class A: the exercise of privilege and power. In what follows, I unravel the complexities of positional identities, moving through the layers to a focus on the nature of agency within apparently determined, but as it turns out, entirely different, pathways.

The first layer: entitled people carry out privileged activities to make claims of entitlement

As Holland et al. point out, positional identities may work as obstacles or possibilities for how a student may feel welcomed or restricted to certain acts in relation to the other actors in the figured world; they are a part of ‘a set of dispositions toward themselves in relation to where they can enter, what they can say, what emotions they can have, and what they can do in a given situation (Holland et al., 1998, p. 143). Ross shares features with boys that we met in the literature review, in work by Barnes (2000), Bartholomew (2000, 2002), Mendick (2005a, 2005b, 2006) and Black (2004a, 2011). In chapter 6, we have seen how Ross claims power and privilege as a ‘smart’ student through his acts of entitlement. He demands attention by being vocal, presenting alternative methods, asking unnecessary questions, correcting Miss A and so on. He uses the opportunities that emerge to signal how he is on top of the situation, acting as though he takes his position for granted. Ross gives the impression that he sees himself having access to these acts, signalling that he is an important actor, beyond the ordinary. He claims entitlement as a clever student in mathematics; as Holland et al. (1998) say:

Entitled people speak, stand, dress, emote, hold the floor—they carry out privileged activities—in ways appropriate to both the situation of the activity and their position within it. Those who speak, stand, dress, hold the floor, emote, and carry out activities in these proper ways are seen to be making claims to being entitled. Speaking certain dialects, giving particular opinions, and holding the floor are indices of claims to privilege. (Holland et al., 1998, p. 133)

That Ross' claims of privilege are approved/accepted by the other actors in Class A is seen in how he is given an important position in Miss A's story; he is among its main actors. As Holland et al. say, "Teachers will take some students' groping claims to knowledge seriously on the basis of certain signs of identity. These students they will encourage and give informative feedback" (Holland et al., 1998, p. 135). Ross' enactment of this role claims the attention of all the actors in Class A, both the teacher and the other students. As seen in Chapter 6, he juggles with the cultural model of a clever boy in mathematics, playing the effortless achiever as seen in Barnes (2000), Bartholomew (2000, 2002), Boaler (1997a, 1997b, 1997c, 1998), Mendick (2005a, 2005b, 2006), Rodd and Bartholomew (2006), Solomon (2007a, 2007b, 2009) and Walkerdine (1989/1998). No one opposes this self-positioning as a powerful actor in this figured world as he works the space of a prominent and powerful student within the dynamics of this mathematics class.

Ross appears to be very aware of how he is seen by the other actors in Class A. For example, his desire for challenging tasks acts as a significant marker of being out of the ordinary, and yet he never elaborates on what such challenges afford him. He seems to be more concerned by the acts than the content of mathematics, where the point of being given challenges works as an affirmation of his status by the teacher, which is then witnessed by the other students. Holland et al. (1998) present the case of 'outsideness' when people cast themselves through the eyes of others, and this seems to be the case here. Ross assumes 'outsideness' in his narrative of self; he is solely concerned with visual acts of performing smartness, for the benefit of his classmates and his family, whose voices are audible in his account; despite his expressed desire for challenge, it seems that mathematics has no intrinsic value for him.

This analysis suggests that, in fact, Ross's narrative is monoglossic; he has only one option in life, which is to be a smart student in mathematics, following in his father's footsteps. In the dynamics of the figured world of Class A, with its authoritative discourse of high grades, this monoglossic story of himself seems to be the only possible way for Ross to respond. He seems to do a lot of identity work in order to position himself as out of the ordinary. As in studies by Barnes (2000), Bartholomew (2002), Mendick (2005a, 2005b, 2006) and Solomon (2007a, 2007b, 2009), hegemonic masculinity dominates classroom cultures, but this may carry challenges within. Despite his position of privilege, Ross' space of authoring emerges as strongly restricted, leaving him with little agency. He seems to be pushed or forced into this position, where he is ventriloquated by the authoritative discourse of the importance of high grades embodied in the figure of a smart boy. Holland et al. (1998) remind of us Bakhtin's

view: “The author does not speak in a given language . . . but he speaks, as it were, *through* language, a language that has somehow more or less materialized, become objectivized, that he merely ventriloquates” (Bakhtin, 1981, p.299, cited in Holland et al., 1998, p. 179). Ross’ claim to entitlement and its approval is not necessarily a ‘healthy’ position, but no one seems to be aware that this could be a disadvantage for him. Ultimately, Ross can be seen as having limited agency as a learner in mathematics within a narrow space of authoring, and this is almost ‘hidden’ within the dynamics of the figured world of Class A.

This analysis of Ross’ restricted agency moves beyond the binarity of gender and mathematics, recognising that taking up a position that is driven by hegemonic masculinity is not necessarily a benefit. There are more to the story of being a successful boy in mathematics, as Holland et al. say, there is more to identity formation that meets the eye. Ross’ strong claims to entitlement and his restricted agency become even more visible once we hear Alexander’s story. Even though they are both boys with high scores in mathematics, they respond to the dynamics in Class A differently, and their self-authoring is substantially different. As we have seen, Alexander does not demand attention like Ross. He doesn’t interrupt Miss A, and his appearances in my fieldnotes are typically short - he ‘pays attention’, ‘practises tasks’ or ‘works independently’. He is ‘under the radar’ and he has just a minor supporting role in Miss A’s story, even though his scores are as good as Ross’, even slightly better.

In contrast to Ross’ use of the passive voice, Alexander is the subject of his own story; he is the main actor, and the supporting actors in his story are no more than shadows. He stories himself as responsible for his achievement. Alexander also appreciates what he calls mathematical challenges. However, he talks about how this makes him think hard and allows him to be creative. While Ross performs smartness, Alexander focuses on the content of mathematics, expressing an intrinsic motivation. He does not see himself through others’ eyes as Ross does. Alexander expresses strong agency as a mathematics student and his story demonstrates that being good in mathematics can be enacted without following the pattern of hegemonic masculinity. As Francis (2012) showed, that there are alternatives to acting along the monoglossic gender matrix.

This comparison of Ross and Alexander illustrates how apparently similar situations do not necessarily lead to uniformity in identity. It is striking that they belong to the same powerful subgroup, yet they answer the world and its voices in different ways, within their different spaces of authoring. It turns out that being boys who have benefitted from the positionality and privilege that accrues from high grades in mathematics doesn’t mean that they have similar

levels of agency. As Holland et al. remind us, there may be far more, or far less, to participation than meets the eye.

Complexities of identity formation evolve

As we have already seen, the significant marker of high grades in mathematics distributes the students in Class A differently according to status and power. But when we take the narratives of Emilia and Kine into account, a more complex story of Class A emerges. The marker of high grades is not always enough to establish a position of privilege. Chapter 7 drew attention to how both Kine and Emilia strive to find a space in this figured world. Despite their high scores, they do not employ positions connected to status, nor do they claim this. Furthermore, neither of them is described as belonging to a subgroup that is labelled with the term 'smart' - Miss A sees Emilia as among the 'sporty/hardworking girls' and Kine as among the 'popular' ones. Emilia and Kine themselves say that they see themselves as being in a group in the middle, according to smartness and cleverness.

The cases of Kine and Emilia illuminate how they self-author in the space where the positional force of gender cross-cuts the authoritative discourse of the importance of grades in Class A. However, they navigate this space differently. As in the case of Ross and Alexander, they author the world from what seems to be the same perspective, but the response they craft has great variability. The story of Kine and Emilia brings another layer to the complexity of identity formation as something which cannot be taken for granted in a figured world, particularly in the cross-cut spaces of gender and discourse in Class A.

The second layer: Social positions become dispositions

Among the mundane activities and use of artefacts in Class A, a student's social position develops over time into their positional identity within the figured world, like the girls in Boaler (1997a, 1997b, 1997c, 1998), Mendick (2005a, 2005b, 2006), Rodd and Bartholomew (2006) and Solomon (2007a, 2007b, 2009). To understand why Kine and Emilia's high grades in mathematics are not enough to afford them a position of status in Class A, we need to understand the operation of gender, and how it creates a particular space within Class A. As Walls (2009a) notices, students become gendered subjects within the discourse of mathematics teaching and learning. In parallel, Holland et al. point out that "Gendered dispositions to participate, or not, in given activities, develop in places where gender participation in activities is treated as a claim of gender specificity" (Holland et al., 1998, p. 143).

Beginning with Kine, we see how, on the surface, she is ‘a girl who lacks confidence in mathematics’, like so many stereotypical girls described in the studies of mathematical identity reviewed in Chapter 2. As seen in Chapter 5, Miss A thinks this too: when I ask her who are the strong students in the class, she feels it necessary to qualify her reference to Kine in this group by saying that she lacks confidence: “*When she [Kine] really trusts herself and comes up with something it’s really great*”.²³⁸ As we saw in chapter 7, Kine herself self-authors as an insecure and unconfident student in mathematics, contradicting her strong achievement scores. Apparently drawing on a cultural model of anxious girls in mathematics, she self-positions as a fragile student who doesn’t fit in among the clever students in a striking contrast to reality which is reminiscent of many studies reviewed in Chapter 2, including Boaler (1997a, 1997b, 1997c, 1998, 2002) and Solomon (2007a, 2007b). The lens of figured worlds enables us to understand the development of a positional identity that carries both the possibility of giving voice and entering into activities, and of silencing oneself and refraining from these activities through self-censoring acts. As we have seen, the latter is the case for Kine: she doesn’t see herself as having access to the visual signifiers of cleverness in Class A, and a disposition of invisibility develops, resonating with the invisibility of girls in studies by Rodd and Bartholomew (2006) and Walls (2009b).

As we saw in Chapter 7, Kine used to have access to a visual marker of being good at mathematics in primary school (attending a special class), but in lower secondary school this gives way to the performance of smartness in the gendered behaviour of the smart boys. Kine stories herself as excluded from the visual signs of position, the calling out and the effortlessness. She describes herself as needing to do hard, exhausting work while she sees the smart boys working easily and joyfully. They understand immediately while she has to think hard, and they have the extra energy to help others while she is occupied with her own struggles. In Class A, Kine’s ‘smartness’ is invisible, like the girls in Foyn et al’s (2018) study, who could not act like the boys but merely hoped that others would know that they were ‘clever’. Kine enacts an identity of exclusion, reminiscent of the girls in Solomon (2007a, 2007b, 2009).

Despite her publicly received cleverness in primary school, ‘not belonging’ seems to be the refrain of her story in Class A. Like the top set girls in Solomon (2007a), she seems to play down, over and over again, her knowledge of mathematics by her acts in the classroom, as when she asks for help, starting to question ‘below her competence’ and claiming, ‘I don’t understand a thing’. Her experience is particularly illustrated in her account of her supposed collaboration

²³⁸ «Når hun [Kine] virkelig stoler på seg selv og kommer med noe er det virkelig flott.»

with Ross, where she describes a feeling of being ‘just in the way’ with this ‘insanely clever’ boy, reminiscent of Holland et al.’s account of inferiority in relational identities.

Within the dynamics of Class A, in the cross-cut space of gender and the hegemonic discourse of achievement, Kine’s positioning has developed into a disposition of silencing herself, and she seems to be overwhelmed by a negative attitude towards mathematics. The passive voice dominates her narrative, and she stories herself as the supporting actor. Kine’s agency seems limited, and she seems to accept her positionality in this figured world – there are no traces of resistance or opposition. It seems that she lacks resources to do this, other than complaining about the acts of ‘the smart boys’. Kine’s space of authoring is narrow, and her story of fear of losing her high grades becomes a self-fulfilling prophecy in the middle of 10th grade. Her awareness of the eyes of others which judge her as not good enough makes her the opposite of Ross. It seems that she is trapped by the binaries within the discourse of mathematics teaching and learning, like Chronaki and Pechtelidis’ (2012) teacher.

However, just as Alexander’s story casts new light on Ross’ story, so Emilia’s story suggests new shades in Kine’s. As Black et al. (2015), Francis (2012), Radovic et al. (2017), Solomon (2012) and Solomon et al. (2016) suggest, there are alternatives to Kine’s stereotypical narrative. Emilia’s narrative is a story of greater agency and consciousness of the choices she makes in learning mathematics, as in the case of Foyn et al’s (2018) Anna and Solomon’s (2012) and Solomon et al’s (2016) Roz. Emilia reflects on her need to understand mathematics, and she knows what she needs to do in order to gain understanding. She is conscious of how she should challenge herself more in order to improve her grades, and she becomes conscious of how she is in a position where the combination of working with understanding at the same time as being able to challenge herself is difficult. This emergent reflexivity about her situation is particularly reminiscent of Solomon’s Roz, as though Emilia is at the beginning of the kind of realisation that the older Roz more expresses strongly. Contrasting with Kine’s story, Emilia’s narrative illuminates the complexity of identity formation within a figured world – in this case, from an ‘unprivileged’ perspective. Importantly, it shows how it is possible to self-direct within what appear to be predetermined positions or spaces: as Holland et al. suggest, there are possibilities for “liberation from the particular determination . . . through the tools shaped in those worlds for their perpetuation” (Holland et al., 1998, p. 64). This becomes clear in Emilia’s story.

Emilia does a lot of identity work within the dominant discourses of Class A. She self-authors by orchestrating the voices in the cross-cut space created by gender specificity and the dominant

discourses of Class A, where she finds a space as a mathematics student. She is strongly aware of her need for understanding, and she doesn't compromise this within the signifying acts of being a high achiever in Class A. She takes opportunities to ask for assistance from Miss A in private, after the plenary session, which is controlled by 'the smart boys' when it comes to pace and level, or she asks some of her friends. If she doesn't get what she needs in Class A, she has a 'safety-net' – her father can always help her gain understanding. Emilia's space of authoring is open, and she draws on resources both inside and outside of Class A – she appears to have a robust agency as a mathematics learner.

In Chapter 7, we see how Emilia finds herself in a dilemma, where she realises she is deprived of the same opportunities as the boys, and it is here her reflexivity on her own situation launches. Emilia starts out by saying that she is happy about the way she works with mathematics in Class A, and she enjoys the freedom to choose who to work with and the level of tasks. Here, it seems that "The everyday aspects of lived identities ... may be relatively unremarked, unfigured, out of awareness, and so unavailable as a tool for affecting one's own behaviour" (Holland et al. 1998, p. 141). But Emilia is suddenly and explicitly caught in a dilemma when she tells me that she should be doing the same tasks as the smart boys, in order to improve her grades. However, their pace and way of working makes her afraid of not being able to understand, so she chooses to keep working together with her friends. The freedom of choice, which she first said she enjoys, becomes the thing Emilia blames Miss A for. She suggests that Miss A herself should make groups so that all students have the opportunity to challenge themselves. It is as though Emilia suddenly realises that she is excluded from the most advanced mathematics – this is a rupture: "Ruptures of the taken-for granted can remove these aspects of positional identities from automatic performance and recognition to commentary and re-cognition... This hermeneutic moment leads persons to specify the figured world that prefigures everyday activity" (Holland et al. 1998, p. 141). Even so, Emilia doesn't oppose the situation more than being explicit that she is not happy about it, and she comforts herself with the idea that she will learn about what the boys are working on once she is in upper secondary school. She appears conscious that she is not in a position to work with understanding *and* challenge in Class A.

Emilia's strong agency is seen in her repeated story of her need for understanding. She resists the authoritative discourse of the importance of grades in Class A and the performance smartness; she takes a rather different stance about her mathematics learning. She needs to understand, she knows what it takes, and she expresses an everlasting love for mathematics. She does as Bartholomew (2002) notices in the case of Tanya: she realises that she must focus

on personal progress rather than on competition with others. Moreover, Emilia's story is in line with Bartholomew's claim that girls need to play a different game from boys, in order to 'survive' in a traditional teaching environment in mathematics.

Emilia's narrative is told with several ifs and buts. She works hard to orchestrate the voices within the figured world of Class A as well as from outside in order to find a space for herself. She expresses an internally persuasive discourse of the importance of understanding, which enables her to take an authorial stance as a student in mathematics in Class A, in her ability "to rearrange, reword, rephrase, reorchestrate different voices and, by this process, develops her own "authorial stance"" (Holland et al., 1998, p. 183). Thus, Emilia's space of authoring is a broad venue. She does the identity work, finds a solution, and improvises. She becomes like Holland et al.'s 'woman who climbed the side of the house', drawing on the available resources and finding a way. Even though she doesn't take up a position connected to status, her identity is that she is able to do mathematics. She has the resources and she knows what to do, and she stories an educational future in mathematics.

Kine's and Emilia's stories present contrasting ways in which two high-achieving girls strive to navigate the dynamics of Class A and to find a place to do mathematics within the cross-cut space of gender and the discourses that build Class A. The way they self-author within this figured world is by no means the same. Their different spaces of authoring reveal a different nature of agency. While Kine unconsciously 'accepts' a position, which becomes disposition, by self-censoring, Emilia, on the other hand, develops an authorial stance within this figured world, never giving up her everlasting joy and love for mathematics. Like the girls in Radovic et al.'s (2017) study, and Roz in Black et al. (2015), Solomon (2012) and Solomon et al. (2016), she shows that there are ways to step out of ascribed positionality in mathematics.

The complexities of identity formation expand

This exploration of research question 2 cannot be completed without including the cases of Rikke and Elias. Their two stories provide a different perspective on students' negotiation of agency and identity as learners in mathematics in the figured world of Class A. Figured worlds distribute people differently according to status. Until now, the discussion has focused on those who achieve high grades in mathematics, a significant marker of status. The cases of Elias and Rikke, whose grades are low, present another perspective. We have seen how the dynamics of Class A develop towards a hegemony of the discourse of achievement at the expense of the discourse of 'bildung'. Within these dynamics, Rikke and Elias are at a disadvantage. But

authorship is not a choice: the world must be answered. Rikke and Elias are forced to find a way of responding to the dynamics in Class A which ‘push’ towards a perceived need for high grades’. In 8th grade, their struggles in mathematics are seen as so pressing that they are both moved out of Class A and into Mr. X’s mathematics group, providing an opportunity for a new sense of self in another figured world with different norms, rules and values.

As their timelines show, this experience enables a recovery from their problems in mathematics. However, if we look closer, we see that Rikke’s timeline indicates an immediate feeling of improvement, while Elias’ tells how he continues to struggle with mathematics until the mid-term of 9th grade. Moreover, for Rikke, recovery seems to be temporary while for Elias it lasts throughout lower secondary school. Exploring the cases of Elias and Rikke underlines the complexity of identity formation within a figured world. Much of the literature reviewed in Chapter 2 focuses on high achieving students, but Black’s (2002, 2004a, 2004b, 2011) work provides insights into the case of students who do not occupy advantageous positions. Arguing that the construction of mathematical knowledge is embedded in social practices, she noticed relationships between students’ social background and identities of participation or non-participation. Even though the students in Class A seem to be a relatively homogenous group, Blacks’ observation that cultural capital plays a role in students’ identity construction seems relevant here. Even though both Elias and Rikke’s space of authoring as mathematics students expands in 9th grade, the nature of this expansion seems to be due to differences in the availability of resources. Given the poor success rates of ‘remedial mathematics’ (Logue, Douglas & Watanabe-Rose, 2019), Elias tells an unusual ‘one in a hundred’ success story. It presents an ideal image of how it might be possible to help and improve a student’s motivation and skills in mathematics, through the ‘cure’ they get in this school. Rikke’s story, on the other hand, presents, perhaps, something more like we might imagine – she is a ‘struggler’ - but the perspective of figured worlds provides a rather different outlook on why she fares so differently.

Evolving self in evolving worlds

Beginning with Elias, we have seen how, in his 8th grade narrative, he describes a one-dimensional relationship to mathematics: he expresses a lack of motivation, confidence and strategies to solve the mathematics tasks he is given. He self-authors as being lost in mathematics, and moreover, he seems lost in Class A. Furthermore, he doesn’t appear to draw on any resources or voices from outside of Class A, making his orientation to learning mathematics somewhat ‘local’. Even so, the analysis notes a sense of will for improvement in his talk in 8th grade and the way in which Elias voices the idea of mathematics as the most

important subject. Together, these suggest a hint of agency within his narrow space of authoring in 8th grade.

As seen in Miss A's story, Elias' strategies for hiding seem to be successful, and his problems go unnoticed in 8th grade; it is as though his employment of the space of 'struggler' is so invisible that he needs the breakdown at the beginning of 9th grade in order to be noticed. Elias' timeline and his talk suggest that the move to Mr. X's group didn't solve his problems immediately, but by mid-term of 9th grade, things began to improve. It appears that it is important to Elias that there is less pressure in Mr. X's group, where it seems that the dynamics contrast with those of Class A, particularly the pace of teaching. A common theme is that Mr. X gives him the key to mathematics, and he becomes a significant actor in his story of improvement in mathematics. Mathematics becomes intrinsically motivating in Mr X's group, and Elias' 8th grade feeling of 'not belonging' in Class A is now storied as replaced by a sense of belonging – he is able to do mathematics, and he expresses a stronger sense of agency at this point than in the end of 8th grade. In addition to what happens locally in the figured world, he starts to draw on resources, or voices, outside – Elias tells me that his parents are now involved, and he especially mentions his father. His space of authoring seems to expand through 9th grade, and his agency as a mathematics learner becomes more robust. It seems that, like some of Black's (2002, 2004a) students, the importance of cultural capital is evident in Elias' story.

Elias' improvement in mathematics leads to his return to Class A in 10th grade. Even though the discourse of achievement gains hegemony in 10th grade and the pressure of scoring high grades is stronger now, Elias retains his renewed positive attitude. But like Emilia, he develops an internally persuasive discourse which focuses on his need to understand mathematics rather than being driven by the authoritative discourse of grades in Class A; he finds joy in doing and understanding mathematics, in opposition to the smart boys' performance of smartness. In fact, he pays little attention to the others, storying himself as the main actor in his narrative, oriented through the mathematics, not the gaze of others. From this point of view, he is not subject to the hegemonic masculinity that seems to trap Ross, but acts in ways which are more like Alexander's. Importantly, Elias travels in the same direction as the evolving dynamics of the figured world of Class A, in that his focus on mathematics resonates with the dominant discourse of achievement. Even though his internally persuasive discourse focuses on understanding in opposition to the performance of smartness, his focus on mathematics and on improving grades is not in conflict with the hegemonic discourse of achievement in 10th grade.

Rikke's story is quite the opposite, although it begins similarly - like Elias, Rikke expresses a narrow space of authoring and a lack of agency in mathematics in the 8th grade. She doesn't talk about drawing on any resources outside of the classroom to support her learning, and her identity as a mathematics learner seems to be strongly local in its orientation. Strongly aware of her positionality, her sense of self in Class A is encapsulated in her expression: "*But everyone in the class knows I'm bad at maths, you see*". Rikke talks about the emphasis on grades in Class A, and in this environment, she describes herself as contrasting with the other students as 'the odd one out'. Rikke accepts the discourse of mathematics as the most important subject, but she does not see it as applying to her; instead, she participates in 'the social group', which, unlike Radovic et al's (2017) popular peer culture, is not used to resource mathematics agency. Instead, it competes with the dominant discourses in Class A about what is important, downgrading being good at mathematics, and upgrading popularity.

As we have seen in Chapter 8, Rikke expresses some agency in 8th grade, working her involvement with the teenage culture and popularity as though it is some sort of compensation for her positionality of being the odd one out in mathematics. It appears to give her some sense of belonging, a sense of inclusion in Class A in general. But her sense of not belonging in Class A as a mathematics student is 'confirmed' by the organisation of teaching in the school: her grades don't permit her a space in the high-achieving environment of Class A. In contrast to Elias, her position as a 'struggler' is noticed by Miss A, and her problems are seen as so urgent that it is agreed that she should be in Mr. X's group in 9th grade.

Mr. X's group provides potential for a different negotiation of agency and identity: it is a different figured world, with a different distribution of power, status and rank which affects Rikke the moment she enters the group. Like Elias, Rikke describes the group as having less pressure on grades, and she expresses a feeling of being included and belonging – in strong contrast to her positional identity in Class A. She experiences an immediate improvement in her relationship with mathematics in the beginning of 9th grade which seems to be a reflection of her positive relations with the actors in the group. Rikke thus stories herself as a part of a collective and Mr. X himself emerges as a significant actor in her story. This focus on other actors is noticeably different from Elias' account. Whereas Elias describes an awareness of how Mr. X helps him improve his mathematical thinking and how he becomes able to help himself, Rikke stories Mr. X as a 'magician', resonating with much of the literature about how girls are more sensitive to relationships with teachers and other students, as for instance in Boaler (1997a, 1997b, 1997c, 1998, 2002) and Solomon et al. (2011).

As we have seen, Rikke's 9th grade improvement led to her transfer back to Class A for grade 10, but the local mathematics 'boom' in 9th grade didn't last, vanishing the moment she returned. Her newfound agency seems to collapse in what is, for her, an unfavourable turn in the evolving dynamics of Class A, resurrecting her previous inferior positionality and sense of exclusion. The rising hegemony of the discourse of achievement becomes toxic in the absence of 'the social group' and the lesser importance of teenage culture and popularity. There is no space for her in Class A, and she gives up. As Walkerdine (1989/1998) describes, it seems that Rikke is counted out of mathematics.

Addressing research question 2 through these six students' stories illustrates the considerable variability in the nature of their agency and their employment of identity, even though they could be taken for a homogenous group of students, or at least very similar pairs who are in the same position. The lens of figured worlds enables us to see beyond the superficial markers of positionality to understand how it is possible to go beyond essentialist views of gender and mathematics, focusing on the situated nature of identity and history-in-person. This analysis suggests that there are more options for mathematics students than just following predetermined trajectories, and that, as Black et al. (2015), Radovic et al. (2017), Solomon (2012) and Solomon et al. (2016) show, there are multiple pathways to agency. As Holland et al. emphasise, "It is folly to assume that members of a voluntary group, or even members of an "involuntary"—an ethnic or racial—group are uniform in their identities (see Rouse 1995). There may be far less to participation than meets the eye." (Holland et al., 1998, p.190).

RQ3: How is gender played out?

As we have seen, the issue of gender is distributed across much of the analysis and permeates the discussion of both research questions 1 and 2. Here, I aim to distil the complexities revealed in the previous discussion into a consistent narrative. I will highlight how actions in a figured world can take place out of consciousness as almost automatic happenings, in contrast to more dramatic events. Drawing on Vygotsky's concept of fossilisation as a means of capturing how everyday happenings in a figured world become 'automatic', Holland et al. note that these mundane activities can be 'more or less conscious, more or less habitual, moving sometimes out of awareness, toward fossilization, and at other times toward consciousness and susceptibility to manipulation' (Holland et al., 1998, p. 237). For the actors in a figured world, the habitual nature of the mundane activities that take place in everyday life may be out of awareness; however, once they become aware, they have the potential and choice to take action.

The nature of gender performance becomes conscious: a moment of recognition

My immersion over time in Class A meant that I not only became familiar with its mundane happenings, but I was also there when the relationship between gender and mathematics suddenly erupted from its hidden nature. This event occurred in the middle of Emilia's narrative, in Chapter 7, when she related an incident which brought an awareness of how gender is played out in Class A to both of us. I had not realised the extent of gender performance in the class until her account drew my attention to the possibility of an additional narrative of Class A.

As she recounts this incident, Emilia articulates her sense of unfairness in relation to her lack of opportunity for combining mathematical challenge with the possibility of asking questions in order to develop her understanding. 'The incident of the quadratic equations' occurred in a lesson when Miss A brought along some extra problems, informing the students that this was for those who wanted to challenge their understanding of reducing algebraic fractions by factorisation. Quadratic equations is an expected topic in tests for the highest grade, and is seen as one of the 'hardest' topics in the mathematics curriculum in lower secondary schools in Norway. As noted in the discussion of research questions 1 and 2, working on higher-level tasks is a significant marker for being among the 'smart' students in mathematics; doing tasks like quadratic equations provides a space for performing smartness.

The incident of the quadratic equations

I was present in this lesson and, interestingly, I refer to this incident in my introduction to Ross and Alexander as a means of describing their way of working in mathematics lessons, as part of the everyday business of Class A. As seen in Chapter 6, I made notes on their behaviour as they worked on the quadratic equations without even realising the significance of what I was seeing. I recorded, in my fieldnotes, that both of these boys chose to work with the tasks Miss A brought, just as a mundane act that takes place routinely.

Alexander works independently and Ross asks for assistance, being eager to confirm his thinking and to solve the tasks. As we know from Chapter 6, both Alexander and Ross say they enjoy mathematics when they are given the opportunity to work with challenging tasks such as this. They take up this space as if it is a habitual way of acting.

Note from observing Alexander's work, winter 10th grade:

Miss A has brought copies for the students who want to work with quadratic equations. Alexander works on his own on factorising algebraic expressions using knowledge of quadratic equations to reduce fractions.

I 'look over his shoulder' to see how his work is going. What he has done in his workbook seems to be correct, and he gives me the impression of not having need for assistance. I leave him alone, and he continues working.

Note on dialogue with Ross, winter 10th grade:

Miss A brought copies for the students who want to work with quadratic equations. Ross works concentratedly on his own and raises his hand to ask me for assistance. He works on factorizing algebraic expressions using knowledge of the quadratic equations to reduce fractions.

Ross is focused and thoughtful in our talk, and our conversation concerns how he is supposed to know when to use quadratic equations. He gives an impression of both enjoying and understanding the conversation.

Emilia's account of this incident contrasts sharply with Ross' and Alexander's unconscious performance. Her focus on it arises unexpectedly during our talk and evolves into something that Emilia becomes aware of – she seems to be affected as she realises her exclusion. It is as though she is suddenly conscious of the position she has developed, and that has been unmarked until this point. As Holland et al. say, positional identity can become “more or less conscious, more or less habitual, moving sometimes out of awareness, toward fossilization, and at other times toward consciousness and susceptibility to manipulation” (1998, p.237). For Emilia, this becomes an event which leads to an awareness of how she does not have access to the most challenging mathematics, and expressions of exclusion emerge in her talk. But even though she is concerned to do this kind of work in order to improve her grade, she decides against working with the boys, and ends up blaming Miss A for not taking action to make sure that all the students who are able to work at the highest level have the opportunity. This is something that comes as a surprise, knowing her attitude and way of talking.

Emilia's narrative suggests that she experiences restrictions on her access to mathematical challenge. Even though Miss A says that those who want to improve their level can choose to work at these tasks, Emilia doesn't take the message from Miss A as a signal that 'allows' her access to this space. It seems that she realises this and resists by complaining to me and blaming Miss A. Just as Kine doesn't see herself as having access to the same spaces as the 'smart boys', the same thing seems to be at stake here for Emilia. She self-censors, refraining from the activity

when – theoretically – she has been invited. It seems that this event affects Emilia in the way she sees what she is entitled to do, or, in this case, *not* to do, because of her position in Class A – and she expresses dissatisfaction with her exclusion. It is noticeable that there are no traces of this incident in Kine’s or Miss A’s stories; it seems that they are not conscious of it or of what is at stake. In the case of Ross and Alexander, this seems to be an everyday happening; these events are a part of their habitus, allowing automatic performance and recognition of their position in Class A. Indeed, it seems that the only person in Class A who notices is Emilia, and even I, with my history in person, didn’t recognise the issues she lines up.

Emilia’s narrative, and her reflexivity about this incident made me aware of the gendered nature of mundane activities in this mathematics class, and their unconscious and usually unquestioned performance. It was not until I had fully analysed her story that I became aware of its significance in revealing what is hidden, enabling us to see the pattern which we have only glimpsed in fragments until now. This incident illustrates how the positional force of gender makes different spaces available in this figured world, but more than that, it works as an example of how inclusion in, and exclusion from, mathematics in Class A goes on unconsciously for most of the students and the teacher.

As noted in Chapter 3, the actors in a figured world learn how to live in the world they are a part of out, in their own way, over time, but they are not necessarily conscious of this. We know that Emilia develops an internally persuasive discourse which enables her to take an authorial stance that opposes the authoritative discourse of the importance of high grades and the performance of smartness in Class A. Furthermore, we know that she improvises within the position she occupies, making it possible for her to direct her own behaviour, while at the same time working in accordance with her feel for the game. Despite this, putting herself forward to gain access to the tasks she knows could challenge her is too difficult, even for Emilia. Perhaps like Foyn et al.’s (2018) ‘clever girls’, she dares not cross the line of set patterns of behaviour to join the ‘smart boys’. Whatever the reason, she decides against entering the space of working with the boys, and she tries to comfort herself by saying that she will learn this later in upper secondary school, outside of the figured world of Class A.

Going beyond available positions

Using the lens of figured worlds to investigate individual trajectories within the same context enables an open rather than a deterministic approach to understanding how students in a mathematics class fashion their sense of self, within the same classroom culture and over time.

Even though figured worlds distribute people differently according to status, power and privilege, and even though positional forces of gender cut across the world, the actors within a figured world have some room to manoeuvre within the available spaces. Holland et al. (1998) remind us that Vygotsky and Bakhtin ‘tell us where—along the margins and interstices of collective cultural and social constructions—how, and with what difficulties human actors, individuals, and groups are able to redirect themselves’ (p.278).

However, if we are not aware of our positionality, the potential for redirecting actions may also be out of awareness. As Chapter 2 showed, a number of studies – Black et al. (2015), Francis (2012), Radovic et al. (2017), Solomon (2012), Solomon et al. (2016) - have sought to understand the possibility of alternative narratives for girls and women in mathematics. Elsewhere, the literature notes how high achieving girls in mathematics may refuse to enter a different position, or even be prevented from doing so, as in Foyn et al. (2018). In this study, the ‘clever girls’ wanted to hide what they were, but no one actually made them do this. The presence of ‘discourse border guards’ explains their reluctance to be labelled as an ‘unnatural’ girl, a nerd; it becomes clear that individuals may self-police. This seems to be the case with Emilia and maybe Kine. Moreover, this is an issue in the analysis and discussion of Ross’ narrative as well. His restricted space of authoring and lack of agency seem to direct his actions towards performing smartness through a cultural model of being good at mathematics that resonates with a combination of the acts of ‘The Mates’ and ‘The Technophiles’ in Barnes (2000). As Barnes (2000) notes, this is might not the most ‘healthy way’ to act as a mathematics learner, being concerned with how the other students see him. But noticing this requires an awareness of the nature of deeply embedded mundane happenings in Class A.

Gender is refracted through ‘smartness’

As already seen in Chapters 5-8 and the discussion of research question 1 and 2, there is an uneven distribution of power in this mathematics class which seems to be embedded in the increasingly hegemonic discourse of achievement. Moreover, it is established that the structuring effect of gender intersects with the major discourses of the figured world, creating a cross-cut space which delineates dominant positions for the boys in this class, leaving girls on the margins, or even excluded. The students craft their response to this figured world and no one seems to register this uneven distribution of power in this classroom. Within these lines the hidden nature of gender is played out and it goes unconsciously on. The situation is articulated as taken for granted; no one really registers the uneven distribution of power or resists it. Indeed, it is striking how, in the analysis in Chapter 5, even though some of the students, including

Kine, note the existence of the ‘smart boys’, they argue against gender differences in mathematics. Despite this contradiction, there is a ‘strange kind of logic’ which makes their argument possible. The argument is not that ‘boys are better than girls at maths’; it is more subtle than this. Performing smartness equals being good in mathematics, and a group of boys perform smartness; thus gender is refracted through the cultural model of ‘smartness’ and effortless work. The students seem to operate with this cultural model of smartness as attached to the boys, leading to a logic which makes it possible to argue that the boys in this class are better at mathematics, while at the same time arguing against gender differences in mathematics. We have seen how Kine and Emilia self-censor away from activities that are connected to performing smartness, and no one seems to position them in a way that challenges this gendered nature of positionality, so the cycle of identifications-in-practice is emergent and powerful.

Nevertheless, listening closely to the girls’ stories, we see that they are at different points on a continuum of realisation of the way in which gender operates in Class A; Kine complains about those who are extremely smart and who make her feel inferior, while Rikke just gives up, explaining that this is the only solution she has because the class is too clever. Emilia expresses a dilemma between working with understanding versus challenging herself; she senses an injustice in not being able to pursue both, but barely articulates it. This must be seen in relation with Ross’ and Alexander’s stories, too; they express no awareness of their occupation of a position of strength which affords them the freedom to act in accordance with their preferred ways of working.

Yet, if we look even closer, we can ask questions about the extent of Ross’ privilege. It is easy to interpret his performance of smartness in terms of power and privilege, but this depends on our understanding of what constitutes being in a powerful and privileged position. If power and privilege are connected to particular preferred actions and to limited access for other actors, we could argue that Ross is in a such position. However, it is worth rethinking what we mean by power and privilege. It is difficult to argue against his access to power. Ross’ acts are characterised by claiming entitlement through performing smartness, in line with Barnes’ (2000) hegemonic masculinities. However, as she comments, this approach to mathematics learning is not really beneficial. Ross seems to be preoccupied with the gaze of others, and he seems to be worked by the cultural model of “being smart/clever” at the same time that he works it to enact his position as a ‘smart boy’. He is ventriloquated by the authoritative discourse of achievement which makes a perfect match with the expectations everyone seems

to have for him. But no-one notices or questions this fact. It is no surprise that Ross doesn't see himself through the eyes of others; his story has so far been written for him.

Summary – figuring it otherwise

As we have seen there is no simple answer to the question of how gender is played out in Class A, but there are some important issues to point out. The assumption of gender essentialism is an unsustainable approach once we see the complexities in the students' stories. Moreover, the most striking feature about gender in Class A is the lack of awareness among the students and the teacher of the existence of (self)exclusion on the basis of gender in the everyday happenings of learning mathematics in this class. It seems that gender is played out within the frame of habitual acts in this classroom, out of awareness for the majority. The only one who realises that there are unequal opportunities for the students in this class, is Emilia. But even though she expresses a sense of agency going forward in mathematics, driven by an internally persuasive discourse of the value and joy of understanding, she does not step outside of the mundane world of Class A and challenge what she feels is exclusion from the most difficult mathematics.

Nevertheless, we might see in Emilia the seeds of 'figuring it otherwise'. An optimistic view is that her reflexivity may grow in the future and play a part in change. On the other hand, a pessimistic outlook is that, without a collective reflection on power and position in Class A, all its players – including Miss A and Ross – will be subject to the centripetal forces which reproduce those positions. There are no heroes or villains in the mundanity of gender in the mathematics classroom.

Chapter 10: No heroes, no villains: some conclusions in a never-ending story

In chapter 9, I have shown how the figured world of Class A is an evolving world where students are distributed differently according to power and privilege, by the significant marker of ‘acts of smartness’. The analysis has revealed that we should not assume uniform identity formation within a class, not even within subgroups of students who we might anticipate as being similar, such as the ‘smart boys’ or the high achieving girls. Students draw on multiple resources to fashion their sense of self: they craft their unique answer to the world of Class A, orchestrating the many voices from within and without this local figured world, appropriating its values, norms and figures into their ongoing histories in person in ways which are shaped by cultural models and discourses. Although Class A is cross-cut by the structuring force of gender and the dominant discourses of achievement and the value of mathematics, there is no uniform identity formation even within these cross-cut spaces.

In this chapter I will reflect on the contribution to knowledge that this thesis makes, particularly in terms of how Holland et al.’s (1998) framework has enabled me to keep in mind the importance of the issues raised at the end of Chapter 2: the need to avoid essentialism, and to capture how students may appropriate regulatory discourses and create their unique trajectories as mathematics students. It has also enabled me to understand the relationship between individuals and their surrounding world, and to capture the collective dynamics of that world. Using the framework of figured worlds, and particularly the role of Bakhtin’s thinking in it, has also supported a methodological approach in which I have been conscious of my own choices in analysing the data and telling the story of Class A. I will discuss the methodological contribution of this thesis and reflect on the research design and what might have been otherwise. I next discuss the implications for policy and practice of my analysis in terms of the need for collective change, and public discussion and awareness of the way in which young people – and their teachers - are positioned in mathematics classrooms in Norway. Finally, I reflect on my experience in this study, and its role in my own self-authoring as a researcher.

Contribution to knowledge

This study contributes to knowledge in the field of gender and mathematics by embedding individual narratives within the context of classroom practices and discourse. Investigating the dynamics of a mathematics classroom as a figured world, with its norms, values, cultural models, and figures, enables insights into the nature of individual students’ agency as they

employ available identities during their years of lower secondary school. I have shown how students fashion a sense of self within this local context, appropriating – or not – the model of ‘smartness’ which permeates the ways in which gender is played out in a classroom culture.

My approach has been to look at the overall ‘package’ of the classroom to understand how students enact and negotiate identity and agency in multiple ways. As discussed in Chapter 2, we need to go beyond essentialist views to understand how gender is performed in classrooms, in accordance with local discourses. I needed a theoretical and methodological approach that enabled an understanding of individual students within a shifting classroom culture, itself understood as a part of a wider social context and its attendant cultural models and discourses of education and mathematics. I have argued that this understanding is supported theoretically by the use of figured worlds and methodologically by the use of a dialogical approach.

Theoretically, the use of the concept of figured worlds has offered tools for investigating the process of identity formation within a classroom culture, acknowledging the importance of the situatedness of the whole class and how individuals within it are involved in a complex interplay between the dynamics of an evolving figured world, their relations to the other actors in the world, and their own history in person. This study has demonstrated that it is not possible to assume uniform identity formation, not even within a subgroup of a class, and it demonstrates that there is more to identity formation within a classroom culture than meets the eye; sometimes there is less significance in individuals’ participation than we might expect, other times there is more. In order to understand how students fashion their sense of self, we need to look at individuals in context, seeing them as a part of a dialogic chain, taking genre and addressivity into account – acts and utterances need to be seen as a response to previous acts or utterances. An important finding in this study is the recognition of the significant value of the position and power related to ‘smartness’ and how this is exercised through a hegemonic masculinity which affects not just the ‘smart boys’ themselves, but also other students in this class as they negotiate agency within their spaces of authoring as mathematics students.

Moreover, this framework has enabled me to go beyond a binarised view of gender and mathematics. Recognising the heteroglossic nature of the classroom culture and the multifarious ways of responding to it reveals alternative understandings of gender and mathematics which go beyond assumptions of male power and female anxiety. This study has shown that although gender is a positional force within a classroom culture, students have other options than simply acting along the predetermined and regulatory pathways of gender and mathematics. The analysis of students’ agency within a space of authoring indicates that the

classroom dynamics are more complex than this: occupying a prominent position of power and privilege does not automatically confer benefits, and there are alternative ways of being successful as a mathematics student, even though these might not be recognised in this world, at this time. This study has noted how an internally persuasive discourse can potentially provide a means of stepping outside of predicted pathways that is taken for granted as beneficial.

Taking the critical and holistic view that this framework offers has enabled a contribution to knowledge which goes beyond pointing to single factors, persons or occurrences. Within the framework of a figured world, there is no sense in chasing heroes or villains, in singling out an event or action from its context. Rather, this framework enables us to focus on the mundane activities which take place within a collectively produced world. This study recognises the mechanisms that are embedded within the everyday happenings that take place within the values, rules and norms of this figured world and the discourses, figures, and cultural models which make particular positions available. In this classroom I have noticed how male power emerges through the gendered model of 'smartness', and how students draw on multiple resources including their history in person and voices outside this classroom in order to negotiate agency within these mechanisms of power. The figured worlds approach enables a recognition that actors are engaged in a complex interplay where cycles of identifications-in-practice are emergent and powerful, and it enables us to scratch beneath the surface to see what lies behind these apparently mundane acts. Furthermore, recognising mundanity in a figured worlds approach underlines the role of collective consciousness in potential change; without collective awareness of the mechanisms of power, it is not possible to 'figure it otherwise'.

The methodological contribution

Using the theoretical framework of figured worlds has implications for the methodological contribution of this study, leading to a dialogic approach which focuses on the 'trio' of individual, speech genre and audience. Understanding how a student fashions their sense of self as a mathematics student requires taking the whole picture into account: it is not possible to single out that one student's story, investigating it separately from other students' stories or the story of Class A. Taking a dialogic approach led me to 'go ethnographical', something that was necessary in order to capture not only the evolving nature of the figured world but also the view through the students' eyes, although I was aware that this latter was not entirely possible. As I have pointed out in Chapter 4, dialogical approaches need to consider both emic and etic stances, just as meaning is constructed in the tension between centrifugal and centripetal forces. Going ethnographical didn't make me a full participant of Class A; rather, it enabled me to

develop 'thick descriptions' of Class A as a figured world through my participation in lessons and the interviews and documents I was offered. Gathering students' narratives of self and analysing these through the lens of spaces of authoring gave me the opportunity to develop a closer understanding of their view of the figured world and how they understood not only their own past and present place in it but that of others. Going ethnographical made it possible to look at 'the complete package' of Class A and how the students in this class related to the world and each other as they negotiated agency and identity over time.

At the same time, in the spirit of dialogism, my role as researcher means that the construction of meaning in this thesis is mediated by the dynamic interplay between my involvement as an actor in the figured world of Class A, the processes of addressivity between myself, the students and teacher, and my own history in person. Recognition of this dynamic entails acknowledging that I have told the story of Class A through my eyes. Using a dialogic approach makes it impossible to claim that I have access to 'the truth' of Class A. Rather, it means that I am aware that there are multiple ways of constructing meaning from the fabric of this figured world, and of understanding how gender is played out within this classroom context. I am aware that there are alternative visions of Class A. This is not to play down the role of this methodological approach. Being transparent about my history in person enables others to know where the 'vantage point' of the 'I' is, and how my meaning is constructed. In addition, there is value in inviting others to experience Class A through my eyes, making it possible to engage with and react to my story, putting discussion of gender and mathematics onto the agenda in Norway.

Reflecting on the research design - the possibility of alternative endings

The spirit of dialogism means that there are multiple ways of constructing meaning and there are alternative stories of Class A to the one I have presented here. Bearing in mind that the way this story has developed is one of many alternatives, I reflect here on the choices I have made and consider how they have affected the way the story of Class A unfolded.

The theoretical framework of figured worlds provided me with tools for looking at the whole package of Class A, to see behind the surface of this classroom culture. A crucial aim in my decision-making was capturing a 'complete as possible' view of Class A, and to this end I used a strategy of 'keeping doors open'. This study was to be conducted over a period of two and a half years, and this was a strong incentive for me to interfere as little as possible in the everyday life of the class, partly to limit the possibility that students or even Miss A would no longer want to participate, but also because I wanted to be responsive to the unfolding of events.

Hence, I aimed to balance completeness – I interviewed every student in the class and I held a number of focus groups – with flexibility. I was sensitive to the rhythms of the class, timing interviews and combining focus groups to match students' availability and Miss A's plans. Undoubtedly, I could have been more systematic in my selection of who, when, and where, but this might have been driven by preconceptions which would have led to an alternative vision of Class A.

However, even though I have tried to take a holistic view of this classroom, I have needed to make some choices due to limitations of time and space. My 'keeping doors open' approach was based on an awareness that my choice of case study students would have implications for the construction of the story of Class A. For instance, at one time I hoped to use two more students' stories, Sarah's story of how everyone except herself was surprised by her good results, and William's story of 'fighting' for a place among 'the smart boys'. Inclusion of their stories would undoubtedly have led to an alternative story of Class A. However, it might not necessarily have led to different answers to my research questions; their stories might have added more detail to my understanding of how different students respond to the way in which gender is played out in Class A, but are less likely to have changed my account of the interplay between discourses, cultural models, and habitual acts, including acts of 'smartness'.

There are other possible directions that this study could have taken, and that further study could take in the future. For example, Rikke's story made me realise how her situation, within this group of what seemed to be homogenous students, was different from the others. She was the only one who didn't have a 'safety-net' at home that could help her if she ran into problems with learning mathematics in school. Rikke's case suggests the value of exploring the role of cultural capital in addition to gender in students' mathematical identities.

As Bakhtin tells us, authorship is not a choice, the world needs to be answered. This thesis is my reaction to my experiences from my time in Class A. There are several 'could have beens' to consider, not least that another researcher with another history in person and another audience in mind, could have told the story differently. And even though I have put a full stop to this work at the end, this story is still an open-ended story, or a never-ending story.

Self-authoring as a researcher: an evolving self in an evolving world

Finally, Bakhtin's message that 'people are condemned to respond to the stimuli surrounding them, because of the dialogic nature of existence' has affected me: being part of the figured world of Class A and carrying out this study has affected me. I began with a real curiosity and

strong motivation to investigate students in a lower secondary classroom, and to understand more about how they developed their sense of self in mathematics, at an age when much changes for them. I brought my own history in person as a mathematics teacher into Class A, and my involvement in this classroom and my relationships with the students and Miss A became part of that ongoing history in person. During my time in this classroom, gender and mathematics emerged as an important issue that I wanted to investigate. Several ‘traces’ led me to realise that I needed to put gender on the agenda in this study, but it was Emilia’s story that enabled me to see how strongly this affected the students and their experiences of mathematics, and the hidden nature of gender. I experienced this story as a dramatic incident, causing me to look at the world with new awareness.

Now it is impossible for me to look at the world without this awareness; it has become a part of my history in person, and it is impossible for me to separate this experience out. I see the world through different eyes now, both professionally and privately. Doing this study has affected me as a researcher. For instance: I started this project confident that I was an experienced participant in classroom culture, I was an experienced mathematics teacher and I was able to understand the world I was engaged in. Now, I have realised that my horizon of understanding of a classroom culture will always be limited; there will always be challenges in claiming to know it all, and there will always be alternative visions to my view. Moreover, this experience has affected me as a human being. I can’t escape from the figured worlds way of looking at the world having become aware and conscious of it. I will draw on this experience for the rest of my life. My understanding of both everyday events and the more dramatic incidents in my own life and that of those closest to me will always be in the spirit of a figured world.

Implications for policy and practice

This study has underlined the complexity of being a mathematics student. As the students’ stories tell us, it involves much more than simply doing the obvious things – following the teacher’s explanations, asking questions, doing exercises, solving problems, doing homework and so on - to construct one’s mathematical knowledge. Learning mathematics is a social activity that takes place in a fluid social world, and students differ in their experiences of this world. But this difference is often hidden; one of the most important findings of this study is the mundanity of actions within a classroom, and how much is out of awareness.

Understanding this complexity reveals how individual considerations are not enough to promote students' learning in mathematics, and that we need to take the collective into account: the mechanisms of the classroom culture, the influence of assessment practices, cultural models of mathematics, and more locally, what being a successful mathematics student constitutes. The findings of this study deny simplistic thinking and "quick fix" or "one size fits all" solutions for addressing issues such as girls' under-participation in mathematics. Rather, we need to recognise and focus on the discourses and mechanisms that underlie classroom practice and which seem to promote and tolerate uneven distribution of power and privilege.

Taking a holistic view also enables recognition of how individual students, or groups of students, are not necessarily in the uncritical or benign position that their willingness to repeat habitual acts may lead us to believe. Realising that something is not beneficial is crucial if we are to figure the world otherwise. World making can emerge in big, spectacular movements, or as more silent, social reconstructions. Alternative worlds carry new identities, cultural forms, and possibilities for renewed agency. These new worlds are not necessarily played out, but they are at least an image of how the world should *not* be, which might be the first step to figuring it otherwise. However, change will not happen by itself. It requires conscious awareness among teachers, students and the other actors in a figured world of its habitual acts and what they signify. This cannot be the responsibility of teachers alone; the dynamics of the mathematics classroom mean that teachers are just a part of the complex interplay that this study has identified. While powerful discourses of testing and performance dominate teachers' work and students' consciousness, so will the pedagogic practices and models of mathematics that perpetuate the perceived value of 'smart' behaviour without understanding. There is less time to notice and reflect on 'what lies beneath the surface' and the impact of such practices on students who are doing well such as Emilia and Kine, let alone the likes of Ross. We also see the growth of a discourse of achievement in Norway, which compounds the pressures on teachers and students alike, eroding the values of 'bildung' and appreciation of difference.

This study has revealed how gender is played out in the mathematics classroom, and its power in students' positionality and self-authoring. It highlights why gender can act as a positional marker even within a context where equity is anticipated and expected, and indeed is apparently signified by exam results as is the case in Norway. The findings of this study, in a randomly picked Norwegian classroom, suggest that things may not be as they appear; the role of gender in the distribution of power and privilege needs to be taken seriously, and gender inequity cannot be dismissed as 'not a problem' in Norway. But it will never be a question of chasing

heroes or villains; rather, it will be a matter of trying to arrive in a position that makes it possible to become aware of what is out of awareness, and uncovering the mundanity of gender in the mathematics classroom.

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Appendices

Appendix 1: Examples of fieldnotes

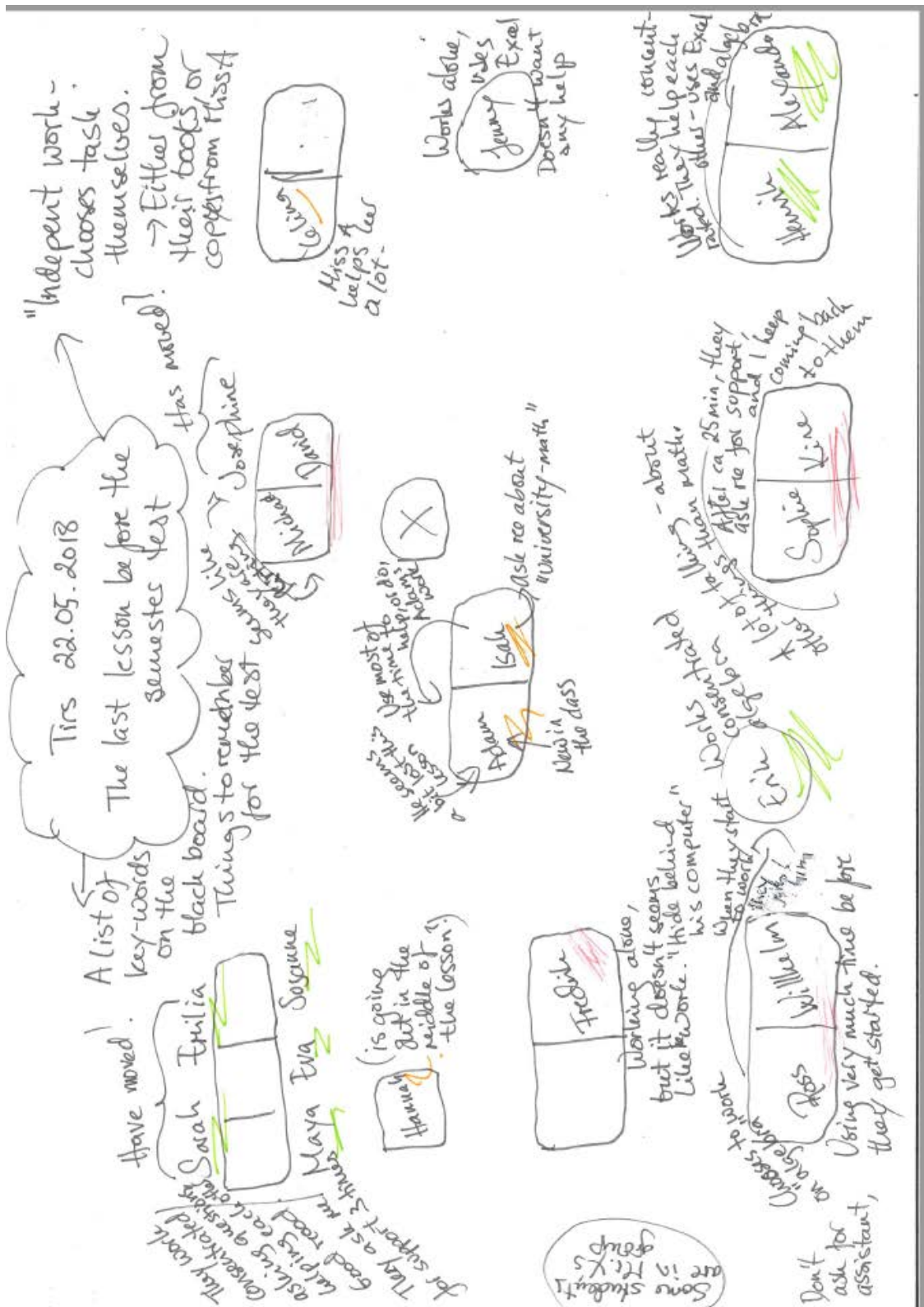


Figure 15. This is an example of fieldnotes, translated to English. It indicates my impression of what the students do during the lesson and who they work with.

Appendix 2: Topic guide for focus groups

Topic guide 8th grade – spring:

Norwegian version

1) Holdninger til matematikk

(Vis enig/uenig plakat)

Jeg liker matematikk

Jeg liker matematikk bedre enn mange andre fag

I vår klasse liker mange matematikk

Diskuter: Hvilke adjektiv mener dere beskriver matematikkfaget?

Hvilket adjektiv er ville du valgt?

Hvilke er ikke riktige?

Morsomt
Kjedelig
Interessant
Vanskelig
Lett
Meningsløst
Tørt
Utfordrende
Kreativt
Repeterende
Slitsomt
Intuitivt
Nyttig

Kan dere bli enig?

1b)

Hvilke fag liker dere best?

Hvilke fag mener dere det er viktig å gjøre det bra i?

DISKUTER:

Hvilket fag gir det mest status å
gjøre det bra i?

Rangere fag:

Lapper

Norsk
Matte
Engelsk
Samfunnsfag
Naturfag
KRLE
Gym
Kunst og håndverk
Musikk
Fremmedspråk
Valgfag

Hvordan ville rekkefølgen vært for ett år siden.

Hvilket fag er det mest viktig for deg å gjøre det bra i?

2) Fra barneskolen

(Vis enig/uenig plakat)

Jeg synes matematikk var lettere på barneskolen.

Jeg synes matematikktimene var morsommere på barneskolen

Jeg liker å få karakterer på matteprøver

Hva er hovedforskjellen på matematikktimene her og på barneskolen?

Skriv på POST IT!

Lapper

Hvilke egenskaper trenger man for å få til matematikken?

Rask
Nøyaktig
Konsentrert
Kreativ
Samarbeidsvillig
God hukommelse
Konkurransen innstilt
Disiplinert
Strukturert
Impulsiv

Prøv å bli enige!

3) Motivasjon

Indre motivasjon

(Vis enig/uenig plakat)

Jeg er interessert i det jeg lærer i matematikk

Jeg arbeider med matematikk fordi jeg liker det

Jeg ser fram til matematikktimene

DISKUTER: Hvordan var dette på barneskolen?

Deg, klassen?

Instrumentell motivasjon

(Vis enig/uenig plakat)

Matematikk er et viktig fag

Å lære matematikk er viktig for meg fordi det vil gjøre det lett å få jobb Matematikk er et viktig fag for meg fordi jeg trenger det når jeg skal studere videre

Å gjøre en innsats i matematikk er viktig fordi det vil hjelpe meg i det arbeidet jeg skal gjøre senere

DISKUTER:

Har dette endret seg på noen måte siden barneskolen?

Har det noe med alder å gjøre?

Hvorfor trenger vi å lære matematikk?

Tildeling av ansvar

(Vis enig/uenig plakat)

Hvis jeg gjør en stor nok innsats, kan jeg lykkes i matematikk

Om jeg gjør det bra eller ikke i matematikk, er helt opp til meg

Jeg er redd jeg vil få dårlige karakterer i matematikk

Diskuter:

Hvem hjelper deg til å få til faget?

Skriv ned på post it lapper

4) Forståelse/utholdenhet

(Vis enig/uenig plakat)

Jeg synes det er lett å huske formler

Jeg liker å forstå hvorfor man kan løse oppgaver på en bestemt måte

Jeg liker å finne svaret raskt Jeg fortsetter å være interessert i oppgaver som jeg begynner på

Jeg fortsetter å arbeide med oppgaver helt til alt er perfekt Jeg utsetter vanskelige oppgaver

Jeg er ofte bekymret for at matematikktimene blir vanskelige

Jeg blir veldig stresset når jeg må gjøre lekser i matematikk

Jeg blir stresset på matematikkprøver

DISKUTER: Er det viktigst å forstå matematikken eller å huske fremgangsmåter?

5) Holdninger til matematikk

(Vis enig/uenig plakat)

Jeg lærer matematikk raskere enn andre fag

De fleste i klassen gjør det bra i matematikk

De fleste i klassen jobber hardt i matematikk

Klassen liker å ha matematikkprøver

Jeg forstår det vanskeligste i matematikktimene

Jeg har alltid ment at matematikk er et av de beste fagene mine

Foreldrene mine synes det er viktig at jeg jobber med matematikkfaget

Foreldrene mine mener at matematikk er viktig for mine studie- og yrkesmuligheter

Foreldrene mine liker matematikk

DISKUTER: Hva er det som gjør at man får lyst til å jobbe med et skolefag?

6) Mestringsforventning

(Vis enig/uenig plakat)

Finne x i en slik likning: $2(x + 3) = (x + 3)(x - 3)$ Finne den virkelige avstanden mellom to steder

på et kart med målestokken $\frac{1}{10\,000}$

Finne x i en slik likning: $3x + 5 = 17$

Forstå grafer som presenteres i aviser

Regne ut hvor mange kvadratmeter med fliser du trenger for å dekke et gulv Regne ut hvor mye

billigere en TV vil bli med 30 % rabatt

Bruke en togtabell for å finne ut hvor lang tid det vil ta å komme seg fra ett sted til et annet

Beregne hvor mye bensin en bil bruker per mil

Translated version

1) Attitude to mathematics
(Show agree / disagree poster)

I like maths.
I like maths better than many other subjects.
In our class many students like maths

Discuss: Which adjectives do you think describe maths?
Which adjective is most precise?
Which is not right?

Funny
Boring
Interesting
Difficult
Easy
Meaningless
Dry
Challenging
Creative
Repetitive
Exhausting
Intuitive
Useful

Could you come to
an agreement?

1b)
Which subjects do you like the best?
Which subjects do you think it is important to do well in?
DISCUSS:
Which subjects are most linked to status according to performance?

Rank subjects :

Norsk
Maths
English
Social Studies
Science
KRLE
Gym
Arts and crafts
Music
Foreign Language
Elective subjects

How would you have ranked it one year ago?
Which subjects are most important to do well in?

2) From primary school
(Show single / disagree poster)

I think maths was easier in primary school.
I think maths classes were more fun in primary school
I like is to get grades on maths-tests.

What is the main difference in maths-lessons here and at primary school?
Write on POST IT!

3) Which of these characteristics is useful when working on maths?

Fast
Precise
Concentrated
Creative
Willing to cooperate
Good memory
Competitive
Disciplined
Structured
Impulsive

Try to agree!

4) Motivation
Inner motivation
(Show agree/disagree poster)

I'm interested in what I'm learning in maths
I work with maths because I like it
I look forward to the maths classes
DISCUSS: How was this in primary school?
You, your class?

Instrumental motivation
(Show agree/disagree poster)

Maths is an important subject
To learn maths is important for me because it will make it easier to get a job
Maths is an important subject for me because I need it in my future education
To make an effort in maths is important because it will help me in the work I will do later
DISCUSS:
Has this changed in some way since primary school?
Does it have anything to do with age?
Why do we need to learn maths?

4) Responsibility

(Show agree/disagree poster)

If I try hard, I can do success in maths
If I do it well or not in maths, is entirely up to me
I'm afraid I'll get bad grades in maths

Discuss:

Who helps you with maths?

Write down on post it notes

5) Understanding/stamina

(Show single / disagree poster)

I think it is easy to remember formulas
I like to understand why we can solve problems in a certain way
I like to find answers quickly and I continue to be interested in tasks that I start to work on
I will continue to work with tasks until everything is perfect
I expose difficult tasks
I am often worried that the maths lessons are difficult
I am feeling stressed when I **have to** do homework in maths
I get stressed on maths tests

DISCUSS: Is it most important to understand mathematics or to remember procedures?

5) Attitudes towards mathematics

(Show single / disagree poster)

I learn maths faster than other subjects
Most people in the class do well in maths
The majority of the class is working hard in maths
The class likes to have maths tests
I understand the most challenging parts of maths lessons
I have always thought that maths is one of my best subjects
My parents think it is important that I work with maths
My parents believe that maths is important for my study - and career possibilities
My parents like maths

DISCUSS: What makes you motivated for working on a subject?

6) Expectation of mastery

(Show agree/disagree poster)

I can find x in one such equation: $2(x + 3) = (x + 3)(x - 3)$
I can find the distance between two locations on a map with the scale 1: 10 000
I can find x in a such equation: $3x + 5 = 17$
I understand graphs that are presented in newspapers

I can calculate how many square meters of tiles you need for to cover a floor
I can calculate how much cheaper a TV will be with 30% discount
I can use train timetable to find out how long time I will use from one place to another
I can calculate how much petrol a car uses per mile

Topic guide 9th grade – autumn:

Fokusgruppe-høst 9.klasse		
Hensikt	Aktivitet	Spørsmål
Finne ut hvordan de mener situasjonen i matte er i 9.klasse	Rangere fag, på ark Liste med alle fag Beskrive med adjektivslapper	Liker dere matte? Liker det bedre enn andre fag? (HVORFOR?)
	Sammenligne 8.klasse/ 9.klasse Ark Hva er likt som i 8.klasse?	Hvordan er matte i 9.klasse? Hva er annerledes enn 8.klasse?
	Lage en typisk 9a elev i matte	Hjelp elevene med: Liker den matte? Er den flink på skolen? Hva er favorittfaget? Hvor godt liker den matte? Rangering (topp, middels, bunn) Er den ambisiøs på skolen? Er den arbeidsom i mattetimen? Er den opptatt av god karakter i matte? Hvordan jobber den med matte? (Hjemme/på skolen) Hvem hjelper den til å forstå? Når liker den matte? (Aktiviteter/oppgaver) Karakter og viktighet

Translated version

Focus group-autumn 9th grade		
Purpose	Activity	Questions
Find out what the students think of maths in 9th grade	Rank subject, on sheets List of all subjects Describe maths using adjectives	Do you like maths? Do you like it better than other subjects? (WHY?)
	Compare 8 th and 9 th grade Sheets What is similar as in 8 th grade?	How is math in 9 th grade? What is different from 8 th grade?
	Create a typical 9th grade student in maths	Help students with: Does the student like maths? Is the student clever at school? What is the favourite subject? How well does the student like maths? Ranking (top, middle, bottom) Is the student ambitious at school? Does the student work hard in the maths lesson? Is the student Is the student concerned about getting good grades in maths? How does the student work to learn maths? (At home/at school) Who helps him/her to understand? When does the student like maths? (Activities/tasks) Grades and importance

Topic guide 9th grade – spring:

Fokusgruppeintervju 2- 9.klasse vår

Hensikt	Aktivitet	Spørsmål
Hvordan har matte i 9.klasse vært	Sammenligne starten av året, med slutten av året. Blir det enighet i gruppa?	Hvordan så du for deg at det skulle gå med matte i 9.klasse? Hvordan har det gått?
Erfaringer med tentamen		Var tentamen som ventet? Var det vanskeligere eller lettere enn i 8.klasse?
Håp for 10.klasse	Hvis dere skulle lagd den perfekte mattetimen, hvordan ville den vært? -Hvordan burde vurderingen vært lagt opp?	

Translated version:

Focus group interview 2 - 9th grade spring

Purpose	Activity	Questions
How has math been in 9th grade	Compare the beginning of the year with the end of the year. Can the group be agree upon this?	How did you think that math would be in 9th grade? How did it go?
Experiences with the semester test		Was the semester test as expected? Was it harder or easier than in 8th grade?
Hope for 10th grade	If you should plan the perfect math lesson, how would be? - How should the assessment have been?	

Appendix 3: Topic guide for individual interviews

Interview individual interview

Intervjuguide individuelt intervju:

Tema – ungdomsskoletiden og matematikk

	Mål	Hvordan	Aktivitet
	Elevene skal fortelle mest mulig selvstendig om sin historie	Eksempel på spørsmål. Men mest av alt. Oppmuntre til å fortelle mer.	
Eleven		Liker du matte? Hvorfor/hvorfor ikke? Spesielle erfaringer fra ungdomskolen? Er du fornøyd med faglig utvikling? Hvordan jobber du for å lære matematikk? -På skolen? -Hjemme? Er det noen personer som har vært viktig for deg, når det gjelder matte?	Tegne linjer inn i koordinatsystem. -Forhold til faget -Faglig utvikling -Arbeidsinnsats Dette gjøres etter eleven har fått fortelle om seg selv.
Klassen		Hva er det beste med klassen? Hvordan er klassen sammenlignet med en ideal klasse? Hvordan er klassen sammenlignet med klassen på barneskolen? Er det grupperinger i klassen? Hører du til en gruppering?	
Meg i klassen		Hvordan ser du deg selv som matteelev? Hvordan tror du andre elever ser deg som matteelev? Hvordan tror du læreren din vil beskrive deg som matteelev?	
Fremtid		Hva tenker du om matte på videregående? Ser du for deg at du kommer til å ta et studie som krever matematikk? Har du et drømmestudie/drømmeyrke?	

Translated version

Interview guide individual interviews

Topic: Lower secondary school and mathematics

	Goal		How	Activity
	Students should talk as independently as possible to tell their story		Example of questions. But most important of all. Encourage the students to tell more.	
The student			<p>Do you like maths? Why / why not? Special experiences from junior high school? Are you satisfied with your development in maths? How do you work to learn maths? -At school? -Home? Are there any people who have been important to you when it comes to maths?</p>	<p>Draw lines into the coordinate system. -Relationship to maths -Professional development -Work effort</p> <p>This is done after the student has been talked about themselves.</p>
The Class			<p>What is the best thing about the class? How is the class compared to an ideal class? How is the class compared to your class in primary school? Are there groupings in the class? Do you belong to a group?</p>	
Me in class			<p>How do you see yourself as a maths student? How do you think other students see you as a maths student? How do you think your teacher will describe you as a maths student?</p>	
Future			<p>What do you think about maths in high school? Do you envision that you will take an educational pathway that requires maths? Do you have a dream study / dream profession?</p>	

Appendix 4: Topic guide for the teacher's interviews

The same guide was used for the 8th and 9th grade interview.

Kan du gruppere elevene i forhold til faglig nivå?

Høyt/Middels/ Lavt

Har det vært noen endringer, siden i fjor, tenker du?

Gruppere etter arbeidsinnsats?

Høyt/Middels/ Lavt

Er det noen du synes ambisiøse?

Gruppere etter popularitet?

Hva tror du er grunnen til at de er populære, har denne posisjonen?

Er det noen av disse du opplever har endret posisjon fra i fjor?

Er det noen av disse som du har spesielt god kontakt med

Hvilke personer vil du si er med på å prege klassen sterkest/ikke kommer unna?

Har det vært noen utfordringer fra 8. til 9.klasse, slik du ser det?

Har det vært utfordringer for grupper av elever? Kjønn/faglig nivå/etc

Kjennetegn på klassen, hva ville du valgt av ord da?

Hvordan synes du klassen er med tanke på faglig nivå?

Hvordan tror du at elevene opplever klassen med tanke på faglig nivå.

Hva tror du at elevene tror at gjennomsnittskarakteren er?

Hvordan er det å være en flink elev i klasse 8a?

Er det noen fag det er status å gjøre det bra i?

Hvordan er det å være en som strever/er lite motivert?

Hvis du skulle lagd et frempek for 10.klasse hvem tror du at kommer til å gjøre det bra og hvem er du bekymret for

Hadde du tenkt at dette hadde vært en bra klasse og fått opp i matematikk?

Translated version

Can you group the students according to academic level?

High / Medium / Low

Have there been any changes, since last year, do you think?

Group by work effort?

High / Medium / Low

Is there anyone you find ambitious?

Group by popularity?

What do you think is the reason they are popular, have this position?

Have any of these changed their position over last year?

Are there any of these that you have particularly good contact with?

Which people would you say help to affect the class the most/impossible to ignore?

(Have there been any challenges from 8th to 9th grade, as you see it?)

Have there been challenges for groups of students? Gender / professional level / etc

If you should choose a word that characterizes the class, what word would you choose?

How do you think the class is in terms of professional level?

How do you think the students experience the class in terms of academic level.

What do you think the students think the average grade is?

What is it like to be a good student in class 8a?

Are there any subjects that is given status to do well in?

What is it like to be someone who struggles / is not very motivated?

If you are going to predict how 10th grade is, who do you think will do well and who are you worried about?

Did you think that this would have been a good class to be picked out for the exam?

Teacher's analysis - semester test spring 2018

Name of students	Numbers	Fractions	Algebra-equations	Geometry	Measures
	Tall	Brøk	Algebra/ligninger	Geometr	
	100%	100%	100%	100%	100%
	90%	100%	96%	100%	100%
	42%	18%	7%	20%	15%
	100%	91%	100%	40%	85%
	85%	91%	75%	100%	77%
	82%	45%	54%	80%	62%
	65%	27%	25%	0%	31%
	98%	82%	86%	100%	100%
	61%	45%	21%	0%	62%
	32%	18%	36%	100%	54%
	85%	73%	75%	80%	54%
	82%	64%	36%	60%	77%
	90%	73%	64%	80%	100%
	79%	36%	54%	40%	38%
	79%	41%	61%	60%	62%
	82%	64%	71%	100%	62%
	61%	36%	36%	60%	62%
	77%	82%	68%	100%	92%
	85%	68%	68%	100%	85%
	94%	45%	79%	80%	92%
	87%	64%	75%	100%	77%
	77%	59%	50%	80%	100%
	98%	100%	82%	80%	100%
	76%	50%	86%	60%	100%
	87%	91%	82%	80%	100%
	89%	91%	93%	80%	69%

ANONYMIZED

Figure 17. Teacher's analysis of the semester test, spring 9th grade

Appendix 6: Example of a student's written reflections after the end of year tests in 8th grade and 9th grade

1) Hva er du fornøyd med etter tentamen?

Det jeg er fornøyd med etter tentamen er mye av del 1 og halve del to.

2) Hvordan forberedte du deg til tentamen?

Jeg forberedte meg med å generelt bare gjøre masse oppgaver til alle temaene gjennom kapittel 1 til 5

3) Hvordan disponerte du tiden din og klarte du å følge

planen din? Jeg hadde ikke en plan sånn egentlig, men jeg brukte ca 2 timer på 1 del, også måtte jeg få i meg litt energi så jeg spiste litt og deretter begynte jeg på del 2

4) Hvilke ambisjoner hadde du med denne prøven?

Mine ambisjoner var at jeg skulle tenke meg ordentlig om før jeg gjorde oppgavene, og da jeg fant ut av hvilken formel jeg skulle bruke måtte jeg dobbeltsjekke om jeg skrev riktig tall osv. Jeg hadde også et mål om å sette et svar på alle oppgavene, så hvis jeg ikke forstod noe skulle jeg uansett prøve mitt beste.

5) Hvordan synes du selv at arbeidet ditt ble?

Jeg synes arbeidet mitt var ganske bra og jeg tror ikke jeg hadde fått til noe mer som var vanskeligere. Så og si så er jeg ganske fornøyd

6) Hvilken karakter ser du for deg at du vil få på denne prøven?

Nå er ikke jeg sikker på hvor mange oppgaver jeg fikk rett og om jeg gjorde det bra, men ut i fra sånn jeg synes det gikk tror jeg kanskje en 4+

7) Hvordan synes du arbeidet med matematikkfaget har gått i 9.klasse? Hvilke ambisjoner har du for 10.klasse?

Jeg synes vi har gått gjennom forskjellige ting litt fort som f.eks pytagoras som vi bare gjorde i en skoletime som jeg kan huske. I tiende klasse har jeg veldig lyst til å få en 5, for å nå dette målet skal jeg jobbe mye og prøve å forstå formlene så godt som mulig, men da må vi også gå gjennom ting litt nøyere og kanskje gjennomgå det flere ganger. På tentamener synes jeg vi skal ha minst to luftepauser, nå fikk vi bare en luftepause og det synes jeg er alt for lite når man

Translated version:

1) What are you happy with after the semester test?

What I am happy with after the semester test is a lot of part 1 and half part two.

2) How did you prepare for the test?

I prepared myself by generally just doing lots of assignments for all the topics through chapters 1 to 5

3) How did you manage your time and were you able to follow your plan?

I did not really have a plan like that, but I spent about 2 hours on 1 part, also I had to get some energy in me so I ate a little and then I started on part 2

4) What were your ambitions for this test?

My ambitions were that I should think carefully before I did the tasks, and when I found out which formula I should use I had to double check if I wrote the correct number etc. I also had a goal to give an answer to all the tasks, so if I did not understand something I should try my best anyway.

5) How do you think your work turned out?

I think my work was pretty good and I do not think I couldn't do anything of what I found difficult. So to speak, I'm pretty happy

6) What grade do you envisage getting on this test?

Now I'm not sure how many tasks I got right and if I did well, but based on how I think it went I think maybe a 4+

7) How do you think the work with mathematics has gone in 9th grade? What ambitions do you have for 10th grade?

I think we went through different things a bit fast like for example pythagoras that we only did in one school lesson that I can remember. In tenth grade I really want to get a 5, to reach this goal I will work a lot and try to understand the formulas as well as possible, but then we also have to go through things a little more closely and maybe review it several times. On semester tests, I think we should have at least two breaks to get some air.

Appendix 7: Examples of analysis

Figure 18, 19 and 20 illustrate the analysis process of the students' narrative of self. Figure 21 illustrate the last process of the analysis of the figured world

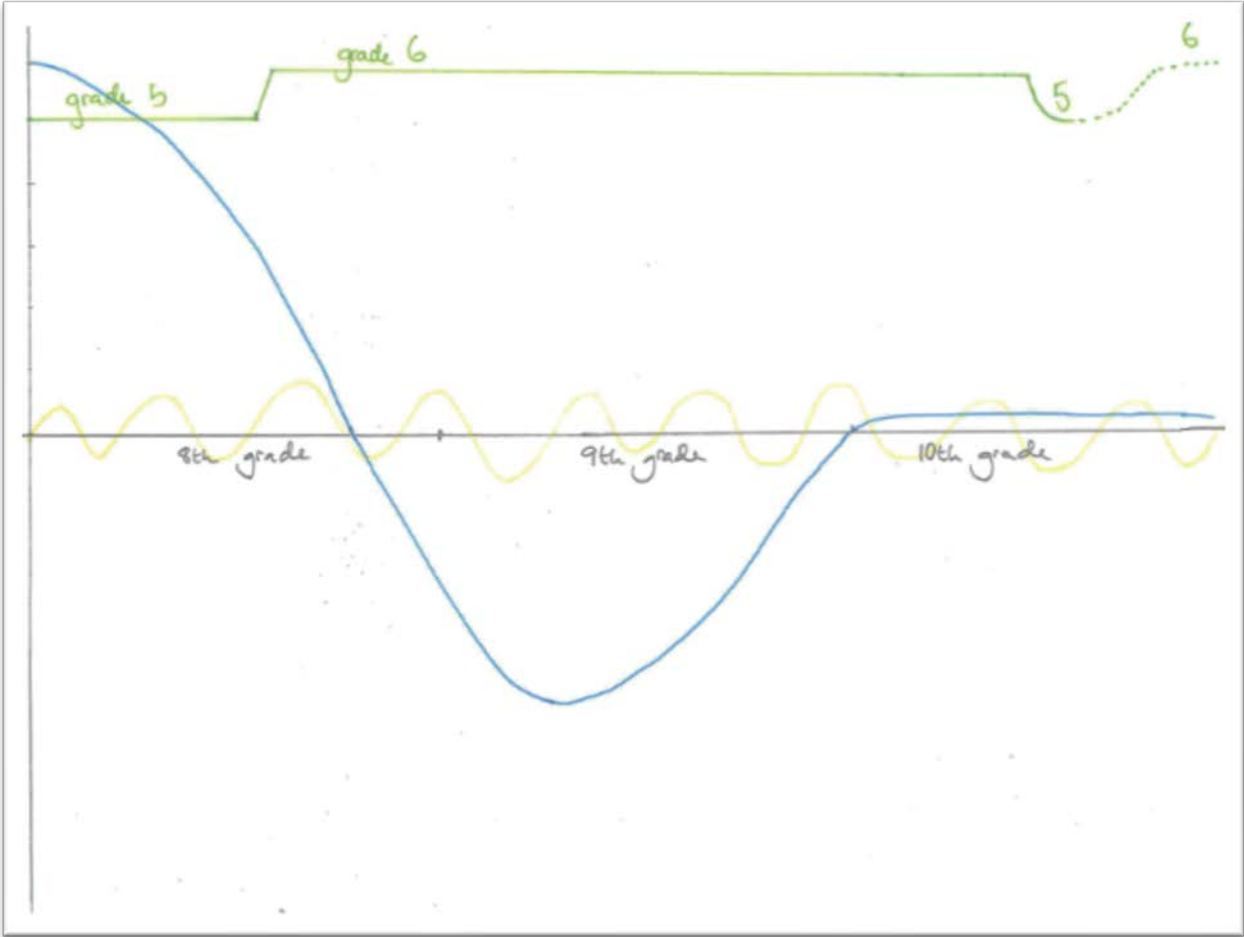


Figure 18. A student's representation of their performance (green line), work-effort (yellow line) and liking of mathematics evolve over time (blue line) in lower secondary school.

...som er på samme nivå som meg, men det er egentlig det samme

tenker at du skal beskrive hvordan klassen din er satt sammen, i en hver klasse er det mange forskjellige grupperinger, er det noen grupperinger i

du i matte eller generelt?

skje i matte eller generelt.

er grupperinger i klassen.

...som er ikke smarte da men de som anser seg selv som litt smartere de som er populære da og de andre

er litt delt. Er det noe spesielt i matte

ene?

rdan dere ser på hverandre i forhold til mattefaget?

enige som, det er jo noen blir som smarte og noen som blir sett på som ikke så smarte

en til at man blir sett på som det ene eller det andre?

ke karakterbasert da og at man bare har fått inntrykk av at de personene er smarte etter hvordan de oppfører seg i timen, da

akteriserer en som man tenker er en som er smart?

ontrekk på den personen?

n man avkode det?

nye aktivt i timen, og hvis man skal motsi læreren så vil man jo karakterisere den personen som smart selv og selvfølgelig karakterisere

votsatt fall da.

nskje en som ikke deltar så mye i timen, en som ikke snakker, en som fokuserer på andre ting i timen, vi har jo ofte de som hjelper andre

for seg selv for å øke karakteren sin og de som ikke bryr seg så veldig, og det er ofte de man anser for ikke så smarte

ssere deg selv?

e helt sikker jeg tror kanskje jeg ville plassert meg selv blant de smarte hvis det ikke virker cooky!

! Awareness of others

lassere deg selv der, er det pga karakter?

forstår det meste i mattetimene, jeg føler at det ikke er så mye jeg ikke forstår og litt fordi, jeg pleier jo å hjelpe andre og sånt

du det er

Jeg liker det, men jeg er kanskje ikke så god til det

?

t flest i klassen, hvilken gruppe er det?

mål egentlig?

rundt 20 i klassen da, så vil jeg si det er kanskje sånn 5-6 som er sm... og sånn da og så har du kanskje 5-6 av

nye for å øke karakteren, så resten bryr seg ikke så mye da

halvparten som bryr seg en del og jobber en del. Tror du at læreren din ser... som den du er i mattetimene

He is a part of
 ↓
 Eksklusiv
 minoritet

ca 1/2 bryr seg ikke

Figure 19. Mark-up of the transcribed text from the same student's individual interview

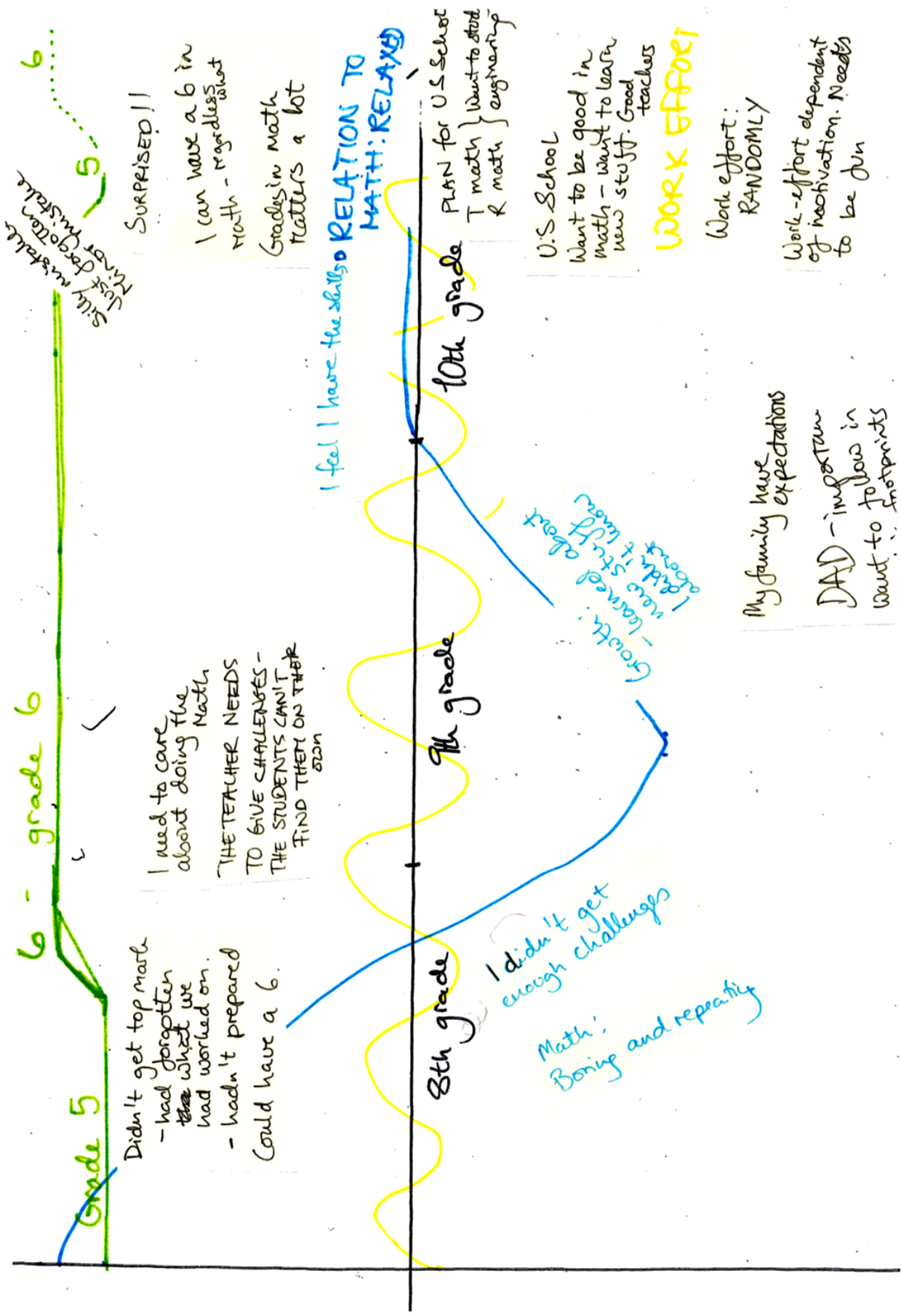


Figure 20. The process of combining the student's drawing and their narrative; my notes towards creating an overall picture of the student's narrative

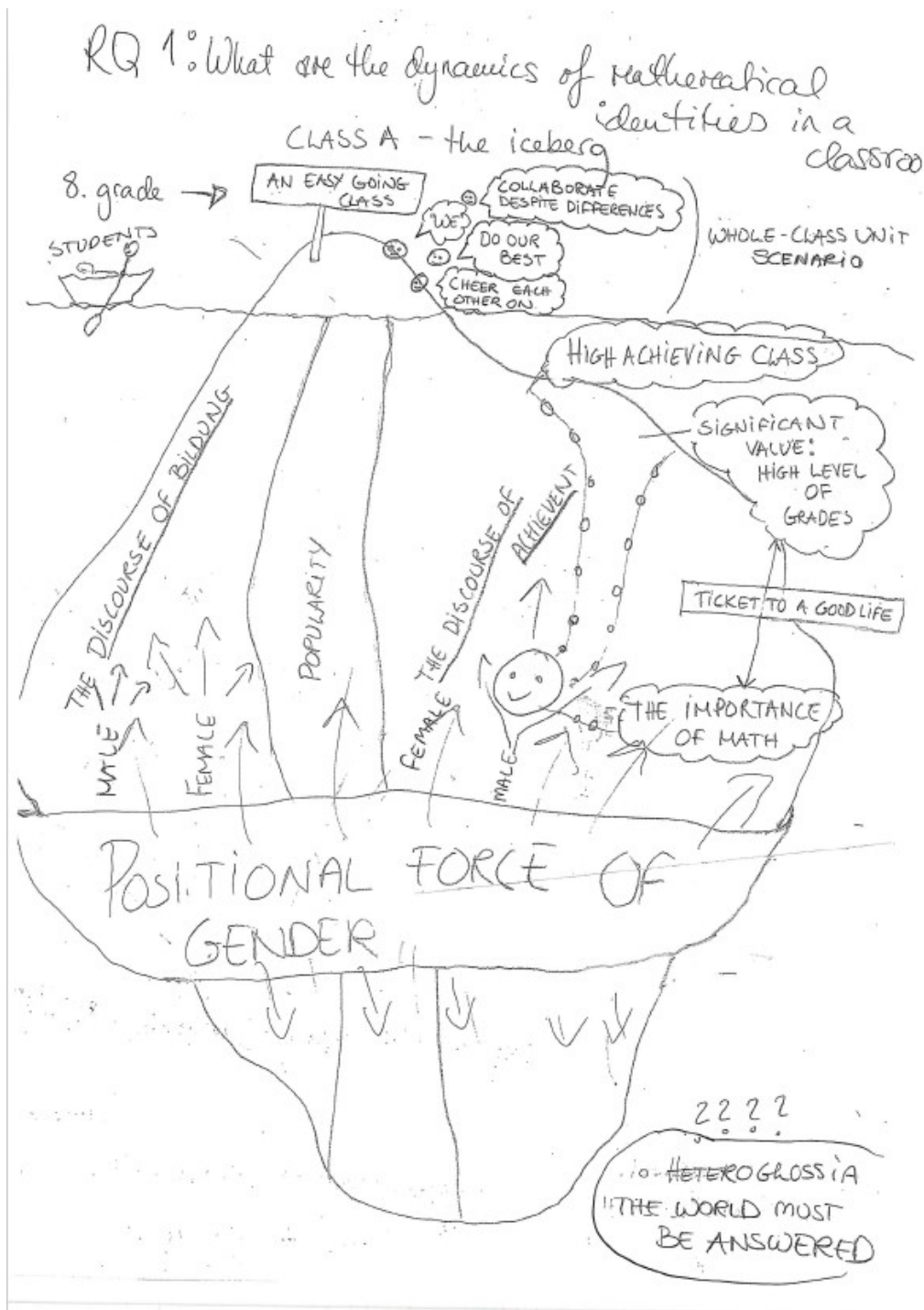


Figure 21. Drafting my response to RQ1 — an “iceberg representation” of Class A as a figured world. The idea is that what is over the sea level, represent how the common attitude of Class A appears, as it is seen on the ‘superficial level’. Below water level represents the discourses, voices, values, norms etc, which is embedded in the mundanity.

Appendix 8: Ethics documentation



Trine Mette Foyen
Institutt for grunnskole- og faglærerutdanning Høgskolen i Oslo og Akershus
Postboks 4, St. Olavs plass
0130 OSLO

Vår dato: 25.01.2017

Vår ref: 51558 / 3 / LB

Deres dato:

Deres ref:

TILBAKEMELDING PÅ MELDING OM BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 13.12.2016. Meldingen gjelder prosjektet:

51558 *A crucial time for making choices in mathematics - the development of mathematics identities in lower secondary school*
Behandlingsansvarlig Høgskolen i Oslo og Akershus, ved institusjonens øverste leder
Daglig ansvarlig Trine Mette Foyen

Personvernombudet har vurdert prosjektet og finner at behandlingen av personopplysninger er meldepliktig i henhold til personopplysningsloven § 31. Behandlingen tilfredsstiller kravene i personopplysningsloven.

Personvernombudets vurdering forutsetter at prosjektet gjennomføres i tråd med opplysningene gitt i meldeskjemaet, korrespondanse med ombudet, ombudets kommentarer samt personopplysningsloven og helseregisterloven med forskrifter. Behandlingen av personopplysninger kan settes i gang.

Det gjøres oppmerksom på at det skal gis ny melding dersom behandlingen endres i forhold til de opplysninger som ligger til grunn for personvernombudets vurdering. Endringsmeldinger gis via et eget skjema, <http://www.nsd.uib.no/personvern/meldeplikt/skjema.html>. Det skal også gis melding etter tre år dersom prosjektet fortsatt pågår. Meldinger skal skje skriftlig til ombudet.

Personvernombudet har lagt ut opplysninger om prosjektet i en offentlig database, <http://pvo.nsd.no/prosjekt>.

Personvernombudet vil ved prosjektets avslutning, 30.09.2020, rette en henvendelse angående status for behandlingen av personopplysninger.

Vennlig hilsen

Kjersti Haugstvedt

Lene Christine M. Brandt

Kontaktperson: Lene Christine M. Brandt tlf: 55 58 89 26

Vedlegg: Prosjektvurdering

Dokumentet er elektronisk produsert og godkjent ved NSDs rutiner for elektronisk godkjenning.

NSD – Norsk senter for forskningsdata AS
NSD – Norwegian Centre for Research Data

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Org.nr. 985 321 884

Figure 22 Approval from NSD (Norwegian centre for research data)

31.01.2017

Forespørsel om å få intervju elever i forbindelse med doktorgradsprosjekt i matematikk didaktikk

I forbindelse med mitt doktorgradsarbeid i matematikk didaktikk, ved Høyskolen i Oslo og Akershus, ønsker jeg å intervju elever om deres forhold til matematikkfaget. Bakgrunnen for prosjektet er at det er mye fokus på elevers resultater i matematikkfaget, fra både myndigheter og media. I min studie vil jeg sette søkelys på hvordan elevene opplever faget, og hvilken betydning dette har for elevenes læring gjennom ungdomsskoletiden. Under vil dere finne informasjon om prosjektet.

Doktorgradsprosjektet har arbeidstittelen «Ungdomsskoletiden, en avgjørende tid for utviklingen av elevers matematiske identitet». Prosjektet vil sette søkelys på hvordan elever i ungdomsskolen utvikler sin oppfatning om seg selv knyttet til læring i matematikkfaget og i læringssettingen. Dette har betydning for elevers læring i faget og deres valg knyttet til matematikkfaget i videre skolegang og studietid. Prosjektet er i oppstartfasen nå og jeg vil følge elevene fra 8.klasse og utover i ungdomsskoletiden. Prosjektet har sluttdato 30.09.2020

Skolens ledelse og klassens matematikklærer har satt seg villig til å la meg bruke klasse XX ved XXXX skole i denne forbindelse. Jeg vil være med i klassen i alle deres matematikktimer i perioder av året for å bli kjent med elevene og deres læringsmiljø. Jeg fungerer da som en ekstra lærer i faget. Det er bare elever som samtykker i at det registreres personopplysninger som intervjues og observeres. Personopplysningene det dreier seg om er resultater i matematikk (innhentes fra lærer) og elevenes holdning og selvoppfatning knyttet til faget (intervju og observasjon). Intervjuene vil foregå i skoletiden. De vil bli tatt opp på lydfil som lagres privat uten internettilgang. Alle filer som lagres i forbindelse med dette prosjektet vil bli slettet, senest ved prosjektets slutt.

Det er frivillig å delta, og man kan når som helst trekke seg uten å oppgi begrunnelse. Dette er elevene informert om. Alle personopplysninger blir behandlet konfidensielt. Prosjektet er meldt til personvernombudet for forskning, Norsk samfunnsvitenskapelige datatjeneste (NSD). Spørsmål om prosjektet kan rettes til meg på denne epost-adressen: trine.foyn@hioa.no

Med vennlig hilsen

Trine Foyn

Jeg gir med dette samtykke til at mitt barn kan delta i studien

Foresattes underskrift

Elevens underskrift

31.01.2017

Request of interview students in connection with doctoral projects in mathematics learning

In connection with my doctoral work in mathematics didactics, at Oslo and Akershus University College, I want to interview students about their relationship with mathematics. The background for the project is that there is a strong focus on students' results in mathematics, from both political authorities and media. In my study, I will turn the spotlight on students experience with mathematics, and what significance this has for students' learning through lower secondary school. Below there is information about the project.

The doctoral project has the working title "A crucial time for making choices in mathematics - the development of mathematics identities in lower secondary school". The project will focus on how students in lower secondary school develop their perception of themselves related to learning in the subject of mathematics and in the learning setting. This has implications for the students learning in the subject and their choice related to mathematics in further education and study. The project is in the start-up phase now and I will follow the students from 8th grade onwards in upper secondary school. The project has an end date of 30.09.2020

The school management and the mathematics teacher in the class have agreed to let me use class XX at XXXX school in this regard. I will participate in all the mathematics lessons in periods of the year to get to know the students and their learning environment. I will participate as an extra teacher in mathematics. Only the students who agree to participate and agree on registration of personal information that will be interviewed and observed. The personal information is results in mathematics (obtained from the teacher) and the students' attitude and self-perception in mathematics (interview and observation). The interviews will take place during school hours. They will be recorded on audio file that I storage privately without internet access. All files saved that are saved in connection with this project will be deleted, at the latest at the end of the project.

It is voluntary to participate, and you can withdraw at any time without reasons. The students are informed about this. All personal information is treated confidentially. The project has been reported to the Norwegian Centre for Research Data (NSD). If there are any questions about the project, please contact me. My e-mail is: trine.foyn@hioa.no

With best regards

Trine Foyn

I approve that my child can participate in the study

Signature - parents

Signature - students

09.01.2017

Forespørsel om deltakelse i doktorgradsprosjekt i matematikk didaktikk

I forbindelse med mitt doktorgradsarbeid i matematikk didaktikk, ved Høyskolen i Oslo og Akershus, ønsker jeg å intervju elever om deres forhold til matematikkfaget. Bakgrunnen for prosjektet er at det er mye fokus på elevers resultater i matematikkfaget, fra både myndigheter og media. I min studie vil jeg sette søkelys på hvordan elevene opplever faget, og hvilken betydning dette har for elevenes læring gjennom ungdomsskoletiden. Derfor vil intervju av klassens lærer også være nyttig, selv om fokuset settes på elevene. Under er det informasjon om prosjektet.

Doktorgradsprosjektet har arbeidstittelen «Ungdomsskoletiden, en avgjørende tid for utviklingen av elevers matematiske identitet». Prosjektet vil sette søkelys på hvordan elever i ungdomskolen utvikler sin oppfatning om seg selv knyttet til læring i matematikkfaget og i læringssettingen. Dette har betydning for elevers læring i faget og deres valg knyttet til matematikkfaget i videre skolegang og studietid. Prosjektet er i oppstartfasen nå og jeg ønsker å følge elevene fra 8.klasse og utover i ungdomsskoletiden. Prosjektet har sluttdato 30.09.2020

Rektor ved XXXX skole har sagt seg villig til å la meg bruke klasse XX i denne forbindelse, etter avklaring med deg. Det jeg håper er å få være med i klassen i matematikktimene i perioder av året for å bli kjent med elevene og deres læringsmiljø. Jeg vil da fungere som en ekstra lærer i faget. Jeg vil ta hensyn til din plan og om det passer deg og klassen om jeg deltar i undervisningsøktene og om det passer at jeg tar ut enkelt elever, eller grupper av elever til intervju. Det er viktig for meg at jeg ikke hindrer det daglige arbeidet i klassen, hverken for deg eller elevene. Jeg ønsker å intervju deg som lærer en eller to ganger i løpet av perioden jeg er i klassen, mest sannsynlig i slutten av 8. og 9. klasse. Intervjuene vil bli tatt opp på lydfil som lagres privat uten internettilgang. Alle filer som lagres i forbindelse med dette prosjektet vil bli slettet, senest ved prosjektets slutt.

Husk at det er frivillig å delta, og du kan når som helst trekke deg uten å oppgi begrunnelse. Prosjektet er meldt til personvernombudet for forskning, Norsk samfunnsvitenskapelige datatjeneste (NSD). Hvis du har spørsmål kan du når som helst ta kontakt med meg, enten på epost eller telefon.

Med vennlig hilsen

Trine Foyen

Jeg har lest informasjonen over og jeg ønsker å delta i dette prosjektet.

Dato

Underskrift

09 .01.2017

Invitation to participate in a doctoral research in mathematics learning

In connection with my doctoral work in mathematics didactics, at Oslo and Akershus University College, I want to interview students about their relationship with mathematics. The background for the project is that there is a strong focus on students' results in mathematics, from both political authorities and media. In my study, I will turn the spotlight on students experience with mathematics, and what significance this has for students' learning through lower secondary school. Hence to interview the mathematics teacher will also be useful, even the focus is the students. Below is information about the project.

The doctoral project has the working title "A crucial time for making choices in mathematics - the development of mathematics identities in lower secondary school". The project will focus on how students in lower secondary school develop their perception of themselves related to learning in the subject of mathematics and in the learning setting. This has implications for the students learning in the subject and their choice related to mathematics in further education and study. The project is in the start-up phase now and I will follow the students from 8th grade onwards in upper secondary school. The project has an end date of 30.09.2020

The principal at XXXX school has agreed to let me use class XX for this purpose and have clarified this with you. I hope I can participate in mathematics lessons in periods to get to know the students and their learning environment. I will be as an extra teacher in mathematics. I will not interfere your plan and I will be flexible to adjust to you and the students. I take consideration to you and your plan when I interview students, in groups or individually. It is important to me that I am not giving restrictions on the daily work in the class, neither for you nor for the students. I would like to interview you once or twice during the period I participate in the class, most likely at the end of 8th and 9th grade. The interviews will be recorded on audio files that I storage privately without internet access. All files that are saved in connection with this project will be deleted, at the latest at the end of the project.

Remember, it is voluntary to participate, and you may withdraw anytime without reasons. The project has been reported to the Norwegian Centre for Research Data (NSD). If there are any questions about the project, please contact me, you can contact me at any time, either by email or phone.

With best regards

Trine Foyn

I have read the information above and I want to participate in this project.

Date

Signature

POSTADRESSE:

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OsloMet Avhandling 2021 nr 17

ISSN 2535-471X
ISBN 978-82-8364-309-1