



Evaluation of the MatematikkMOOC Continuing Education Provision 2015-2016

Cathrine Tømte, Sabine Wollscheid, Siri Aanstad and
Jørgen Sjaastad



Report 2016:21

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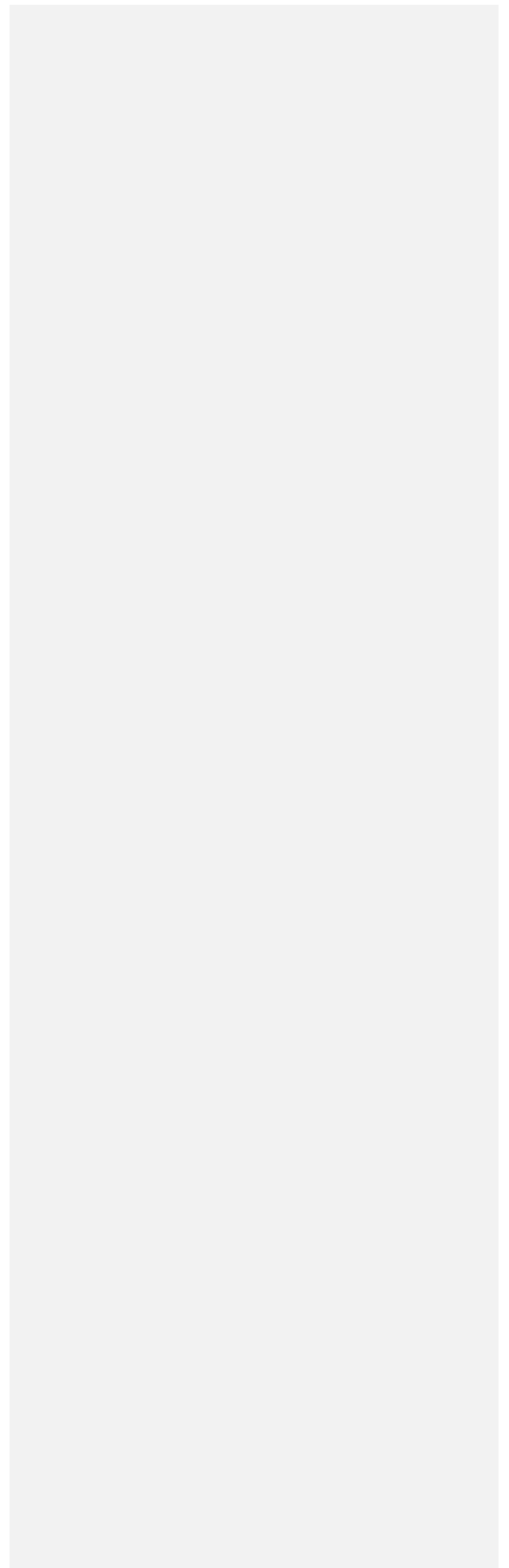
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Foreword

This report presents the results of a formative evaluation of the continuing education provision offered by MatematikkMOOC (Mathematics MOOC), which was conducted in the programme's first year of operation (2015-2016). The social goal of MatematikkMOOC was to develop a cost-effective model for the large-scale continuing education and training of teachers in primary and secondary education and training, in addition to evaluating the potential for applying a similar model to other disciplines. This evaluation highlights different aspects of the MatematikkMOOC continuing education provision across two levels: the management level and the user level. The evaluation also features recommendations and an evaluation of different funding models.

NIFU's project consists of Jørgen Sjaastad, Sabine Wollscheid, Siri Aanstad and Cathrine Tømte, with Tømte serving as project leader. In addition, Vera L. Kristoffersen and Umar S. Khan, two master's degree students from the Communication, Design and Learning (KDL) programme in the Department of Education, University of Oslo, were affiliated with NIFU's evaluation of MatematikkMOOC. Kristoffersen and Khan made contributions to parts of the data collection. Moreover, Kristoffersen and Khan wrote master's theses examining MatematikkMOOC from the user's perspective.

We are grateful to all the respondents and their contribution to this project. Conclusions and recommendations are the authors' own.

Oslo, 31 August 2016

Vibeke Opheim
Deputy Director

Nicoline Frølich
Head of Research

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Summary

The continuing education and training of teachers represents a key political priority area and is intended to contribute to enhancing the quality of teaching by developing teachers' academic, didactic and pedagogical skills. The Norwegian government's declaration of October 2013 affirmed the objective to provide continuing education to 10,000 teachers of mathematics over the coming five years. To implement this, the same autumn, the Ministry of Education and Research tasked the Norwegian Centre for ICT in Education with developing a large-scale, web-based continuing education programme in mathematics based on the MOOC model. The Ministry of Education and Research set out guidelines according to which this initiative would be a collaboration between the Norwegian Centre for ICT in Education and a number of teacher training courses and that the level of student completion would be just as high as that of traditional session- or campus-based continuing education programmes.

MatematikkMOOC is, in other words, a vital contribution to the development of MOOC-based continuing education and training provisions. In collaboration with the then Sør-Trøndelag University College (HiST), now the Norwegian University of Science and Technology (NTNU)¹, the Arctic University of Norway (UiT) and the Norwegian Directorate for Education and Training, the Norwegian Centre for ICT in Education developed MatematikkMOOC as a pilot project for school years 1–7, with a particular focus on the upper primary level. In the autumn of 2015, MatematikkMOOC was launched as a continuing education and training provision for primary and lower secondary school teachers who were interested in enhancing their mathematics didactics expertise.

We conducted a formative evaluation of the MatematikkMOOC continuing education provision in its first year of operation (2015-2016). This continuing education provision has a value of 30 credits in Mathematics 2. The social goal of the project was to develop a cost-effective model for the large-scale continuing education and training of teachers in primary and secondary education and training, in addition to evaluating the potential for applying a similar model to other disciplines. Extensive empirical data consisting of both quantitative and qualitative approaches allowed us to shed light on different aspects of the MatematikkMOOC continuing education provision and to evaluate ways in which the MOOC model might be a suitable tool for the large-scale continuing education of mathematics teachers. This evaluation encompasses both the management level and the user level.

In Norway, many MOOC and MOOC-like provisions are now becoming available, the vast majority of which were initiated by enthusiasts and/or dedicated academic communities. MatematikkMOOC is distinct from these MOOCs in a number of ways: first, it is a collaboration between several educational institutions and falls under external project management; second, it provides continuing education within

¹Sør-Trøndelag University College merged with Gjøvik University College, Ålesund University College and NTNU during the course of the project, with a resulting name change to NTNU. NTNU is therefore used in the remainder of this report.

subject didactics (i.e. mathematics didactics). It is relatively unusual for the development and management of a continuing education and training provision to be organised in this way, which means that the experience gained from the provision in question will likely be of use to other educational institutions that are in the process of evaluating whether to collaborate in order to develop new course provisions.

Findings from the study

Almost 80 per cent of the 297 students who started the course in September 2015 completed it. The participation and completion figures made MatematikkMOOC the country's largest continuing education provision within the Competence for Quality initiative. However, experience gained from MatematikkMOOC has also uncovered the need for clearer descriptions of the roles of the parties involved and the expertise they are to bring to the project, preferably based on a dialogue initiated as early as possible in the project phase. In this way, it should be possible to avoid misunderstandings linked to responsibilities. This is likely to be of particular importance in cases where government agencies lead projects involving the academic community. Although the MOOC concept has helped in the promotion of pedagogical innovation in the two teacher training courses involved, and that this cross-institutional collaboration was perceived as positive, it has also presented some challenges. For example, connecting and co-ordinating these two educational institutions administratively proved to be a weighty, time-consuming process. MatematikkMOOC has taught us that it is possible to collaborate on such a level but that it is important to put in sufficient amounts of time to do so. In the worst cases, putting in too little time can be detrimental to student progress. It has also proved difficult to alter the existing study formats of continuing education provisions to suit MOOC or MOOC-like formats. The planned MOOC format, which formed the basis of MatematikkMOOC, was substantially adjusted during the process. Much of the reasoning for such adjustments can be traced to the different understandings of education quality held by the parties involved. Local academic cultures and understandings of the opportunities presented by different teaching formats most likely played a role in this, and these can probably be perceived differently depending on the educational institution. However, the fact that such different understandings exist could be a valuable consideration in developing MOOC or MOOC-like courses for teacher training courses in other disciplines.

The content of the MatematikkMOOC provision was rated positively by its students. Many felt that the programme was relevant for their own teaching practice and that it was practice-oriented. Nevertheless, through this evaluation, we have identified areas that should be altered in the context of continuing with such a provision, in particular, the organisation of the programme, its workload, the amount and format of supervision and whether parts of the reading lists should continue to be in English. MatematikkMOOC's current format, which involves frequent deadlines and a close monitoring of students, appeared to work better for students who were given a paid reduction in working hours for continuing study (referred to here as the 'substitute scheme') than those who were given study grants without necessarily gaining a reduction in working hours (referred to here as the 'grant scheme'). It appears that the implications of the grant scheme were not sufficiently well communicated; neither the students nor the head teachers appeared to have sufficient knowledge of what this arrangement involved with regard to its practical organisation.

In general, MatematikkMOOC's technological solution appears to work well, even if two areas in particular should perhaps be changed. First, supervisors require a better user interface, one suitable for the supervision of several study groups. Where possible, integrating user log data into such an interface would be beneficial as supervisors could then make use of this data to monitor students' academic performance and to pick up on those who may be at risk of dropping out. Second, students lack any form of notification when something new 'happens' on the MatematikkMOOC platform. Although Canvas is a newer generation learning platform, the current version used in MatematikkMOOC has no form of responsiveness. As a result, students create their own local solutions to meet this need, most often in the form of their own Facebook groups. If technically possible, a future solution would benefit from integrating functionality in a way similar to that of Facebook.

Our study encompasses the management and user levels and is based on several sources of data. We have shed light on several aspects relevant to these two levels, which are discussed in the report. As regards the management level, we examined the interaction between the educational institutions and government agencies involved. With a longer-term perspective than that permitted by our study, it might be interesting to explore the extent to which and the ways – if any – in which the pedagogical innovations and multi-party co-operation originating from MatematikkMOOC are further spread within the institutions involved or even to other institutions.

Our study offers limited insight into how school owners and head teachers at individual schools have evaluated the opportunities offered by the MatematikkMOOC concept for the continuing education of teachers. It could be interesting to explore this perspective in a future study as this would help us understand how such scalable, web-based provisions can help enhance skills both within individual schools and between schools at the municipal level.

As regards the user level, we examined the students' evaluation and use of the MatematikkMOOC provision. The two master's theses linked to this evaluation allowed us to delve into students' interaction patterns. However, neither our evaluation nor the master's theses have shed considerable new light on the interaction between teachers and/or supervisors and students. This is an interesting field of research in which one could probably benefit from looking at international studies. It would also have been interesting to follow up on these students in two to three years' time to explore whether they feel that their teaching practice has changed towards becoming better teachers.

Another unexplored field, which we believe has potential, is how different log data generated by MatematikkMOOC could help elucidate the interaction patterns and use of its different learning resources. A systematic review and analysis of such data could reveal something about the areas of the design as well as the resources that offer the best learning opportunities. These are possibilities that most likely belong in the future, albeit a not too distant future.

Based on the evaluation, we would like to make the following concrete recommendations:

Recommendations

- The pilot project of the MatematikkMOOC continuing education provision was organised as a three-part co-operation between two teacher training departments and one external government, agency-appointed competence centre. We note that this work has been innovative and demanding but feasible.
- As a model, MatematikkMOOC was developed with consideration to its transferability and reuse. Should such a managerial and organisational model be extended and/or spread to other teacher training courses and higher education settings, it is important to bear in mind the inherent complexity of such a model, both in terms of how it is grounded in an institution's management, administration and academic staff and the need for an adequate technological infrastructure and – not least – good procedures and systems for communication and dialogue.
- Given the desire for scalability, we deem the grant scheme to be the most favourable from a financial viewpoint as well as with regard to school capacity. At the same time, we have also pointed to a number of weaknesses of this arrangement in the existing version of MatematikkMOOC. In order to succeed with the study grant scheme, students will require greater flexibility and predictability with regard to MatematikkMOOC's study programme, for example, through easier access to a calendar overview of coursework deadlines, syllabuses and exams for the entire academic year. Students on the continuing education programme are often extremely driven and well organised. Such an overview would therefore be of great utility to them in planning their work. In light of this, one could also consider reducing the number of obligatory coursework submissions. The scope of the content, programme format and financial aspects of the study grant scheme must be made clearer and be better communicated to school

owners, head teachers and potential students. We observed many misunderstandings and, consequently, much frustration felt by those who have used this arrangement. It also appears that school administrations do not necessarily have an understanding of how these students should be accommodated. There remains, in all likelihood, some work to be done to communicate how schools can best do this.

- Based on what we have learnt from closely following students and educational institutions over the course of one academic year, we believe that there are grounds for changing how supervision is organised. There is no doubt that supervision is important. At the same time, we observed that this function is variously organised in MatematikkMOOC. In addition, the role of supervisor is performed by people with different areas of expertise at the two educational institutions – which might explain the students' varying perceptions of supervision. A large number of supervisors working only on a part-time basis do contribute to there being a fragmented understanding of the supervisory task. Organisationally, we therefore recommend reducing the number of supervisors and giving each supervisor responsibility for two or more study groups. This will give supervisors a better understanding of the group dynamics in web-based solutions as well as a broader base on which to identify relevant academic topics and the general challenges faced across the groups. Supervisors should also work more closely together to develop and maintain a shared understanding of the supervisory role.
- We recommend that video meetings be structured differently. These functioned only partly satisfactorily as an arena for academic discussions. We recommend that smaller groups hold their own video meetings without supervisors so that all participants feel more compelled to contribute to discussions. Academic discussions and reflections on one's own practice are important in teacher training. In particular, students who are the only MatematikkMOOC participants from their schools should feel the added benefit of such web-based meeting places. With smaller groups, it might also be easier to agree on a time for video meetings. In addition to having smaller groups with their own video meetings, we recommend holding larger video meetings with a number of groups and supervisors. Each group can send in topics or questions in advance of each meeting for the supervisors to look at. Small group meetings should be held more often than large video meetings.
- With the above suggestions for amendment, we believe that it would be possible to use the MatematikkMOOC format in other disciplines. Here, an important point for reflection would be the distinctive characteristics of the subject at hand. The MatematikkMOOC format has the potential for transferral to other subjects. However, one can imagine that language subjects, for example, would need more opportunities for communication and co-operation than what we have seen in MatematikkMOOC. Another point of reflection linked to the transferability of the format is whether future provisions should cover a subject or subject *didactics*. Arrangements for monitoring student progress can be organised in different ways based on these two approaches, bearing in mind that MatematikkMOOC is an example of mathematics didactics teaching via the internet.

1 Introduction

1.1 The continuing education and training provision in higher education

Continuing education and training in higher education constitutes the third largest form of communication with the public along with articles directed at the public and public lectures. Nevertheless, there is a good deal of variation between educational institutions when it comes to their continuing education and training provision, including a good deal of variation within institutional groups. Some universities, such as NTNU, have a large number of continuing education provisions, whereas others, such as the University of Oslo, have relatively few. Oslo and Akershus University College is one of the largest suppliers, whereas Gjøvik University College was, prior to its merger with NTNU, one of the smallest (Tømte et al., 2015).

Even if the higher education sector is undergoing tremendous structural reform, and much of the attention is focused on the development of academic quality, we are also seeing attention being directed at the relevance of education and at strengthening co-operation between the higher education sector, the world of work and the business sector. Under pressure from the Ministry of Education and Research, the majority of universities and university colleges have set up councils for co-operation with the world of work in order to improve the quality and flexibility of educational provisions (report to the Storting no. 44, 2008-2009).

Since 2006, flexible education – decentralised, web-based teaching – has grown by almost 28 per cent, especially in relation to web-based provisions. However, this growth varies from institution to institution. Whereas at the large institutions fewer than five per cent of students were pursuing flexible education, 20–35 per cent of students in smaller institutions were affiliated with flexible provisions (the National Budget, 2015). Nevertheless, when it comes to continuing education and training, session-based provisions are still the most common. Half of continuing education and training provisions are session-based. Session-based provisions are often combined with web-based teaching in what is known as 'blended learning', and together, session-based provisions and blended learning constitute roughly two-thirds of all continuing education and training provisions. Sessions are held both during the day and in the evenings and can be grouped into shorter periods of time or spread out over a semester or longer. Purely web-based continuing education and training provisions are offered at some of the educational institutions, and these follow either a defined schedule or allow students to complete them at their own pace (Tømte et al., 2015).

The above descriptions offer a view of a composite continuing education and training landscape dominated by traditional teaching formats – even if web-based provisions are growing in number. This is so particularly with the development of new continuing education and training provisions in which web-

based solutions – including massive open online courses (MOOCs) such as MatematikkMOOC – are tested. Although there are many definitions of MOOCs, most would appear to agree that their key characteristics are their open access nature – regardless of location – and their scalability, that is, these courses can be taken by a large number of students. This makes MOOCs an interesting concept within continuing education and training. In June 2014, the government-appointed MOOC committee presented its final report on the way forward for MOOCs in Norway, and one of its recommendations was to explore the potential that lay within MOOCs, particularly with regard to continuing education and training (Official Norwegian Report 2014:5). In 2016, there were 20 MOOC provisions registered under the direction of Norwegian universities and university colleges. The majority of these were offered in the Norwegian language, and many related to continuing education and training (www.mooc.no).

1.2 Background of this study

The continuing education and training of teachers is a key political priority area and is intended to contribute to enhancing the quality of teaching by developing teachers' academic, didactic and pedagogical skills. The Norwegian government's declaration of October 2013 affirmed the objective to provide continuing education to 10,000 teachers of mathematics over the coming five years. To implement this, the same autumn, the Ministry of Education and Research tasked the Norwegian Centre for ICT in Education with developing a large-scale, web-based continuing education programme in mathematics based on the MOOC model. The Ministry of Education and Research also made it clear that the Norwegian Centre for ICT in Education should co-operate with several teacher training courses, and as such, the Norwegian Centre for ICT in Education would have to find partners to participate in the pilot initiative. As part of the assignment by the Ministry of Education and Research, it was announced that the level of student completion was to be as high as that of traditional session- or campus-based continuing education provisions. This was an ambitious target as educational provisions based on the MOOC model traditionally have a considerably higher dropout rate than traditional campus-based provisions. This set high requirements for the project's partners – both the teacher training courses and the project group at the Norwegian Centre for ICT in Education – and in terms of how the project was organised.

The *Competence for Quality* initiative was established in 2009 to enhance the competence of teachers and head teachers (Ministry of Education and Research, 2011). The initiative is aimed at primary and secondary education and training, and its purpose is to increase students' learning and motivation. Skills should also be enhanced through the continuing education of teachers. This strategy represents a collaboration between KS (the Norwegian Association of Local and Regional Authorities), the trade unions, the teacher training courses and the state education authorities. The parties are responsible for different aspects of the strategy and together bear the responsibility for it being realisable (Gjerustad and Salvanes, 2015).

Through this initiative, considerable public resources will be invested into ensuring a nationwide continuing education and training provision; and by accommodating online study, emphasis is placed on the fact that the provision should address school owners' and teachers' need for flexibility. If we look at the web pages of the Norwegian Directorate for Education and Training's on this initiative, however, they offer no immediate overview of which provisions are web-based or how many such provisions are offered as part of the initiative. In addition, the 2015 participant study linked to the initiative lacked any questions about such provisions. There is therefore much to indicate that knowledge and overviews surrounding web-based provisions are limited, at least when compared with those relating to the normal, session-based provisions.

MatematikkMOOC is a contribution to the development of MOOC-based continuing education and training provisions that are specifically intended for teachers and are included in the course portfolio of the Competence for Quality provision. The provision was developed by the Norwegian Centre for ICT in

Education in co-operation with the then Sør-Trøndelag University College (HiST), now NTNU,² and UiT, the Arctic University of Norway, and is a pilot project commissioned by the Ministry of Education and Research. MatematikkMOOC was started in the autumn of 2015 and is offered as a continuing education and training provision for teachers in primary and lower secondary schools (years 1–7, with a particular focus on the upper primary level) who would like to enhance their expertise in mathematics didactics.

1.3 Mandate

We conducted a formative evaluation of the MatematikkMOOC continuing education provision in its first year of operation (2015-2016). The social goal of the project was to develop a cost-effective model for the large-scale continuing education and training of teachers in primary and secondary education and training as well as evaluating the potential of applying a similar model to other disciplines.

This evaluation sheds light on different sides of the MatematikkMOOC continuing education provision and evaluates the ways in which the MOOC model might be a suitable tool for the large-scale continuing education of mathematics teachers. This evaluation also features recommendations. In line with our mandate, we structured the evaluation on two levels: the management level and the user level. Below, we specify what we have identified as the crucial points of each of the two levels.

- The management level
 - Assessment of the funding model, including funding via higher education institutions and the grant/substitute scheme
 - Identifying the prerequisites for using similar MOOCs in continuing education and training programmes within other disciplines and school years
 - Assessment of the role of the teacher training courses in the MOOC and their co-operation in implementing it
- The user level
 - Assessment of student satisfaction
 - Assessment of the quality of the digital platform
 - Assessment of the returns regarding the ambition for collective participation.

1.3.1 How this report is organised

The onward organisation of this report comprises a presentation of academic and theoretical frameworks in which we go through relevant research linked to different countries' approaches as well as our reasons for including a MOOC as an educational provision in the current education system. Here, we shall draw upon several perspectives such as innovation in pedagogical practice/content as well as in how education is organised. We will also explain how we plan to shed light on the user and management levels, working from the current literature, among other things, with regard to the experience gained from web-based competence development and co-operation. In Chapter 3, we shall explain our methodological approach and source data, followed by a presentation and analysis of our findings in Chapters 4, 5 and 6. The final chapter is split into two parts and comprises an overarching summary of and recommendations for the MatematikkMOOC continuing education provision, an evaluation of MatematikkMOOC as a model for continuing education and training within other disciplines and for other school years and an evaluation of the funding model, including funding via higher education institutions and grant/substitute schemes.

²Sør-Trøndelag University College merged with Gjøvik University College, Ålesund University College and NTNU during the project. The merger resulted in the new name NTNU. The name NTNU is therefore used in the remainder of this report.

2 Academic and theoretical framework

2.1 Introduction

This chapter contains an overview of different frameworks of understanding relating to the continuing education of teachers as well as experiences involving web-based and MOOC provisions for teachers. It also delves into some studies relating to learning communities and the conditions for online co-operation. We also examine how the MOOC concept has been introduced into the education systems of different countries and how MOOCs have contributed to innovation and change within the higher education sector.

2.2 The continuing education of teachers

In the Competence for Quality user survey, Gjerustad and Salvanes (2015) summarise three perspectives on what is distinctive about the continuing education of teachers and their teaching work.³ The first of these perspectives relates to the types of competences that are essential to teachers, focusing in particular on the relationship between practical and theoretical knowledge. Schön (1987) states that teachers are confronted with unique situations characterised by uncertainty and conflicts of values that cannot be resolved on the basis of technical rationality. Schön emphasises 'reflection in action', which can be viewed as a key basis for a situated learning perspective in which learning is understood as participation in communities of practice (Lave and Wenger, 1991; Wenger, 1998; Nielsen and Kvale, 1999). In the context of teaching qualifications, the idea of communities of practice emphasises, among other things, the need for teachers to have the opportunity to develop their professional knowledge bases through co-operation with other teachers (Perry, Walton, and Calder, 1999, p. 218; Postholm and Rokkones, 2012) as well as the fact that teachers need supervision and long-term development work to change their teaching to suit student learning. The second perspective deals with the transfer of knowledge and relates to how those who pursue continuing education might transfer knowledge from one context to another as well as the different circumstances that can facilitate this process (Tuomi-Grøn and Engstrøm, 2003). Research suggests that in order to achieve knowledge transfer, it is important that participants are not simply presented with theoretical examples but that they also work on making use of this theoretical knowledge (Stark, 2000). Research also indicates that the effect of using examples in teaching is modest because students do not understand what conditions must be in place to enable the use of specific knowledge (Aarskog, 1998). The third perspective relates to the extent to which participants' learning during study correlates with what they practice – whether the content relates to participants' everyday working life and whether the programme builds on their experience (Grossman et al., 2008). According to Grimen (2010), teacher training, as with most vocational training courses, lacks homogeneity as it is comprised of a range of disciplines and subjects.

³This passage is based on Gjerustad and Salvanes (2015, p. 13).

What could integrate these elements, Grimen argues, is if these courses addressed the challenges of professional practice. In addition to these perspectives on learning, to improve quality, one could also look at learning as a condition for changing one's practice, an approach found in Ertsås and Irgens' work (2012). These authors indicate that all practice is theory-based. They believe that teachers' experience-based practice can be developed through critical analysis and reflection. Informed reflection is a core element of improvement and development and, thus, of changing one's practice. Self-efficacy (Bandura, 1997) affects one's effort, engagement, endurance, aspiration and goals. These researchers establish that it is probable that a higher level of self-efficacy in participants in a continuing education initiative would lead to a change in practice.

The following conditions appear to be particularly important for teachers to benefit from a continuing education programme:

- That the programme build on the students' previous study experience and their own working practice
- That the programme clearly relate to the participants' concrete everyday work and the different conditions and determinants that might affect this
- That the students work to analyse, concretise and exemplify problems, theories and possible solutions over the course of their continuing education programme
- That the necessary conditions be in place to allow for a change of practice, such as incentives to reflect on one's own practice.

Furthermore, the following workplace conditions appear to be particularly important in order for participants to benefit from a continuing education programme:

- That there be a positive and supportive approach to continuing education at the participants' workplace
- That there be a positive environment in which teachers have the opportunity to try out, present and discuss what they have learnt
- That there be a focus on collaboration between colleagues in the schools
- That the management of the individual schools be good and supportive, with a focus on long-term development work in order to improve the quality of children's education.

These perspectives on the factors that influence teachers' practice are relevant for the teachers included in the MatematikkMOOC continuing education provision. At the same time, previous user surveys conducted for the Competence for Quality initiative did not focus specifically on whether the teachers have been accepted on web-based courses or combinations of web-based and session-based courses. In many ways, the present study therefore provides a first insight into how Competence for Quality participants view a purely web-based format in a continuing education context.

2.2.1 Teachers as a target group in MOOC-like courses

In contrast to the situation in Norway, teachers in the USA have been a key target group for web-based learning as well as for precursors to MOOCs. Seaton et al. (2015) offer one such example – the Continental Classroom of the 1960s – which made use of new technologies to address national challenges relating to education reforms. Several recent research articles have examined the potential of MOOCs, specifically targeting teacher training (Jobe, Östlund, and Svensson, 2014; Levy and Schrire, 2015; Vivian, Falkner, and Falkner, 2014; Zhou, Guo, and Zhou, 2015).

A review of the literature conducted in August 2015 reveals that when compared with other professional groups, teachers make up a large share of MOOC participants (Saadatdoost et al., 2015). According to

a survey covering 11 MITx MOOC courses in the spring of 2014, which roughly totalled 250,000 participants, one in four respondents was identified as being a teacher (Seaton et al., 2015). Seaton et al. (2015) offer some recommendations for improving MOOCs directed at this target group, including giving teachers opportunities for interaction, strengthening their social networks through courses and making use of their professional experience.

When it comes to the continuing education and training of teachers in particular, there is relatively little research into teachers' participation in MOOCs or MOOC-like provisions (Jobe et al., 2014). In a review of the literature relating to study groups, Chen and Chen (2015) suggest that there is a need for more studies on study groups in the field of web-based learning and distance education. As far as we are aware, only a few existing studies have investigated the significance of MOOC-like provisions for teachers in continuing education and training.

One of these is a pilot study from Australia, which evaluated a provision that sought to support primary school teachers as they implemented digital technologies in the curriculum. The purpose of this provision was to accommodate the teachers' needs for additional skills in the new field – digital technologies – i.e. to allow for flexibility, ad hoc interaction, mutual support and resource sharing (Vivian et al., 2014). This pilot differs from the MatematikkMOOC in our evaluation, which targets mathematics teachers with a primary focus on the upper primary level. In addition, the Australian provision offered no credits. Of the 1,378 people who registered for the course, 99 completed it, while 438 people did not go beyond registration. The study concluded that the partnership developed through this course was valuable (p. 17).

Another research article by Zhou, Guo and Zhou (2015) provides an account of MOOCs and their potential for countering the inconvenience of continuing education and training for teachers, in particular, the lack of continuity in the provisions, shortcomings in efficiency and the relatively small number of provisions that meet teachers' current needs. Among other things, the authors put forward the opportunity for social interaction and mutual evaluation or 'peer assessment' among students (Zhou et al., 2015).

2.2.2 The importance of learning communities for teachers and competence development at the school level

The Ministry of Education and Research's strategy *Promotion of the status and quality of teachers* emphasises 'colleague- and team-based continuing education' (p.33). With this, school owners and schools were urged to apply to continuing education provisions – such as MatematikkMOOC – for more than one teacher at each school.

A systematic knowledge overview shows several positive outcomes linked to co-operation between teachers as regards skills enhancement at different levels for students, teachers and the school as an organisation (Vangrieken et al., 2015). Other studies emphasise the importance of collaboration and co-operation between teachers in sharing and building knowledge in school (Rismark and Sølvsberg, 2011). The significance of the school as a workplace for sharing and building knowledge was previously highlighted by Dewey (1970), who maintains that 'the success of excellent teachers tends to be born and die with professional learning communities' (cited in Rismark and Sølvsberg, 2011:151).

The following figure visualises how a traditional continuing education and training provision for teachers and a MOOC-based continuing education and training provision can be mutually supportive.

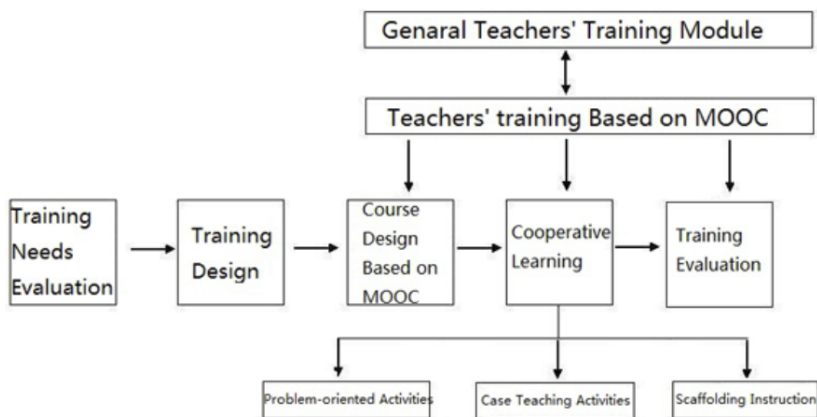


Figure 2.1: Zhou et al. (2015:49).

With regard to MatematikkMOOC, we can distinguish between two forms and levels of learning communities: 1) In study groups, teachers have learning communities at their workplace, which is to say that if teachers from the same school are participating in MatematikkMOOC, they will be able to exchange what they have learnt from the course and discuss the course content outside of the online study group. 2) We can make a further distinction between teachers from the same school who are in the same online study group and those from different schools who take part in the same online study group.

Nonaka and Takeuchi (1995) outline four distinct modes of knowledge conversion based on the assumption that human knowledge is generated and expanded through the conversion of tacit and explicit knowledge: 1) socialisation, 2) externalisation, 3) combination and 4) internalisation. In particular, we consider the third mode, combination, to be relevant to our study on the continuing education and training of teachers; it combines different forms of explicit knowledge from different groups of individuals. It also involves a reconfiguration of existing information through the categorisation, re-categorisation, joining and reconstruction of explicit knowledge to form what is potentially new knowledge at an organisational level. We expect MatematikkMOOC participants from the same school to have better prospects for converting recently acquired knowledge through this programme into new knowledge at an organisational level compared to an individual participant who is the only teacher from his/her school taking part in the course.

Joint participation in continuing education provisions is also one recommendation made by Kleinman and Wolf (2015), who among other things recommend participating in MOOC-Eds (Massive Open Online Courses for Educators) with colleagues so as to be able to discuss experience gained from the course in a way that relates to their local context at the school level, thereby enhancing their own skills.

2.3 Online learning – prerequisites for dialogue and co-operation

Research into web-based learning and education has focused on the importance of dialogue in teaching (see, for example, Bonk, Angeli, and Hara, 1998; Funaro, 1999; Mason, 1998; Hratsinski, 2009, 2011). So-called web-based participation has been developed by researchers with a view of learning that posits it as a social act (Lave and Wenger, 1991). The sociocultural theory of learning emphasises that learning is present in co-operation with others (Säljö, 2000). Participation in web-based learning activities has traditionally been grounded in text-based activities, whereas more recent use has placed an increasing emphasis on supplementary media such as sound, image and video. Hratsinski (2009) characterises web-based participation as follows: web-based participation 1) is a complex process that maintains relationships with others; 2) is supported by physical and psychological tools; 3) is not synonymous with speaking and writing and 4) is supported by all sorts of other activities. Vygotsky's (1978) optimal learning process is linked to the learner's social surroundings. Each individual's zone of proximal development depends on interaction with one or more people. Language plays a key role in this interaction. In online teaching, interaction moves from a local arena to a digital one in which normal monologue, dialogue and group discussion patterns are changed. Web-based dialogue happens in many ways and takes many forms. For example, it may be a matter of e-mails, noticeboards, chat functions (synchronous or asynchronous), group discussions etc. There seems to be general agreement in the literature that a prerequisite for realising an intent for dialogue in web-based situations – regardless of the form – is for the teaching programme or design to take this into account from the inception; it cannot be expected that all course participants will want to take part in group discussions or debates or answer questions online, despite being encouraged to participate actively (see, for example, Shearer, 2009).

2.1 MOOC – different countries, different approaches

The first MOOCs were developed to offer students admission to lectures held by renowned professors at elite universities. This was intended to encourage a higher quality of study by giving students around the world free access to high-quality learning content. Since then, we have witnessed a worldwide response to and diffusion of MOOCs. The experiences of lecturers, students and study administrators have shed light on the different quality aspects of MOOCs (Mazoue, 2013; Conole, 2013; Guo et al., 2014).

In general, the research literature makes a distinction between xMOOCs, which focus on the transfer or duplication of knowledge, and cMOOCs, which focus on knowledge creation and generation (e.g. Rodriguez, 2013; Siemens, 2012, cited in Saadatdoost et al., 2015:7). Where the former, xMOOCs, are primarily based on traditional forms of classroom teaching, cMOOCs are more radical, providing exploratory platforms within university and university college didactics. The 'c' here stands for 'connectivist', which underlines the 'connected and collaborative' nature of the course (Yuan and Powell, 2013, cited in Saadatdoost et al., 2015:4). This typology has, however, been criticised for being overly simplistic, and more complex typologies do exist (see, for example, Hayes, 2015).

Alternatively one can distinguish between five different types of MOOCs: 1) cMOOCs (connectivistic/constructivistic), 2) xMOOCs (extended MOOCs), 3) bMOOCs ('blended' MOOCs), 4) smOOC ('small' MOOCs) and 5) SPOCs (small private online courses). In matters of continuing education and training, the latter two in particular – smOOCs and SPOCs – are more frequently highlighted as these formats emphasise the individual nature of participants and attempt to combine the

advantages of face-to-face learning situations with those of e-learning (Hochschulrektorenkonferenz, 2014). Some MOOC provisions differ from previous forms in that they are subject to both course fees and qualification requirements, and participant numbers are limited (Official Norwegian Report, 2014:5). Such provisions are referred to as SPOCs, which stands for 'small private online courses'. This is also true of the current continuing education provision for teachers in mathematics, MatematikkMOOC, which will initially be limited to 300 teachers and which can therefore be referred to as either a MOOC-like provision or a SPOC.

However, the original teaching models of MOOCs, which were based on transparency and large-scale approaches, are only marginally characteristic of many of today's MOOC initiatives (Chiappe-Laverde et al., 2014). Despite the fact that the majority of MOOCs are well organised and present course materials in a good way, the teaching design of many MOOCs has been deemed weak, especially with regard to interaction with teachers and fellow students (Margaryan et al., 2015). Another aspect relates to what *type* of education MOOCs provide. Some students have already obtained a higher education qualification and are primarily seeking continuing education or training, whereas others are seeking to complete a university or university college programme (Hollands and Tirthali, 2014).

The role of MOOCs as a continuing education and training provision has proven to be particularly relevant in countries where traditional higher education is free, as in many European countries. For example, one study of employees in the internet and mobile industry – an industry in rapid development – shows that MOOCs are suitable for enhancing people's professional knowledge (Canals and Mor, 2014), whereas others note the potential of MOOCs as a continuing education and training provision for teachers (Jobe, Östlund, and Svensson, 2014).

Over the years, MOOCs of different forms and formats have spread around the globe. Initially launched in the USA, different MOOC concepts have seen the light of day in countries ranging from the Middle East and Africa to Australia and from New Zealand and Japan to many European nations (Adham and Lundquist, 2015; Bonk et al., 2015; Jansen and Schuwer, 2015). Researchers have demonstrated how different countries adopt and adapt MOOCs to their own cultural, political and economic contexts as well as to the technological infrastructures and organisation of their education systems. For example, we can find clear differences between MOOC strategies in the USA's higher education sector and those of Europe, particularly with regard to the approach chosen when it comes to technological support and/or web-based and distance education, not least when it comes to scalability. The latter has been deemed far more important for MOOCs in the USA than in Europe (Jansen et al., 2015). In addition, web-based learning in the higher education sector has attracted renewed attention in many European countries (Teixeira, Volungeviciene, and Mazar, 2014). In some European countries, such as Norway, government agencies have played a key role since the earliest days of MOOCs. As mentioned, in Norway, there was a government agency-appointed committee whose intended purpose was to look into opportunities for MOOCs in Norway (Official Norwegian Report, 2014:5). In addition, as owners of public higher education institutions, government agencies have also had overarching responsibility for their technological infrastructure, primarily maintained through the UNINETT AS eCampus programme and through the Norwegian Agency for Digital Learning in Higher Education, which provides a basis for the higher education sector's initiatives and trials of new pedagogical approaches using technology.

2.1 Innovation and change in the public/higher education sector

Schuwer and colleagues (2015) investigated the experiences of the management departments of several European online/distance universities (open and distance learning, or ODL) with regard to MOOCs in higher education. The majority of the challenges and opportunities found were associated with the macro level, such as accreditation, innovation and different platforms (Schuwer et al., 2015). In many ways, as far as existing higher education institutions are concerned, MOOCs represent opportunities as well as limitations. For example, MOOCs can contribute to co-operation across institutions, which is made easier when there is a shared accreditation system. However, the accreditation system can be equally restrictive, in that, it makes it more difficult to

reconcile/accommodate formal and informal education. In addition, MOOCs can help to update and change existing pedagogical models, but this can also be a demanding process given the local regulations and internal systems of educational institutions (Castaño-Muñoz et al., 2016; Fevolden and Tømte, 2015).

3 Data and methodological approach

Our evaluation of the MatematikkMOOC continuing education provision began in August 2015 and concluded in September 2016. This evaluation is formative, which means that we maintained regular dialogue with the commissioning body over the course of the pilot year. Our input is based on observations made in the different data collections (Baklien, 2000). The role of a formative dialogue researcher is described by Lindøe, Mikkelsen and Olsen (2001:193): 'The formative dialogue researcher assumes a sort of intermediate standpoint between being a neutral observer on the sidelines of what is going on and being an agent of change who actively takes part in the intervention being put into action'. During the course of this project, we delivered one midway paper, along with the presentation of preliminary observations, as well as a working paper in which we described the roles and expectations of the formative dialogue research. This was done specifically for the project in question and was intended solely for internal use by those involved in the project. In addition, the midway paper was presented to the steering group at the beginning of February.

MatematikkMOOC's continuing education provision is a large-scale project in which many are involved. It is also trialling many different organisational models and academic perspectives. As a result, our chosen approach draws on a number of data sources and methodological approaches, i.e. a triangulation of qualitative and quantitative data and methods as well as a triangulation of different perspectives (of users, educational institutions and other key actors at the organisational level). Our data sources include surveys of mathematics students/teachers, interviews with different groups of respondents, school visits, video meeting observations and analyses of current documents. Before explaining our design and source data, we shall briefly present the continuing education provision offered by MatematikkMOOC.

3.1 The MatematikkMOOC continuing education provision⁴

The MatematikkMOOC continuing education provision is worth 30 credits and is aimed at mathematics teachers who already have 30 credits in mathematics (this includes teacher training courses after 1994) and who would like to build on this. The programme has a focus on mathematics didactics and emphasises themes relating to mathematics in years 5–7; however, it could also be relevant to teachers of other years in primary and lower secondary school. The programme corresponds to Mathematics 2, 1–7, within what is known as the 'GLU model' (the teacher training model for primary and lower secondary education). The programme comprises six courses split into modules and different subjects of limited duration. Among other things, the courses feature videos, quizzes, online meetings and assignments. The six courses consist of 3–4 modules, which correspond to a breakdown of the content.

⁴The presentation of this provision is an abridged version of what is available [in Norwegian] on matematikkmooc.no as at 25 June 2016.

MatematikkMOOC is web-based and has no physical sessions; however, it does require group reflection and collaboration. Video meetings in groups (of around 8–10 people) are arranged, on average, once weekly. The students are organised into groups, which remain the same throughout the programme. Some of the video meetings are held with subject teachers and take place during working hours.

3.2 Research design

The social goal of the evaluation of the MatematikkMOOC continuing education provision was to develop a cost-effective model for the large-scale continuing education and training of teachers in primary and secondary education and training, in addition to evaluating the potential of applying a similar model to other disciplines. As mentioned in Chapter 1, this study was organised in two parts: the management level and the user level, in addition to evaluating the social goal. The methodological approaches and data are organised so that each level is illustrated with several sources. Table 3.1 below presents our approach.

Table 3.1: Methodological approach and data

	The management level			The user level			Evaluation
	Col. 1a	Col. 1b	Col. 1c	Col. 2a	Col. 2b	Col. 2c	Col. 3
Interview (including school visit)	x	x	x	x	x	x	x
Survey	x	x		x	x	x	x
Analysis of documents	x	x	x				x
MOOC participation		x		x	x		x
Canvas log data				x	x		x

In addition to the overarching goal of the evaluation, there is a set of evaluation points for each of the levels, which are listed here:

- The management level
 - a) Assessment of the funding model, including funding via higher education institutions and the grant/substitute scheme
 - b) Identifying the prerequisites for using similar MOOCs in continuing education and training programmes within other disciplines and for other school years
 - c) Assessment of the role of the teacher training courses in the MOOC and their co-operation in implementing it
- The user level
 - a) Assessment of student satisfaction
 - b) Assessment of the quality of the digital platform assessment of the returns regarding the ambition for collective participation.

The following sections go through the different methods and data sources in greater detail.

Interview with representatives from the following groups/organisations

- The Norwegian Directorate for Education and Training
- The Norwegian Centre for ICT in Education
- The Arctic University of Norway (UiT)
- NTNU
- Supervisors (UiT and NTNU)
- Teachers/MatematikkMOOC students
- School owners

Other sources

- School visits – two schools
- The Canvas platform
- Document studies

3.3 Interviews

Interviews can provide us with insight into different people's perceptions of events and actions, giving them the opportunity to share their framework of understanding. Conversations are key to the qualitative interview. Within this evaluation of MatematikkMOOC, the purpose of the interviews was to gain insight into the different actors' evaluation of the project. A number of respondent groups have therefore been included in the evaluation on organisational and user levels alike. Below, we describe the interviews conducted with each of the respondent groups.

3.3.1 *The Norwegian Directorate for Education and Training and the Norwegian Centre for ICT in Education*

We interviewed two respondents from the Norwegian Directorate for Education and Training and four respondents from the Norwegian Centre for ICT in Education. The latter were face-to-face interviews, and with the former, we conducted one interview in person in early autumn 2015 and one telephone interview in the spring of 2016. Thus, there was a time lapse in the interviews with respondents from both the Norwegian Directorate for Education and Training and the Norwegian Centre for ICT in Education as some interviews were conducted in early autumn and some in winter/spring. The point of this was to pick up on any changes occurring and how the project was going at different stages of the pilot year. The interview themes covered the background to the establishment of the provision, the expectations surrounding it, experiences of it as well as organisation and collaboration with the educational institutions. Accounts of the interviews were approved by the respondents.

3.3.2 *HiST/NTNU and UiT*

Respondents from the above educational institutions were interviewed in part by phone and in part in person in line with a supervisor gathering in Tromsø on 30 March. The respondents were either academically responsible for the provision or had an overarching role in its co-ordination. The purpose of the interviews was to shed light on the background of the participation, the tasks and organisation, the collaboration locally and between the parties as well as to evaluate the way forward for the provision. In all, three respondents from NTNU and four respondents from UiT were interviewed. In addition, two of the respondents from UiT and NTNU, respectively, were interviewed again in the spring of 2016, the purpose of which was to glean insights from the pilot. In addition, we interviewed the MatematikkMOOC co-ordinators. Accounts of the interviews were approved by the respondents.

3.3.3 *MatematikkMOOC supervisors*

Supervisors were invited to an experience-sharing session in Tromsø on 30 March 2016. Nine supervisors attended the session: five from UiT and four from NTNU. In addition, managers, co-ordinators and others involved in MatematikkMOOC from both educational institutions participated alongside the project group at the Norwegian Centre for ICT in Education. We interviewed the supervisors in groups. Both groups comprised supervisors from both educational institutions.

3.3.4 *School owners*

A school owner/municipality was interviewed over the phone because the municipality focused on MatematikkMOOC as part of its science subject strategy, and many of its schools and teachers utilise the continuing education provision. A number of schools had more than one participating teacher. The purpose of the interviews was to investigate the school owners' motivations for focusing on MatematikkMOOC as well as their experience of this focus and the collective participation.

3.3.5 *MatematikkMOOC students/teachers*

In November 2015, we conducted telephone interviews with nine teachers registered as students of MatematikkMOOC. We experienced some challenges with recruiting respondents. A number of those approached did not want to respond to questions, most of whom did not provide a reason. We therefore invested an unexpected amount of time into putting interview agreements in place. An important purpose

of these interviews was to gain insight into MatematikkMOOC from a user's perspective. A number of subjects were discussed, including an evaluation of academic content, collaboration with colleagues in school and online, contact with supervisors, assessment practices, studying online and, not least, the experience of participating with either a paid reduction in working hours for continuing study (the substitute scheme) or a study grant that did not necessarily entail a reduction in working hours (the grant scheme).

In addition, we wanted to understand whether users were taking part alone or with other colleagues from their schools and to gather different viewpoints from the different online groups on video meetings and online forums. We also wanted to interview teachers at the schools we would later visit in order to ensure continuity and to be able to bring out real case studies in the evaluation. Table 3.2 provides an overview of the selection of teachers interviewed.

Table 3.2: Overview of respondents

	Teachers	School	Study group	Substitute scheme/ grant scheme	Alone/ colleagues
1	4 teachers school visit spring 2016	1	A	substitute scheme	colleagues*
2		2	B	substitute scheme	colleagues
4		3	C	grant scheme	alone
		4	C	grant scheme	colleagues**
5	5 teachers	5	D	grant scheme	colleagues***
6		6	E	grant scheme	colleagues
7		6	E	grant scheme	colleagues
8		7	F	grant scheme	colleagues
9		8	F	substitute scheme	alone

*Colleagues substitute scheme/grant scheme; ** colleagues at neighbouring schools; *** has stopped

3.4 School visits

We visited two schools in eastern Norway. The initial plan was to visit four, but the head teachers at two of these schools declined. The selection of schools included teachers who had already taken part in telephone interviews that autumn. The purpose of the school visits was to gain a contextual understanding of how the MatematikkMOOC provision was being handled at the schools. Both schools visited were located in so-called 'middle-class' areas with a relatively homogeneous student body, both of which had around 300 students. In one of the schools, School A, four teachers took part in MatematikkMOOC – two year 4 teachers and two year 6 teachers. In the other school, School B, one teacher took part. In School A, we held a group interview with the four teachers, and in both schools, we conducted group interviews with students. In School A, seven students from year 7 took part, and in School B, five students from year 4 and five students from year 6 took part in two separate group interviews. There was an even distribution of girls and boys in all groups. We asked the head teachers about: their experience of MatematikkMOOC as part of continuing education and training; continuing education and training generally and the school's approach to it; web-based continuing education and training and their outlook on ICT and education; the procedures and systems in place for developing skills and their points of view on the substitute and grant schemes. We asked the teachers for their points of view on: professional development and collaboration with colleagues in school and online; the substitute and grant schemes; the academic quality of the provision; the Canvas platform and any previous experience they had as web-based students or participants in session-based continuing education and training provisions. The interviews with the students shed light on the work forms and their response to their teaching plans as part of MatematikkMOOC.

3.5 Survey

In February 2016, everyone registered as an online student as at October 2015 was invited to take part in an electronic survey. As part of the survey, the online students were given questions on many different themes, including: their previous experience of continuing education; collective participation at their schools; collaboration with colleagues, online students and supervisors, either electronically or face-to-face, and their evaluation of the online meetings and programme resources, the Canvas platform, the general organisation of the programme and funding arrangements.

The majority of questions were answered by students selecting different answer categories – for example, from 'strongly disagree' to 'strongly agree', 'not accurate' and 'accurate' or similar. After the

individual questions, the respondents were also given the opportunity to go into more depth in their responses by writing in a text box. Finally, the students were given a chance to share their own feelings as to whether an arrangement similar to MatematikkMOOC could have worked in other disciplines and for other school years and to share any further comments regarding the programme.

Between mid-February and mid-March 2016, two e-mail reminders were sent. When the survey was closed at the end of March, 171 of the 265 people invited to participate had responded. The response rate of 65 per cent was satisfactory. The answers were analysed using the SPSS statistics programme.

3.6 The Canvas platform

NIFU's project team has had access to the Canvas platform in MatematikkMOOC. The purpose of this was so that we could acquaint ourselves with the content and structure of MatematikkMOOC. As a result, we have been able to follow selected student groups and their participation in discussion forums and real-time organised video meetings. Overall, we observed three real-time meetings and went through two recorded video meetings. The video meetings were held by three different student groups. We wanted to look at the Canvas platform to gain an overview of the continuing education provision itself in terms of its structure, presentation and academic content and to explore how interaction, teamwork and learning were brought into web-based media. The master's students affiliated with the project investigated interaction on the platform through their own master's theses, and we shall make use of some of their findings in our analyses.

3.7 Analysis of documents

The Norwegian Centre for ICT in Education has submitted diverse evidence bases of MatematikkMOOC, including results from the evaluation of the pilot project, minutes from steering group meetings and different status reports from the project. These have been important data sources for our understanding of the working processes surrounding the provision. We have also looked at relevant national and international specialist literature relating to different aspects of the provision, such as the importance of MOOCs within lifelong learning generally and within teacher training, especially the continuing education and training of teachers. In addition, we studied relevant documents linked to the Competence for Quality scheme (Gjerustad and Kårstein, 2013; Gjerustad and Lødding, 2014; Lødding, 2015, and steering documents, Official Norwegian Report 2014:5: MOOCs for Norway, New digital learning methods in higher education).

4 The organisation and management of MatematikkMOOC

4.1 Introduction

MatematikkMOOC was developed by the Norwegian Centre for ICT in Education in collaboration with the teacher training courses at NTNU and the Arctic University of Norway (UiT) and is a pilot project commissioned by the Ministry of Education and Research. The Norwegian Centre for ICT in Education is the project manager. MatematikkMOOC has a steering group made up of representatives of the project participants, the Ministry of Education and Research, the Norwegian Directorate for Education and Training and the National Council for Teacher Education (NRLU). The provision represents one of a number of provisions within the Norwegian Directorate for Education and Training's Competence for Quality initiative.

In practice, MatematikkMOOC encompasses two different concepts: a web-based continuing education programme for mathematics teachers and an open online resource, also referred to as a supplementary teacher training initiative. This evaluation deals only with the web-based continuing education provision.

In the early phases of the project, the government agencies expressed a desire to involve teacher training courses at more than one educational institution. One reasoning for this was the desire to promote innovation and competence development. These ambitions are discussed in the project documents and are referred to by the respondents. It was anticipated that having a number of teacher training courses and developing new academic continuing education and training provisions would promote the exploration of new teaching designs and contribute to academic development and innovation locally within the educational institutions involved. How did it go? The following sections give a more concrete account of the practical organisation of the provision and of the lessons learnt over the course of this pilot year.

The development of MatematikkMOOC began as early as 2013. The Norwegian Centre for ICT in Education was the project owner and project manager. The composition of this project group changed somewhat over the course of the project. Among other things, the project came to a new project manager at the Norwegian Centre for ICT in Education. NTNU and UiT were recruited to the project through an open invitation from all members of the NRLU. From the interviews, we learnt that before the work on the deliveries began, there were many fundamental discussions about what MatematikkMOOC should be in concrete terms. Initially, the Norwegian Centre for ICT in Education assembled reference groups from the sector, including representatives for teachers, teacher training courses and the Norwegian Centre for Mathematics Education⁵, in order to encourage discussion and mutual decision-making.

⁵The Norwegian Centre for Mathematics Education.

Among other things, this looked at the level of deliveries – whether the course would be at the level of Mathematics 1 or Mathematics 2 – and, not least, who the target groups would be. The discussions held and decisions made in the reference groups laid the foundations for the development of MatematikkMOOC. The Ministry of Education and Research had originally commissioned a course provision in mathematics, but the final provision was in fact in mathematics didactics, as per the request of the target group. There was a need for teachers who were better at teaching mathematics. A test version of MatematikkMOOC was piloted in the spring of 2015 as a supplementary training provision but without exams or close monitoring by supervisors. From this work, a final report was produced (the Norwegian Centre for ICT in Education, 2015), which we were able to access for this evaluation.

4.2 Organisation

The Norwegian Centre for ICT in Education is, as mentioned previously, responsible for the overarching project ownership and project management of MatematikkMOOC. NTNU and UiT are involved in the project, each having different administrative and academic roles and areas of responsibility. At an early stage, UiT gained overarching responsibility for the administration and development of ICT operations, and on 1 December of the pilot year (2015-2016), it appointed a full-time co-ordinator as a point of contact between students and NTNU and UiT. The following sections give a more specific outline of the division of work between the actors involved and the experience gained over the pilot year.

4.2.1 The Norwegian Centre for ICT in Education

The Norwegian Centre for ICT in Education staffed the project with one full-time project manager and four project participants in different percentages of a full-time post, each of whom has primary responsibility for different areas of expertise, such as project management, mathematics, ICT pedagogy and technology. Project staff have specialist expertise within these areas and consider such expertise to be central to the preparation and execution of the project and, not least, to gaining legitimacy at the educational institutions. The Norwegian Centre for ICT in Education asserts that it started with a broad approach in order to get important stakeholders concerned involved in the project and, as such, to work to achieve the broadest possible grounding among the users (which is to say schools in Norway, here understood to be school owners, head teachers and teachers) and teacher training courses involved.

In the description of the assignment, the Ministry of Education and Research wanted the Norwegian Centre for ICT in Education to involve several higher education institutions as its objective was to ensure a broad grounding across such institutions. The Norwegian Centre for ICT in Education worked actively with the academic and administrative management teams at UiT and NTNU as well as with their student administrations, admissions offices and IT departments.

The Norwegian Centre for ICT in Education has, as project owner and project manager, performed the roles of administrator and co-ordinator. It has been involved in academic discussions and ICT pedagogy arrangements and has also had technical platform competence. The centre stresses the fact that when forming a continuing education provision, such as a MOOC, through collaboration with different actors, there is a need for relationship-building and an acknowledgement of the actors' different roles and complementary expertise. The centre has the responsibility for organising and conducting the meetings of the MatematikkMOOC steering group.

4.2.2 NTNU

The dean of the Faculty of Teacher and Interpreter Education has had the overarching responsibility for MatematikkMOOC at NTNU.⁶ She is part of the NRLU and represents NTNU on the project's steering group. The head of department – who is responsible for continuing education and training – and two other faculty members have provided administrative support for this work. The head of department has also participated in some of the steering group's meetings. Between six and ten people at the Faculty

⁶ The faculty was part of the Sør-Trøndelag University College (HiST) until 1 January 2016 when it became part of the Norwegian University of Science and Technology (NTNU) – see Chapter 1.

of Teacher and Interpreter Education have taken part in the development of the programme's academic content, and eight subject teachers have been involved as supervisors in the project's implementation. In addition, two master's students have served as supervisors. There has also been some participation from the IT department, though to a limited extent as the main responsibility for ICT operations has gone to UiT.

4.2.3 *UiT the Arctic University of Norway*

The head of department at the Institute of Teacher Training and Pedagogy has had overarching responsibility for MatematikkMOOC at the Arctic University of Norway (hereinafter UiT). The head of department has sat on the steering group and led work at UiT together with the directors of Studies for Continuing Education and Training and the integrated master's in teacher training. The director of Studies for Continuing Education and Training has taken part in steering group meetings where necessary. The two directors have, together with those responsible at NTNU, had overarching responsibility for the planning, initiation and implementation of operations. They have also been responsible for monitoring in relation to the goals of the framework plan and subject plan. A team of academic staff at the Institute of Teacher Training and Pedagogy has contributed to the academic development of the programme, and four subject teachers work as supervisors. In addition, the institute uses master's students for supervision, but they do not have independent supervisory responsibilities in the way the students at NTNU do.

4.2.4 *The division of responsibilities between UiT and NTNU*

NTNU and UiT have shared academic and administrative responsibility for the development and implementation of the provision. This collaboration has been outlined in an agreement, and NTNU and UiT have made equal academic contributions. They have divided the supervisory responsibility for student groups between them and shared responsibility for examinations/transcripts of marks; UiT is responsible for examinations in subject 1 and NTNU for examinations in subject 2. As mentioned above, UiT has had administrative responsibility for MatematikkMOOC and handles information about students, admissions/evaluations of qualifications and ICT. The respondents at the educational institutions pointed out that this is due to the fact that it would have been impractical to split these responsibilities between two institutions, owing among other reasons to the systems used by the institutions.

4.2.5 *Academic co-ordinators at NTNU and UiT*

To begin with, NTNU and UiT established a shared structure for the co-ordination of the academic work, and an academic co-ordinator was appointed at each of the educational institutions. The co-ordinators had primary responsibility for the academic development and quality assurance of the provision. They were to work closely with academic staff locally and co-ordinate activities between the two educational institutions. The academic co-ordinators reported to their closest academic superior; at UiT, this was the director of studies, and at NTNU, this was the dean of teacher training.

The academic co-ordinators were also responsible for monitoring and co-ordinating the programme supervisors. The co-ordinator at UiT was a supervisor; however, the co-ordinator at NTNU was not. On 1 December, a dedicated co-ordinator was appointed, who would function as a point of contact between the educational institutions and students; the academic co-ordinators also monitored students and helped with any questions they might have had with regard to IT support and administration.

The academic co-ordinators have been in contact with one another and the academic staff at the educational institutions as well as with key members of staff at the Norwegian Centre for ICT in Education during the implementation phase.

4.2.6 *Supervisors at NTNU and UiT*

Supervisory responsibilities are organised a little differently at the two educational institutions. At UiT, each subject teacher is responsible for more groups than his/her counterparts at NTNU. At UiT, there are four subject teachers who are supervisors for MatematikkMOOC – one is responsible for four

groups; two are each responsible for three groups; and one is responsible for one group. The subject teachers involved are in close contact with one another; they share office space and emphasise the value of close dialogue and sharing experiences. At NTNU, there are a total of ten supervisors: eight subject teachers and two master's students. Roughly half of the supervisors are responsible for two groups each, the other half for one group each. A number of supervisors from both educational institutions took part in the academic development of the programme.

Both UiT and NTNU make use of master's students in the latter stages of their studies, giving them marginal roles in the implementation of the course. At UiT, students pursue a five-year integrated master's degree, not a bachelor's degree with subsequent master's studies (as is the case at NTNU); thus, there are formal limitations to the role that they are allowed to play in supervision. This means that in practice, UiT has two specialists linked to each group: one academic supervisor who is responsible for supervision, the main course requirements, the majority of the video meetings and for marking examination files; and one master's student who is responsible for the ongoing monitoring of forum activity and the quality of the peer assessments. At NTNU, the master's students have the same role as that of the subject teachers, i.e. they have supervisory responsibility for one group. However, in line with UiT's examination regulations, master's students cannot mark examinations.

The supervisors at NTNU and UiT have online meetings every other week. They have had training in how to use the platform through seminars with the providers, Canvas⁷ and the Norwegian Centre for ICT in Education, but they have nevertheless experienced many challenges in navigating the platform. Notwithstanding, they believe that the students find it easier to use.⁸

4.2.7 The experience of organising and administering MatematikkMOOC

A respondent at one of the educational institutions pointed out that, initially, what expertise each party would bring to the project was not sufficiently clearly defined and that having such a clarification in advance would probably have helped lessen friction and misunderstandings in the early phases of the project. Over the course of the first pilot year, the parties involved have found that a number of processes took longer than expected and that in many cases, this had to do with the different procedures, regulations and practices surrounding the administration of the educational institutions. In the interviews, a number of examples of administrative obstacles were described, and – among other things – a number of respondents pointed to the fact that the student databases at the educational institutions were not intended for lateral co-operation. Student admissions were cited as another example. It was clarified that UiT would be responsible for student admissions to MatematikkMOOC; however, the fact that there were also dedicated admissions regulations within the Competence for Quality scheme was not sufficiently well communicated. In practice, this meant that some students who the Competence for Quality scheme had evaluated as being eligible for admission to the programme were not deemed as such by UiT's own admissions regulations. This misunderstanding was soon clarified, but according to several respondents, it created unnecessary delays. Another example concerns the different regulations in place at the two educational institutions regarding who can perform the role of external examiner. As previously mentioned, the master's students who UiT used as supervisors could not take on the role of external examiner, owing to UiT's examination regulations.

As previously shown, there were also differences between the educational institutions with regard to the extent to which master's students could be involved in supervision. The above examples demonstrate some of the practical and administrative challenges associated with this collaboration. They relate to more than simply the relationship between the educational institutions (as well as the Norwegian Directorate for Education and Training/Competence for Quality) or the co-operation regarding administrative admissions systems. We also heard similar examples relating to their use of different technological infrastructures. Although both educational institutions make use of services from the

⁷ See Chapter 6 on the technological solution.

⁸ See Chapter 5 on the students' experience of the platform.

national support apparatus for ICT in the higher education sector (the eCampus programme), problems arose locally when it came to putting in place a shared technological platform for MatematikkMOOC.

The objective was to transfer overarching operational responsibility for MatematikkMOOC from the Norwegian Centre for ICT in Education to the educational institutions after the first pilot year. In line with this, the Norwegian Centre for ICT in Education developed operational handbooks relating to MatematikkMOOC. They were developed in co-operation with the academic community, and the expectation is that they will serve as working documents to clarify who is responsible for what parts of MatematikkMOOC. As far as we are aware, these handbooks have not yet gained a strong foothold at the educational institutions. One can question why this is so, and it is likely that the answer lies at least in part in the tension between the autonomy of the higher education sector and the involvement of government agencies, here represented by the Norwegian Centre for ICT in Education. Within the higher education sector, there is no widespread practice of collaborating on continuing education and training provisions across educational institutions or of allowing external actors to adopt project management responsibilities in the development of new academic curricula (Tømte et al., 2015). This means that at the start of the project, the educational institutions and the Norwegian Centre for ICT in Education had little to no experience to fall back on. The lack of existing procedures for, and experience of, such multi-party work can also go some way towards explaining why a number of challenges were not sufficiently taken into account at the start of the project. The project certainly conducted an initial risk and vulnerability analysis, but this did not sufficiently take the higher education sector's autonomy into account, which has also had a bearing on academic development, the technological infrastructure and, not least, administrative systems and regulations.

So far, we have presented examples of administrative challenges that the two educational institutions experienced in the first pilot year of MatematikkMOOC. Although the higher education sector has a number of common administrative procedures and rules at an overarching level, there are many local solutions and regulations in place at individual educational institutions. In the short term, changing these or adapting new structures is no simple task – something the MatematikkMOOC experience has made clear. On the basis of this experience, it would probably be sensible to give enough consideration to local variation when developing future study provisions and academic resources collaboratively between several institutions. For example, one of the respondents proposed that the educational institutions could collaborate in the development and management of academic provisions but that administrative responsibilities should lie with only one such institution. Such a solution would free up time and resources for academic development and, in the short term, create less friction surrounding programme and student administration.

4.2.8 The experience of academic collaboration

Despite the somewhat unique organisation of the project locally, employees at NTNU and UiT were quite content with the academic development and implementation of MatematikkMOOC. Both institutions praised the other for good academic collaboration. In the interviews, they underlined the fact that they experienced real academic benefits from such a collaboration, and both teacher training courses would be interested in continuing this collaboration.

The academic staff on the teacher training courses at UiT and NTNU have been responsible for the development of MatematikkMOOC's academic content. Each educational institution had different strategies for the composition of their academic staff. Whereas NTNU prioritised university teachers, UiT chose to recruit teachers with experience of primary and secondary education and training and continuing education and training. The academic staff at both educational institutions had some experience of online teaching. In this way, the academic staff at the two institutions represented, to some extent, different expertise. How the work efforts were organised also varied somewhat: we learnt that UiT considered it important that academic staff be located in the same place so as to ensure that colleagues could share their experience in the academic development and – not least – implementation of the programme, including supervision. This was not as strongly emphasised by NTNU; here, the

interviewees gave us the impression that employees worked on MatematikkMOOC primarily on an individual basis.

Academic collaboration has taken place at several levels in the two teacher training courses: on an overarching level between the dean of NTNU and the head of department at UiT and between the academic staff of each institution. Although MatematikkMOOC is an example of an academic measure initiated at a management level at the educational institutions – and, according to one respondent, such measures can often be difficult to implement – the respondents stated that the project is coming along very well. NTNU's management team has been less involved in the project than it would have wished due to the work around the HiST merger, through which the teacher training course was to be incorporated into NTNU's operations (see interviews).

Nord-Trøndelag University College (HiNT) was brought into the project by NTNU for a short time, but it left after two to three months. NTNU's reasoning for bringing a third educational institution into the project was that it did not have sufficient capacity to work on the development of academic content. This did initially entail some extra work, especially as HiNT did not have the same understanding of the assignment as that developed by UiT and NTNU in partnership. Bringing in yet another partner contributed to a general sense of 'a few too many cooks, and not a great broth', as summed up by one of the respondents.

The task of the Norwegian Centre for ICT in Education was, above all, to co-ordinate academic collaboration at an overarching level – for example, by ensuring that progress is made, that communication flows and that experience is shared throughout the project as a whole. The Norwegian Centre for ICT in Education and the educational institutions all felt that this work was somewhat demanding. Where the Norwegian Centre for ICT in Education was concerned, it felt that it was difficult to get local support for decisions within the academic communities and that few wanted to take responsibility. It also felt that justifying its own activity in the academic work proved demanding.

In addition, the Norwegian Centre for ICT in Education has no overview of how experience has been shared or how communication flows have been maintained locally at the educational institutions. In some cases, particularly initially, it feared that important lessons were not being shared with the relevant actors. The respondents from the academic communities at the institutions noted that they felt that the Norwegian Centre for ICT in Education was 'interfering' in the educational institutions' academic development of the programme. In addition, they pointed out that the Norwegian Centre for ICT in Education did not have sufficient knowledge of teacher training or what such training involved in a purely vocational sense: '(...) this is a course in mathematics didactics; the teachers aren't here to develop their mathematical skills but their skills regarding the teaching of mathematics'. The academic communities' feeling that the Norwegian Centre for ICT in Education was 'interfering' can probably be linked to the higher education sector's tradition of autonomy, which means that educational institutions are relatively unaccustomed to intervention from government agencies, at least not when it concerns academic development.

4.3 Understandings of MatematikkMOOC: MOOC, SPOC, web-based teaching?

The Norwegian Centre for ICT in Education, the Norwegian Directorate for Education and Training and the Ministry of Education and Research have all sought to promote innovation in continuing education by exploring the opportunities offered by MOOC technologies. The MOOC concept was integrated into the project to signal that MatematikkMOOC would not be a closed continuing education arrangement but an open resource that would be accessible to everyone. For their part, the educational institutions have been oriented towards traditional, campus-based teaching and/or traditional web-supported teaching. One of the respondents at the educational institutions summed up an understanding of the provision as follows: 'MatematikkMOOC was viewed as a web-based continuing education programme and not a real MOOC in reality'. It appears, unsurprisingly, that the differences in understanding of what

the provision should be, which were held by the educational institutions, the Norwegian Centre for ICT in Education, the Norwegian Directorate for Education and Training and the Ministry of Education and Research, were most pronounced at the start of the pilot year, leading to a number of misunderstandings surrounding how the provision was organised. As one of the respondents from the educational institutions summarises:

This process has been important. By being involved in the development of an entirely new concept, we have seen that we had to work actively to reach a mutual understanding of what we needed to create. There have been many different understandings, which have to some extent dictated how we have worked. The process of agreeing on what to create has been important and informative.

But how can we describe the programme that was actually created? What characterises MatematikkMOOC? If we look at what makes up the acronym MOOC, as explained by Jansen and Schuwer (2015), among others, 'M' stands for 'Massive', which suggests, among other things, the scaling-up of the provision. In its first pilot year, MatematikkMOOC brought in 300 teachers from Norwegian primary and lower secondary schools, who undertook 30 credits of continuing education in mathematics didactics, Mathematics 2. Compared with other continuing education provisions within this subject, the majority of which are session-based and thereby consist of classes of roughly 30-40 students, MatematikkMOOC represents a considerable scaling-up of the number of students. The first 'O' in the MOOC acronym stands for 'open'. In contrast to traditional MOOCs, the continuing education provision offered by MatematikkMOOC is not open; it is closed and regulated by admissions, and each user has his/her own login details. The second 'O' stands for 'online' and indicates that the provision is web-based and thereby accessible regardless of the geographical location of potential participants. This is also the case of MatematikkMOOC. In principle, all teachers can take part, regardless of the school they are employed at or where in the country they might be located. This has proven to be a success in the sense that students in the first pilot year have been spread throughout the country; they can participate from the comfort of their own school or home without having to spend time or money travelling to sessions. The last letter, 'C', refers to 'courses'. MatematikkMOOC is a course of study for continuing education that offers 30 credits, which is to say that it is a formal educational provision and forms part of the continuing education portfolio at the educational institutions. As part of this, the course is also designed in such a way as to involve a close monitoring of student progress. Traditional MOOCs were not initially intended as such; for these, the intention was more for the provision to be open courses that anyone could take as an informal course of study for lifelong learning. The MatematikkMOOC project group has worked to develop such a resource, in parallel with the continuing education provision, as a stand-alone supplementary training provision. This is ready for use, but it does not fall within the remit of our evaluation assignment.

In other words, if we are to summarise the MatematikkMOOC continuing education provision in light of the term 'MOOC', we can see that the provision to some extent meets the general definitions of what characterises a MOOC. In an international context, one might question how 'massive' it is to train 300 teachers online, but in light of the number of possible students within that specific education segment in Norwegian schools, 300 teachers most likely represents a considerable figure. The continuing education provision is, however, not open to everyone, instead following established higher education admissions regulations, which can also be found in other MOOC-like provisions in Norway (see, for example, mooc.no) as well as in Finland and Denmark (Kahlroth et al., 2016). However, these are less widespread in the rest of Europe (Jansen and Schuwer, 2015). In addition, the fact that MatematikkMOOC is organised as part of a formal course of study at these educational institutions, accompanied by the close monitoring of student progress, suggests that the course component – the 'C' in 'MOOC' – becomes less relevant here as this is not a freestanding course in which one can determine one's own progress. There is a long tradition of web-based and distance courses in Norway; private online schools have traditionally dominated in this field, but the higher education sector has increasingly focused on this type of education (Tømte et al., 2015; Tømte and Kårstein, 2013). In other words, in Norway, we have good traditions surrounding the second 'O' in 'MOOC', online/web-based/distance learning.

MatematikkMOOC is therefore both massive and online, without being openly accessible. It consists of flexible courses only where flexibility allows for guided progression. These characteristics of the continuing education provision align closely with what some researchers refer to as SPOCs. Within this format, what is emphasised are the individual characteristics of participants; it also attempts to combine the advantages of face-to-face learning situations with the advantages of web-based learning (Hochschulrektorenkonferenz, 2014). SPOC courses are also characterised by course fees and qualification requirements and allow only a limited number of participants (Official Norwegian Report 2014:5). As such, the continuing education provision in question, for teachers of mathematics, or MatematikkMOOC, which consisted of 300 teachers in its pilot year (2015-16), can fall under a 'MOOC-like' provision or a 'SPOC'.

4.1 Different understandings of and approaches to quality

'MatematikkMOOC is about creating a provision that is of high quality'. The majority of people associated with the MatematikkMOOC project can agree with this understanding and approach; however, what the term 'quality' covers varies from one person to the next. While the Norwegian Centre for ICT in Education maintains an understanding of quality that is linked to an overarching ICT pedagogy and web-related approach, the educational institutions were primarily concerned about the academic quality of the provision.

The educational institutions ostensibly have a mutual understanding of the concept of quality. The programme quality of MatematikkMOOC was expanded by the academic employees in several ways. Among other things, they believed that they enhanced the quality of the provision by incorporating learning activities where the students actively contributed to the MatematikkMOOC design. One of the respondents emphasised that an important consideration in the academic development of the programme was that the course should not only be 'an online PDF'; instead, students should actively participate in their own learning. The academic communities were concerned about which type of teaching would have the best effect on learning, and based on their knowledge of this area, they gave weight to teaching and learning methods such as discussion tasks and videos on case studies from the classroom and related assignments. 'Videos of classrooms/learning' and having 'one supervisory voice throughout the course' were put forward as better learning methods than 'videos of teachers'. Closely monitoring student progress throughout the programme was stressed as an important aspect of good teacher training. Such an approach to students is absolutely central to vocational training courses, and it is therefore not particularly surprising that the teacher training courses highlighted its importance in the MatematikkMOOC continuing education provision. How, therefore, can such an understanding of quality and practice be transferred to web-based teaching?

The understanding of teaching quality within the teacher training courses, as expressed in the interviews, appears to have originated largely from an understanding of teaching quality founded on session/campus-based teaching, with a weight on didactic considerations promoted in such teaching forms. One concrete example of such an understanding was its manifestation in rather heavy workload requirements, frequent submissions and obligatory online meeting attendance. The latter could suggest that there was concern that online students might drop out without any real requirement to log in to the planned video meetings or to record them while making written contributions about them in web-based discussion forums. In this respect, the requirements surrounding obligatory attendance in session-based continuing education programmes have probably been transferred directly to web-based teaching. Close monitoring by supervisors is also important to teaching in subject didactics. In MatematikkMOOC, this was resolved to a large extent by increasing the number of supervisors so that each student could have as much supervision as he/she would have had in a session-based continuing education programme. Another means of monitoring student progress was through 'peer assessment'. This assessment form is commonly used in web-based courses and MOOC provisions, especially where too many students make close monitoring, by the academics employed at the educational institutions, unfeasible. The academic communities emphasise peer assessment as important in being able to take in the large volume of students that the Ministry of Education and Research initially wanted.

The Norwegian Centre for ICT in Education appears, for its part, to be interested in the potential for interaction enabled by the technology of the platform on which MatematikkMOOC is built. The understanding of quality is here more closely aligned with the development of a platform and an organisational form capable of managing large numbers of students. The Norwegian Centre for ICT in Education expressed the desire to bring about a comprehensive approach to quality, which meant establishing an interdisciplinary project group with expertise in fields like ICT pedagogy, mathematics didactics, digital learning platforms, project steering and project management.

These different understandings of what quality within MatematikkMOOC can mean appear, in other words, to be founded on different understandings of teaching quality whereby different perspectives, such as academic content, pedagogy, technology, presentation and admissions, are emphasised and understood in different ways.

4.2 Innovation in the teacher training courses?

As shown in Chapter 2, the march of MOOC into higher education has contributed to pedagogical innovation, while at the same time uncovering diverse challenges surrounding the introduction of new formats and systems into established systems. Many of the experiences of pedagogical innovation found in the international research literature (see, for example, Castaño-Muñoz et al., 2016) come up again in the development and testing of the MatematikkMOOC continuing education provision. Both educational institutions are primarily interested in spreading the expertise and experience gained from MatematikkMOOC among the mathematics teaching communities. Respondents from UiT explicitly stated that their strategy was also to make use of the knowledge acquired on web-based didactics teaching in disciplines other than mathematics and that their participation has created an academic community that has truly enriched their teacher training course:

We have had a unique opportunity to test different examination forms on a large scale. We have learnt much from this. We have also gained a stronger academic community and enhanced our master's teaching. We have also further developed our expertise in web-based teaching. In the autumn, UiT will hold a conference to share experience, and we are in discussions about how to involve NTNU.

MatematikkMOOC as a *concept* represents something new for higher education; producing and hosting a course academically as well as administratively across a number of institutions and with what was initially an instance of external project management is, from what we have seen, very uncommon within the higher education sector. As such, MatematikkMOOC represents a piece of pioneering work. As shown in the research literature, the development of MOOCs can be a demanding process given the educational institutions' own regulatory frameworks and internal systems. This was also instantiated through the case with MatematikkMOOC. The Norwegian Centre for ICT in Education, for example, noted that grounding a project that in many ways runs across established systems and structures within different institutions can invite many challenges within these large established systems. At the same time, we can attest that the academic collaboration between the educational institutions has worked well, likely due in part to the fact that the different academic communities work in a somewhat similar way and that they have had some level of co-operation prior to MatematikkMOOC.

4.3 Summary

This chapter has shed light on the different challenges faced and the experience gained from the organisation and management of the MatematikkMOOC continuing education provision. Much of this experience can be linked to different processes and the maturation of a mutual understanding of the project and product. At the same time, we feel that it could be beneficial to adjust some of the decisions made with regard to the organisation of the provision should the decision be made to transfer the existing provision or create new provisions based on MatematikkMOOC.

There is a potential for development in three specific areas of the organisation and management of MatematikkMOOC. First, we would recommend clearer descriptions of the roles involved and the expertise to be provided by the parties involved, ideally based on a dialogue as early as possible in the project phase. In this way, it should be possible to avoid misunderstandings linked to responsibilities. This is likely to be of particular importance in cases where government agencies lead projects involving the academic community. Second, we observed some weighty and time-consuming processes involved when two educational institutions are to be interconnected and co-ordinated administratively. What MatematikkMOOC teaches us is that it is possible to collaborate at this level, however, it is also important to put in the necessary time. In the worst cases, putting in too little time can be detrimental to student progress. Third, changing existing study formats is a demanding process. The original MOOC format for MatematikkMOOC was substantially adjusted during the process primarily because of the different understandings of education quality held by the parties involved. Local academic cultures and understandings of the opportunities presented by different teaching formats most likely play a role in this, and as far as we know, these can be perceived differently according to the educational institution. However, the fact that such different understandings exist could be a valuable consideration in the development of MOOC or MOOC-like courses for teacher training courses within other disciplines.

Moreover, we observed that in the two teacher training courses involved, the MOOC concept itself contributed to new ways of thinking about pedagogy. There was evidence of co-operation across the institutions, highlighted as being positive by both parties, with the desire for continuing co-operation.

5 Being a MatematikkMOOC student

5.1 Introduction

Chapter 5 sheds light on student satisfaction with MatematikkMOOC in terms of its academic content, prescribed texts, workloads, relevance as well as its assessment and supervision methods. Some students participated with colleagues; others studied alone. This gave students different conditions for participation in MatematikkMOOC. In this chapter, we examine how these different conditions affected the students' perceptions of the course. We also examine how the two funding arrangements affected perceptions of the course and how the schools accommodated their employees over the course of the continuing education.

5.2 Satisfied students

Of the 297 registered students, 242 were registered for examinations in the spring of 2016. In other words, the data from the first year of the MatematikkMOOC continuing education provision show a high level of completion; close to 80 per cent of the 297 students who started in September 2015 completed the programme. With so many students completing the course, and with such a low dropout rate, one can consider MatematikkMOOC an immediate success. In the interviews, we also generally heard from satisfied students; the MatematikkMOOC provision was felt to be both academically relevant and interesting, as summarised by one of the respondents: 'The content, the academic content of the course is first-rate, so much so that I feel lucky to have been able to do it. I'm always learning new things' (Respondent 7, School E). Group interviews with teachers at two schools and telephone interviews with individual teachers revealed that teachers felt the course content to be interesting, current and academically relevant: 'I think those doing the programme next year will get a fantastic course. The content is good, with interesting assignments' (School 2, teacher interview). This impression was confirmed by the survey. The first two questions in figure 5.1 show that the students found the programme relevant for their own practice and that it was practice-oriented.

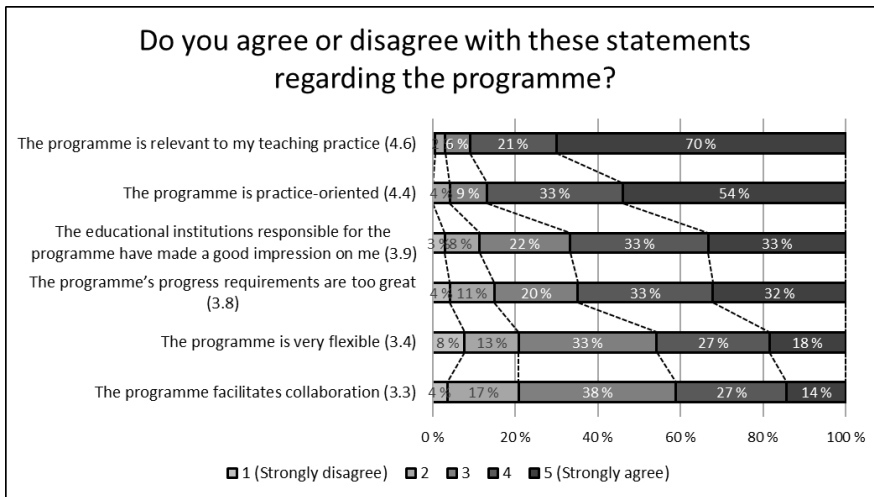


Figure 5.1: The students' evaluation of the programme.

As pointed out in Chapter 2.2 on the continuing education and training in the context of students' learning outcomes, a programme that relates to students' previous experience of teaching and their own professional practice contributes positively to learning, in addition to students analysing, concretising and exemplifying problems. In the above, we observed that the students largely felt this to be true of MatematikkMOOC. Also, the interviews demonstrated that students felt that the academic content and set-up were relevant to their own practice. For example, one of the students stressed that the academic content promotes a greater level of reflection on one's own role as a mathematics teacher and that such reflection has a ripple effect on a school's focus on mathematics:

The academic content was very interesting, and it makes me reflect on what sort of maths teacher I am. And this means I talk about it at work, and my colleagues have shown some interest. We're doing a maths drive at our school this year, so it's quite cool to be able to bring this to the table. (Respondent 3, School C)

Nevertheless, figure 5.1 reveals some mixed opinions regarding other aspects of the programme, including those relating to flexibility and opportunities for collaboration (we will come back to these later on in this section). The students also pointed out some specific challenges of being a MatematikkMOOC student. Figure 5.2 presents the challenging aspects for the students. For example, well over half of the students found the programme's workload and the fact that prescribed texts were in English to be (major) challenges (63 and 75 per cent, respectively).

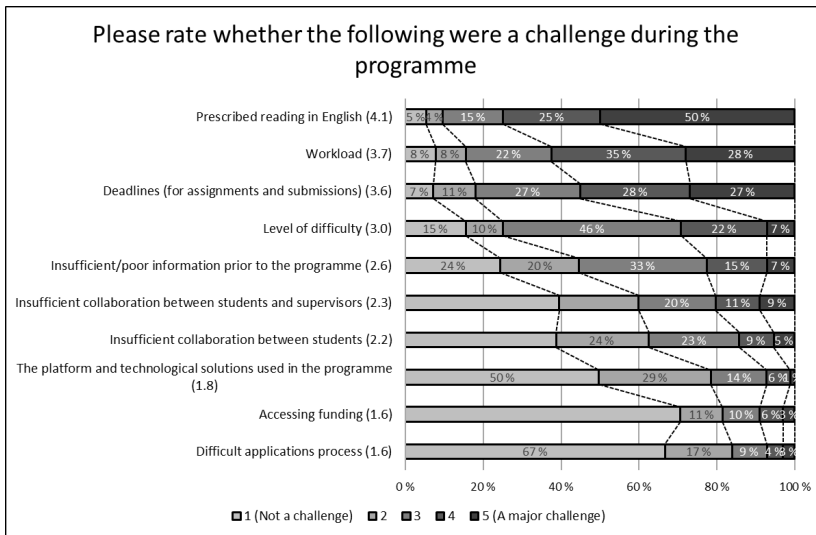


Figure 5.2: The students' evaluation of challenges presented during the programme.

As the figure shows, challenges were related to aspects of content, structure and format alike. In the following sections, we will address these areas in greater detail.

5.3 MatematikkMOOC's academic content

We will start by looking at the academic content of MatematikkMOOC and, in particular, how students evaluated this. Specifically, we will look at the prescribed texts, workload and how they evaluated the course content.

5.3.1 Prescribed texts

Many teachers gave the feedback that reading academic literature in English is a time-consuming process. This was highlighted as the greatest challenge of the programme academically, both in the survey (see figure 5.2) and in the interviews. This challenge relates to the difficulty of handling and understanding prescribed texts in English:

For my part, I don't like English. I got some help at home; it was really hard; the articles were very dense. It felt a bit that way, I don't know. I'm sure there was lots of useful stuff in the articles, but what's stupid is that this was prescribed reading (...). (School 1, teacher group interview)

I'd have liked a bit more prescribed reading in Norwegian. I feel I'm good at reading English, I read a fair bit of English myself. But a lot of the texts are dense and take up a lot of time... You have to look up a lot, read carefully... But the worst was course 3 as it was all in English, and the subject was mathematics and technology, which made it even more difficult. It was a good book with lots of great examples, but it would have been great to have it in Norwegian. (School 2, teacher group interview)

In addition, some teachers thought that a lot of time was spent reading and understanding prescribed texts in English or languages other than Norwegian:

Some of the assignments take a lot of time to read, and for me, not being used to reading maths in English, this takes a lot of time if I want to understand it properly. So much so that I haven't used them so much, but maybe others have, I don't know. I've seen that some questions have come up, so I'm trying to click around and see. (Respondent 4, School D)

The English is difficult. A major challenge; takes up a lot of time. (Respondent 5, School E)

And digesting the prescribed texts is perhaps a bit of a time cruncher. And there's a lot of prescribed reading in English, and English isn't one of my subjects, so I normally spend a lot of time on the English reading. What's in Danish is fine. (Respondent 7, School E)

Notwithstanding, some more nuanced statements about the prescribed English-language texts were also forthcoming. Some said that they found it difficult to read academic texts in English.

Reading in English is hard, I find – I have to look up a lot because it's in academic English. So I feel the specialist literature has generally been very good, what I've read so far. (Respondent 4, School D)

I feel that the academic content has been very good. Good, relevant prescribed reading. The only thing that has been hard is that while I feel I'm relatively good at English and reading in English, having the academic material in English is pretty dense, or so I've seen. (Respondent 10, School I)

(...) good and relevant, but... particularly the texts in English, those were quite hard to take in. Very many academic expressions, which can make it hard. Luckily, the prescribed texts weren't too long for each part – 30–50 pages – and that's kind of manageable. But had it been 700 pages of English, I'd have had a slightly more negative view on it. (Respondent 9, School G)

It's been all that with the academic reading in English; it certainly won't be available in Norwegian for the time being. (Respondent 9, School G)

Thus, the vast majority of students found the academic English-language texts demanding, and according to a number of the quotations above, the academic terminology in English, in particular, meant that they had to spend a good deal of time understanding the content. The vast majority of MatematikkMOOC students have most likely been teaching in schools for a number of years, which again means that it has been some time since they graduated as teachers. This suggests that they may not have studied for some time (unless they have pursued other continuing education and training during this time), which means that they are no longer used to reading academic material in English. In addition, much of the target group's academic background will be from Norwegian teachers' training colleges, which traditionally have a lot of prescribed reading in Norwegian. These students have not had to work with academic material in English as much as academics at the university and university colleges who have selected and quality-assured the prescribed reading. A number of the respondents pointed out that even if they felt comfortable with English as a foreign language, reading academic material in English required an entirely different language skill.

The challenges of reading specialist literature in English were identified at an early stage of the evaluation, and we presented this feedback to the academic communities as part of the midway reporting in January. The feedback from the academic communities was that they wanted to offer MatematikkMOOC students the most recent and highest quality specialist texts and that such literature was primarily available in English. In other words, the educational institutions argued that academic material in English made a positive contribution to the programme's academic quality. By contrast, if we look at the input from the students, it was precisely the English-language specialist literature that reduced the quality of the programme. The students' argument was that academic texts in English lessened accessibility and hampered progress as understanding and absorbing the materials took longer when reading in English. The academic communities and students here emphasise different

views of academic quality, even when quality is being discussed. We have seen a number of similar examples of different understandings of quality (see, for example, Chapter 4.1).

One student stressed that the educational institutions were very helpful in terms of accessing the literature in question; at the start of the programme, however, this was difficult:

(...) and it was also hard to get hold of the literature to begin with. But I also think that the university has been really good with getting us lots of articles and the like. In a way, this makes it accessible without us having to buy an entire book just to read a chapter. We have three core books, and the rest was digitalised and downloadable. I think that was really good. (Respondent 9, School G)

5.3.2 The provision's workload and flexibility

The survey showed that many students found the programme's workload challenging (see figure 5.2). A particularly high number of students found the autumn term demanding but the spring term less so. This change had something to do with the fact that the educational institutions reduced the number of compulsory submissions in the spring, in part based on student feedback. Two appraisals sum up how the provision was perceived in respect of this change:

All in all, it's been a good programme. The workload in the autumn term was rather high, but it seems that this has changed for the spring term. (free text response, survey)

It was a bit demanding to begin with, but you took responsibility and did something with the feedback, so this spring term has been more manageable and easier to combine with work. I think that this has been an informative continuing education programme, and I would absolutely recommend it to others! (free text response, survey)

The workload, combined with a lack of flexibility in terms of time, was noted by a number of students. Over half of the respondents said that assignment deadlines were a (major) challenge (see figure 5.2). Many found the frequent submissions frustrating, especially in light of the fact that it was not possible to access all of the courses for an overview of what they would be doing. We also found some differences in how students perceived the workload based on whether they had chosen a substitute or grant scheme for funding. We will return to this later on in this chapter. One student who chose not to finish the programme also stressed that the lack of flexibility was a key part of the decision to quit:

In the past, I have studied online alongside a full-time job, and this was demanding, but it was flexible enough that I could work at the right tempo to be able to fit it around my work. But once the course requirements started coming in, we could see that this wasn't compatible with a full-time job. This wasn't an option for me now, and the study grant we were offered wouldn't have been enough to cover me at my workplace. (Respondent 1, School A, quit)

In summary, we can see that frequent submissions impair flexibility. A number of students would have liked to be able to put aside time during holidays and weekends to get on top of work, but they felt that it was difficult to reconcile this with the frequent submission deadlines and the limited overview of what had to be done over the course of the academic year.

5.3.3 The contents of the provision and academic innovation

Some of the teachers we interviewed mentioned that they had many years' experience of teaching. The TALIS survey, which outlines teachers' continuing education and training on an international level, shows that younger teachers generally receive significantly more opportunities for professional development than older ones (OECD, 2009). The participant survey from 2015 shows that a higher number of older than younger teachers were registered in the continuing education programme (Gjerustad and Salvanes, 2015). The following quotation from one teacher with roughly 20 years' experience highlights the importance of continuing education and training provisions such as

MatematikkMOOC for teachers who have worked in schools for a long time as well as the fact that such measures help supplement professional knowledge while also promoting reflection on old routines:

I have now worked as a teacher for almost 20 years, mainly at upper primary level throughout. And I thought I could use this course as a refresher. I have Mathematics 2 from my basic training – I didn't know if this had been approved, but it was approved by the municipality anyway. The content was completely different to what it was 20 years ago. And I also think it was helpful to get a break from the normal school day, and I got a few other things done, a little top-up. Shook up my old routine – in a positive way. (Respondent 9, School G)

The programme's topicality and relevance – for example, in working with other national initiatives such as Assessment for Learning – were mentioned in a group interview at one school: '(...) the content has been really good, very up to date and relevant in the themes handled. We are now busy with Assessment for Learning, which we're also working on during shared time here at school' (School 2, teacher interview).

5.4 Arenas for collaboration

A key element of teacher training – and of the continuing education and training of teachers – is getting students to reflect on and discuss their own pedagogical practice and learning. MatematikkMOOC was set up to allow students to do this through formal structures in the programme's design. The idea is also that the students will put what they have learnt into practice at their own schools over the course of the academic year. It would appear that the students have run with this. In the interviews, they revealed that they had gained a new awareness of their own teaching practice and – not least – ideas about new ways of teaching:

It's really relevant, we get to fill up any gap we have. I'm sure about that. In a way, it has confirmed the importance of having discussions and talking about maths and finding a language for it all. I do this a lot, and I've got much better at getting away from the books. Because they aren't everything, but I've put a lot to use – I'm actually doing that all the time. (Respondent 7, School E)

Such discussions can take place online, such as in video meetings, as well as in the learning platform's online forums. The conversations can also take place in schools and learning communities where teachers meet in person offline. For example, this happens when two or more teachers from the same school are participating in the programme, when a number of schools in the same region organise face-to-face sessions or when teachers from neighbouring schools take the initiative to meet in person. In the following section, we will present some of the general experiences of the web-based and physical learning communities.

5.4.1 Web-based and physical learning communities

Just under half of the students took part alongside colleagues from their own school. These students highlighted how important it was to be able to discuss things and share experiences with their colleagues. They also believed that local opportunities to share experiences and hold academic discussions were more important than web-based ones, especially since they had more chances to talk about the course in a more spontaneous way. As the video meetings were so rigid in structure, they were not necessarily conducive to a flowing conversation. Students who were the only participants from their school were also only somewhat satisfied with the video meetings, to some extent, for the same reasons as those taking part with other colleagues – namely that the video meetings did not encourage open academic discussion – but also because it often proved difficult to find a meeting time that suited everyone. Many also stressed that the group size affected interaction and communication; many felt that it would have been advantageous to have smaller groups. Figure 5.3. shows the students' experience of the video meetings. As this shows, there are mixed feelings as regards how much they got out of such meetings; however, the majority felt positively about them.

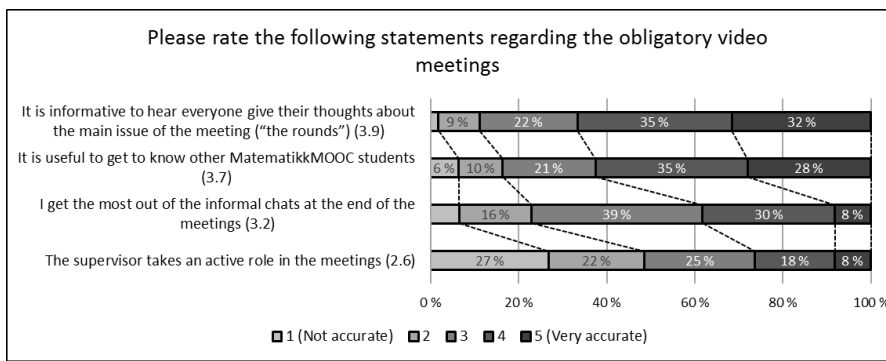


Figure 5.3: How students evaluated the video meetings.

The student interviews reveal the same sentiment. Here, feelings are also mixed with regard to how much the students got out of such meetings. According to one student:

(...) I think I might have got a bit less out of the video meetings, it's probably the aspect I learnt the least from, personally. It's a bit like talking into a void because everyone mutes their microphones to prevent echoing, so you can only see the others, and we say a lot of the same things, we agree. In that respect, it's nice having a study group – we've used Facebook a bit to discuss things with each other. And there are places where you should post things, and that's been really good, but the video meetings in themselves have been more of a hassle to set up, and they haven't given me much. (School 2; teacher interview)

Many people also felt that the size of the group meetings via video was too large. Many noted that when group size reaches around 10 people, they become too large. In such cases, it is not easy for everyone to be heard. While some dominate the conversation, others are left sitting in silence. For such big groups, the technology in itself can feel restrictive, especially with regard to taking turns. In practice, students' microphones have to be turned off when listening and then activated before they speak. Among other things, this is to prevent the noise from coughs, breathing and other background noises being picked up by all participants. This means that there is less spontaneous input and fewer immediate responses. Others highlighted that the video meeting structure was restrictive. The fact that everyone had to take turns and say something about their own experience can feel very static, thus hindering dialogue:

To begin with, the online group was far too big. There are 11 of us in the group, and we're supposed to communicate. When there are so many people, you need such a rigid, structured system that there is no conversation, no discussion. You just have the questions and issues to discuss at each meeting, and the focus becomes covering each thing, completing the task. (...) there [are] four of us from our school, so it feels much more natural for us to chat together than to use the online group. It does feel a bit egocentric, but that works much better for us. I've thought about this a bit because there are 11 of us in our group: four from our school, two from a neighbouring school and five slightly further away. For the next round of study, I'd split the group in two no matter what. As far as I know, the [ones from further away] are the only ones from their schools taking part. (Respondent 10, School I)

Using the internet isn't unfamiliar ground in itself. It's an OK way of studying, but it takes time, and the groups for the video meetings are so big, so it's tough when the technology doesn't always work. (Respondent 5, School E)

These two student experiences are consistent with our own evaluation of the video meetings. We observed real-time meetings as well as recordings of meetings (see Chapter 2), and we saw, among other things, that the discussions were much better when the groups were smaller.

The students were also supposed to take part in asynchronous web-based forums on specific themes from each course module. They were sometimes required to prepare posts for these, but the forums can also be used at will for students' own academic discussions. However, a number of students felt that their participation in the forums was primarily to fulfil work requirements:

The programme requires a lot of work, with assignments and regular deadlines, so I've noticed that people don't take the time to go back to discussions and add new posts because they're already working on at least two new things. I think it would've been interesting to have a little more time to go back and really finish off each discussion. (Respondent 10, School I)

Don't [join in] much, but I've seen some questions come up there. I haven't posted any, I haven't joined in any discussions that weren't mandatory. I do read them a bit, but I think it takes a lot of time. (Respondent 4, School D)

The findings from the survey suggest the same tendency (see figure 5.1). Vera L. Kristoffersen and Umar Khan analysed the forum discussions and video meetings as part of their master's theses on MatematikkMOOC (Kristoffersen, 2016; Khan, 2016). Both found a close correlation between the group size of the video meetings and the opportunities for discussion. They also emphasise the potential for academic discussions within the design of the forum. They stress the fact that students feel that the workload of the programme was too high to allow sufficient time for them to follow up on such discussions.

5.5 To take part alone – or with colleagues?

As shown in the above, MatematikkMOOC is conducive to different forms of web-based interaction. At the same time, we observed that in addition to purely web-based arenas, a number of teachers participated in various forms of physical learning communities. As such, the situations of the students participating in MatematikkMOOC are different; either they are purely online students interacting with their fellow students online, or they are participating with one or more colleagues as well as interacting offline. In light of this, we questioned whether there was any difference in the students' satisfaction and experience of the programme depending on whether they participated on a purely online basis or whether they had colleagues they could turn to in person in their everyday work. In the following sections, we will take a closer look at these different situations.

Although the Competence for Quality initiative is intended to lay the groundwork for a school-based continuing education for teachers, leading to collective participation in continuing education and training provisions, in the autumn of 2015, just over half of MatematikkMOOC students (58 per cent) stated that they were taking part in the programme alone, as opposed to 42 per cent who were taking part with other teachers (figure 5.4).

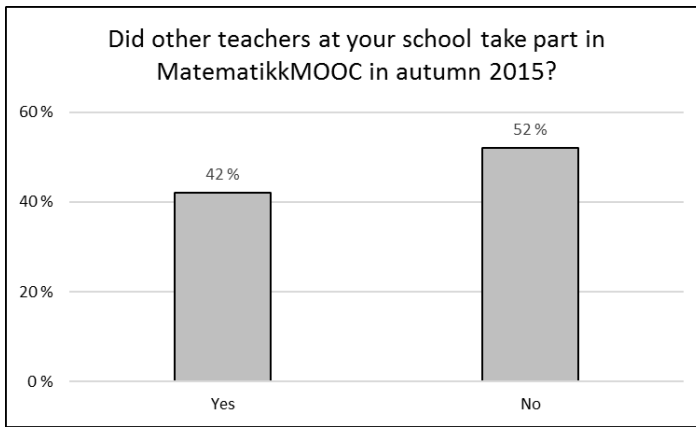


Figure 5.4: Participation with colleagues.

5.5.1 Collaboration with other teachers

As far as the continuing education and training of teachers is concerned, the literature references other forms of collaboration between teachers (Vangrieken et al., 2015). Of the students who were participating with one or more colleagues, six out of ten responded that it was 'important' or 'very important' that there were other teachers from their school taking part in the MatematikkMOOC provision.

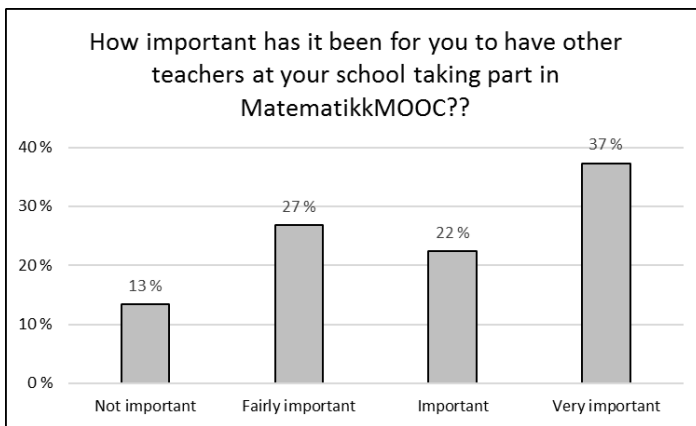


Figure 5.5: Importance of colleagues. Responses from students taking part with colleagues.

Comment [.1]: Do you mean: Importance of colleagues

This result was also confirmed in the interview responses. One of the respondents highlighted the importance of being able to discuss the course content and lessons learnt from the programme with colleagues.

It's probably an advantage to take part in the programme with others you know; you can set up your own little study group and work together. And the fact that two of us are working with the same year group makes it even easier to work together. I felt a bit sorry for those who were on their own. (School 2, teacher interview)

In the following section, we will explore the collaboration between teachers regarding skills enhancement in the following situations: 1) when taking part in MatematikkMOOC with colleagues from the same school; 2) when taking part in MatematikkMOOC alone but with teacher contacts from other schools; 3) when taking part in MatematikkMOOC alone without any previous contacts.

One can assume that each of these groups will have differing levels of collaboration/interaction, both online (formal/informal) and in person – for example, through arenas like study groups (formal/informal). In what follows, we turn our attention to the first and third of these groups in particular, i.e. students participating with others from the same school and those participating alone.

5.5.2 Participating with others

Half of the students who participated with others from the same school stated that they did not work together online outside of the obligatory video meetings. Around one-fifth, however, stated that they had worked with teachers from their own school online – for example, through Facebook groups that they had set up themselves.

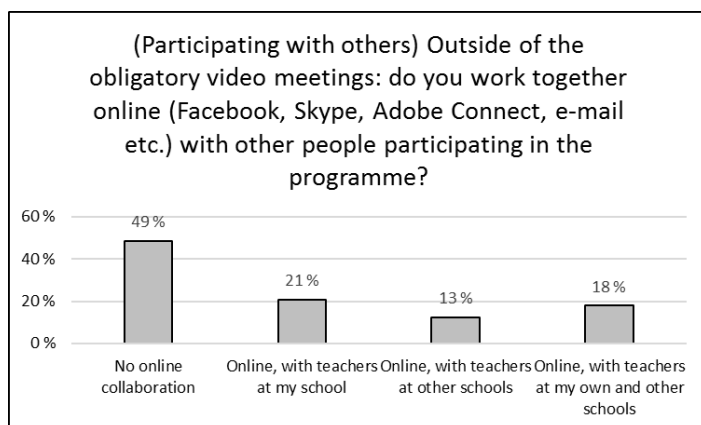


Figure 5.6: Online collaboration. Responses from students taking part with colleagues.

Of those who took part in the programme with colleagues, roughly two-thirds stated that they had face-to-face meetings (figure 5.7).

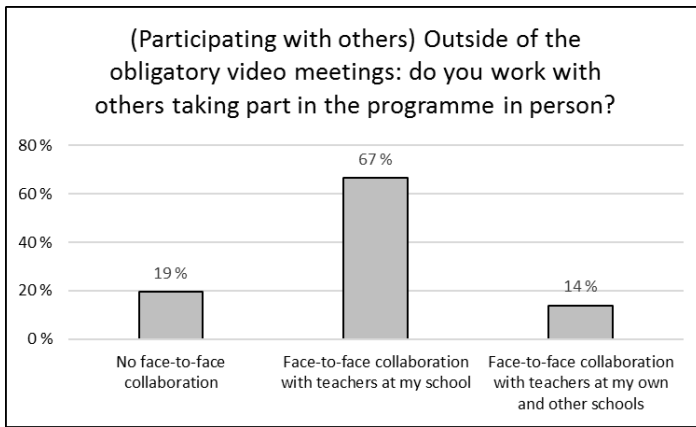


Figure 5.7: Face-to-face collaboration. Responses from students taking part with colleagues.

The teacher interviews also indicate that some of those who were taking part in the programme with others participated in online groups with colleagues from neighbouring schools. Creating informal groups online – through Facebook, for example – was considered a means to expanding academic discussion:

We haven't met them [students from the neighbouring school]. We use Facebook a bit, where we've set up a group, but there are a couple of people that aren't on there. We've had a few discussions, like 'what are you thinking about for that assignment?' We use it a bit, and it's been useful. People check Facebook all the time. It's easier to go on there than to log in to the MOOC and the discussion forum and because you don't get a beep or anything with them. (School 2, teacher interview)

5.5.3 Participating alone

Almost half of the students who were the only participants from their school stated that they had worked with others taking part in the same programme online (figure 5.8). Moreover, it became apparent that just as many people in this group had not worked with other MatematikkMOOC students.

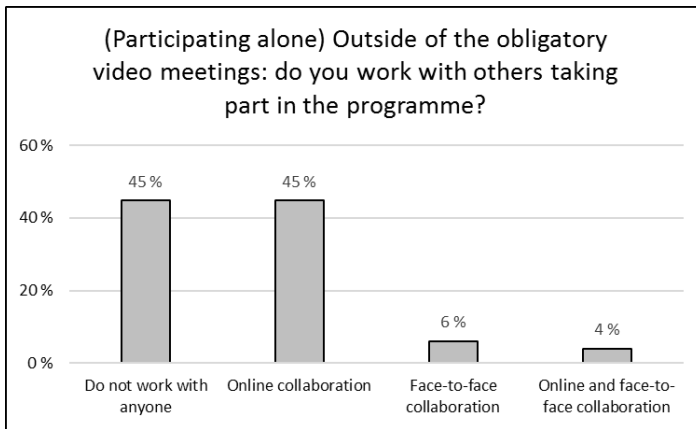


Figure 5.8: Collaboration with others outside of the video meetings. Responses from the students participating alone.

By contrast, from our interview data, we found that very few of those who participated in the programme on their own worked with others – former colleagues, for example – through face-to-face meetings.

I said to a friend at another school that we had to do the course. And I met a former colleague, who had also thought about signing up, to chat about it together, that sort of thing. So those were the two others I knew before we started. (Respondent 3, School 3)

We push each other and chat and inform each other and work together. She and I work together almost every weekend. And we did the last video meeting together from my house. The three of us had planned on working together, but the third person fell sick. We've worked together for some years and know each other well, so we're on good terms... We're like sparring partners. She's like another colleague, so we work together a bit. (Respondent 3, School C)

Yeah, and we're all in the same online group... I think they've split us up a bit based on geography. In my group, there are quite a few of us from... one from... and two to three from... or somewhere around there. (Respondent 3, School C)

Participating in MatematikkMOOC with other contacts – such as former colleagues – was mentioned by our respondents as important in terms of their own learning and learning outcomes. This finding is supported by the survey results. Of those who took part alone, three out of four said that they felt that their own learning outcomes would have been better had they had colleagues from their school with whom they could collaborate on the continuing education programme.

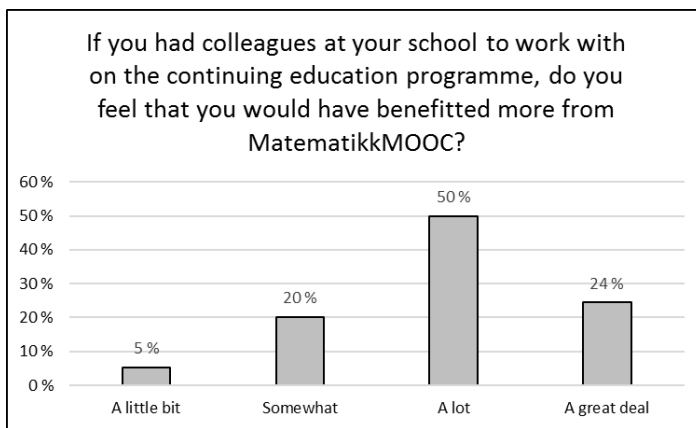


Figure 5.9: Benefits of working together. Responses from students participating alone.

In summary, the results show that interacting and collaborating with others outside of online meetings and in person was seen as important for learning outcomes.

5.6 'Peer assessment'

'Peer assessment' is intended to both promote collaboration between students and help to inspire reflection on their own learning, while at the same time giving them the opportunity to take inspiration from the contributions of others. Peer assessment is also an important characteristic of MOOCs or MOOC-like courses (Martín-Monje, Bárcena, and Ventura, 2013). At the same time, the literature shows that such assessments are not always taken seriously by fellow students. For example, students might not give substantive feedback, or they may simply neglect to give feedback, which can result in many students abandoning studies (Coleman, 2013). A number of academic communities are therefore working to improve peer assessments (Ashton and Davies, 2015). The results from student interviews in MatematikkMOOC also show that there is room for improvement with regard to peer assessments, even if the responses vary from negative and ambivalent to positive evaluations.

Our interview data show that not all students understood the purpose of the peer assessments, as illustrated in the following statement:

I don't get the point of it. Me giving guidance to others, yes, of course it can get me thinking and all that. But if I've misunderstood the text, I'll either transfer my uncertainty on the topic to the other person or say it's really good when in fact it's completely wrong. And then [the supervisor] will comment that we have to write more than just say it's all fine and dandy, but I don't feel we have the grounds to write in much more depth. And then I think about the insane amount of work I have with my job... We had assignments for last week and for this Wednesday and Sunday. When we have to do peer assessment too, it just feels like: check – get it done, be finished with it. That's how I feel and how the others I know feel, too. (Respondent 3, School C)

This quotation shows that peer assessment can also be seen as yet another requirement or a compulsory exercise imposed for the sake of it, with no special purpose – particularly if one already feels pressed for time. This understanding comes through clearly in the following statement through the use of the expression 'forced feedback':

We have a good deal of forced feedback on assignments, which is a study requirement, so there you go, give feedback. But the programme is a lot of work, with assignments and regular

deadlines, so I've noticed that people don't take the time to go back to discussions and add new posts because they're already working on at least two new things. I think it would've been interesting to have a little more time to go back and really finish off each discussion. The tempo is just a little too high. (Respondent 10, School I)

Some students also called for feedback from the educational institutions since the peer assessments were felt to be of little academic relevance:

The only feedback I got was that my fellow student felt that I had fulfilled the criteria, but I don't know anything else about how good the assignment was. When I don't get any feedback from anyone at the university college, I feel unsure. In any case, I'm not going to use this as an exam submission, which is a shame, because it might just be a good one. (Respondent 10, School I)

At the same time, we also found more instances of mixed feelings in our materials, including positive references to the evaluations made by fellow students:

What I got out of the peer assessment – it was really varied,. (School 2; teacher interview)

I've heard that others on the programme were really happy with it, but I'd rather have been assessed and got proper advice from a supervisor. And when I'm sitting there looking at assignments, I really want to give positive comments, right, but how it all goes, I'm less sure of. The only assessment I haven't had back was the main course requirement from the previous course, so I don't know what the supervisors' assessment is like. (Respondent 7, School E)

Some of the respondents pointed to the positive aspects of peer assessment, such as being able to see what their fellow students had written. However, some expressed a desire for more traditional forms of supervision, such as the inconvenience of peer assessment linked to the time taken:

Some of it has been really rewarding, but we could have got even more from it from a teacher. In that sense, we could have got much more out of supervision, but we did get to read the assignments of others. I might have wanted some supervision from a teacher too because we're going to be submitting soon. We haven't really had anything to say about where we are right now, so in that sense, I'd have liked more supervision from a teacher to be able to improve the assignment. (Respondent 4, School D)

No, it doesn't really take so much time, but it's a bit like as soon as you feel you're done with one assignment, you have to assess someone else's. I feel like people are more eager to finish quickly than to spend a lot of time on it. I feel like the evaluations I'm giving won't be as good as a supervisor's would have been. At the same time, it's useful to see the responses of others – so a mixed blessing. You do get a few more ideas, you can see whether you're thinking along the same lines as others, or things you hadn't considered yourself. (Respondent 2, School B)

These statements are supported by the findings in the Danish study, which concluded that 'peer to peer response activities are not perceived as a qualified replacement of teacher feedback' (Gynther, 2016:26).⁹ Based on our interview data, we can see that many students understood the concept of peer assessment; however, many also perceived it as an unnecessary obligation and were unsure about how significant their own evaluation was or how they should approach their fellow students' evaluation of their own work. A number of the students interviewed in the first six months of MatematikkMOOC also felt that the peer assessments were too frequent, which were adjusted in the last six months of the programme. We reported these observations as part of our formative evaluation, and in the second half of the programme, we observed that the educational institutions communicated the objectives of the peer assessments more clearly.

...

5.7 Supervision

Many students felt that supervision was important in terms of the academic benefits as well as their progression through the programme. 'The supervisor is everything! Practical academic tips, development, etc.' (free text response, survey). An analysis of several data sources, including interviews with students, open answers from the survey and personal notes from the supervisor's meeting, revealed a composite picture of the students' contact with their supervisors, different understandings of the supervisor's role and students' satisfaction with the supervision in terms of both academic and administrative elements. Figure 5.10 shows that the majority of students had little contact with their supervisor:

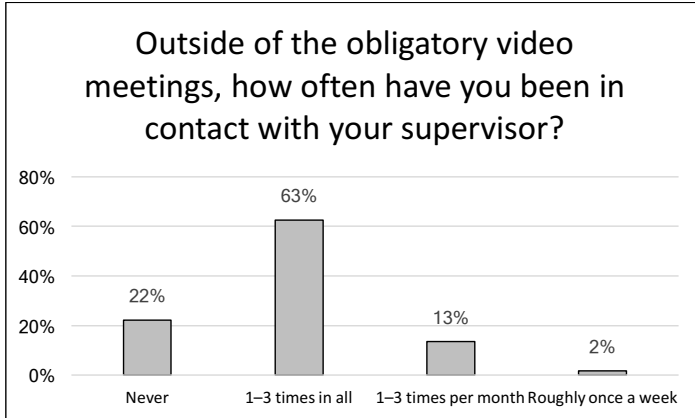


Figure 5.10: Contact with supervisors.

The interviews with students from November 2015 pointed to the same tendency as the survey, which was conducted three months later. The students reported that they had little to no contact with their supervisor:

You know, we've been able to have a bit of contact with our supervisors. But it's not very much – say, some tips the supervisor shared on a few of the reflection assignments. There have also been a few general tips from the supervisors. I've asked the supervisors a few questions and had good responses to them, but that's relatively little. (Respondent 9, School G)

Uh, no, not much supervision. The supervisor was with us in two of those online meetings, but if you ask them something, you do get an answer. But I haven't asked so much. (Respondent 2, School B)

The supervisor joined us once, and he had nothing to add. I don't know if he was there mainly to watch, so I'm a bit concerned as to whether we can get some time for questions and a bit of help. Otherwise, we can e-mail the supervisor and get answers sent back to us, so yeah, I sent some messages and got some pointers for an assignment and a few answers, but they had nothing to do with that. You have to work very independently, and that's one of the things that's quite demanding, the fact that you don't have sessions where you can sit face to face with someone and talk. (Respondent 7, School E)

5.7.1 Understanding the supervisor's role

Some of our respondents expressed a lack of understanding of the supervisory role.

I don't completely understand the supervisor's role. He's been very flexible, but we've gone round and said what we needed to, and then he just makes a little summary. He doesn't bring anything like that himself, something's missing, he's lacking in something. I wrote to him before the last main course requirement because he only comments on the form of what we submit and how we reference. So I wrote, look, it's great to have that feedback, but what about the content? Have I understood the text right? We were informed that the supervisors wouldn't assess, so I don't get the point of the supervisor's role. I sent feedback to F and S, but the replies were a bit like hot air. Another criticism I have is that there are some things I'm wondering about; one thing was raised by F at a video meeting. I got a reply, but it seems a bit like he doesn't really know. Talked about the first main course requirement because, at the time, he'd said that the assignment wasn't written like an academic text, but the task was only to write a paper, not an academic text. He'd commented on it like it was an academic text but said not to take it seriously... (School 1, teacher interview)

We heard from a number of the students that the supervisors were slightly passive and hesitant and that it was not entirely clear what to expect from the feedback – such as the content of the above quotation.

5.7.2 Structural factors – time

Some respondents expressed a feeling that the supervisors did not have enough time to give sufficient supervision, evident in the following statement:

I think the supervisor had far too much to do; he has two groups. We were at a video meeting, and he wasn't prepared. The group did get somewhere, and we wanted the supervisor's thoughts, but he didn't have anything to say. It was clear that he hadn't read the assignment beforehand. And we got a bit too little feedback on main course requirement 1, but he improved. On the second two, we got better feedback, more critiques too, but that was good because then we knew where to improve...

I think the supervisors just have too much to do; they don't have the time to monitor our progress like they should. Like in one assignment, we answered pretty much completely incorrectly in the discussion forum, and a supervisor should have stepped in then. I submitted that assignment as an exam submission, and I wouldn't have had I known the answer was wrong... There are too many assignments. Cut out 30%, and we'd learn just as much in a more assured way. At least the supervisor could monitor more of what we did. (School 2, teacher interview, group)

5.7.3 Evaluating supervision

The majority of feedback from both the interview material and the free text answers in the survey related to the supervisor's contribution to the organisational and administrative aspects of study. For example, a number of students stated that contact with their supervisors took place mainly via e-mail:

(...) Otherwise, we can e-mail the supervisor and get answers, so yeah, I sent messages and got some pointers for an assignment and a few answers. (Respondent 7, School E)

When I've had questions (sent via e-mail), he has always given relevant answers. (free text response, survey)

We also found open text responses in the survey stating that the supervision was somewhat useful academically and otherwise. Below are some selected text responses which add some nuance to the somewhat negative image portrayed through the interviews.

I was given good supervision before and after submitting assignments, help with technical queries and general encouragement.

General questions, supervision on assignments, help with problems in MOOC, views and tips.

The questions that come up along the way that I feel I need an answer to – like feedback given by another student – or if I'm unsure about anything relating to the assignment requirements, etc.

The supervisor has helped me by giving me advice about whether I was on the right track, whether I'd understood the course text and whether I was theorising in the right way. A good discussion partner, academically and pedagogically.

Our supervisor ... is fantastic in the way she gives constructive feedback. She's available for questions, and if there's something I'm unsure of, she gives me quick feedback that helps me take my work further.

Academic questions, and when a peer assessment was lacking. I'm really satisfied with my supervisor, I got good supervision and fast answers.

We have shown that the students experienced mixed feelings about supervision. Where some were very satisfied with their supervision, others were more critical or had higher expectations. This could have something to do with the organisation of the supervision itself (see Chapter 4.2.6) but may also relate to other factors such as students having different needs when it comes to input.

5.8 Grant or substitute scheme?

The strategy of the Ministry of Education and Research (2015) for the continuing education of teachers and head teachers, the Competence for Quality initiative, recommends the grant scheme over the substitute scheme as the former does not entail further absence of teachers from schools. The grant scheme would instead see teachers study alongside their work as teachers. However, findings from the last participant survey, a survey of teachers in different forms of continuing education and training, reveal differences among participants relating to their funding arrangements and how satisfied they were with the workplace arrangements for their study. In addition, the programme reveals some small variations in learning outcomes and dropout rates based on the selected funding arrangement. The authors conclude that these differences, although small, indicate that it is important to monitor whether participants on the grant scheme benefit as much from the programme as those on the substitute scheme (Gjerustad and Salvanes, 2015, p. 79). Here, we would like to present the MatematikkMOOC students' experience of each of the schemes.

5.8.1 The students' evaluation of the schemes

Of the 167 teachers who responded to the survey, roughly half of them (54 per cent) stated that they took part in the MatematikkMOOC provision through the grant scheme, whereas 46 per cent took part through the substitute scheme (figure 5.11).

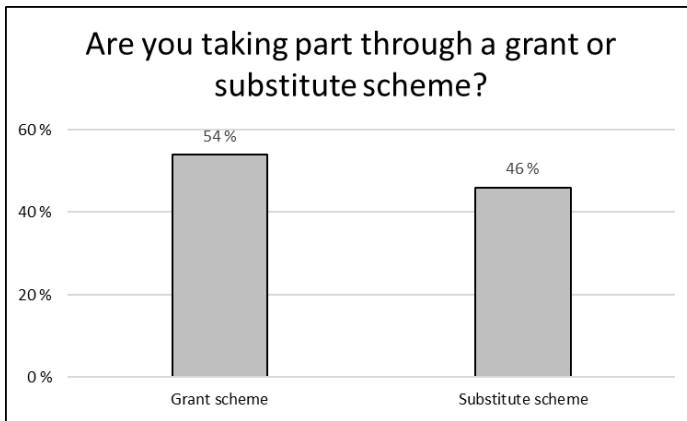


Figure 5.11: Participation through a grant or substitute scheme.

The proportion of students on the substitute scheme who stated that they were either satisfied or very satisfied was 46 percentage points higher than that of those on the grant scheme. Among the latter, 44 per cent stated that they were satisfied or very satisfied, whereas 39 per cent stated that they were very dissatisfied or dissatisfied. Put simply, almost all of those on the substitute scheme were satisfied with this funding arrangement, whereas those on the grant scheme were more evenly distributed over the entire scale.

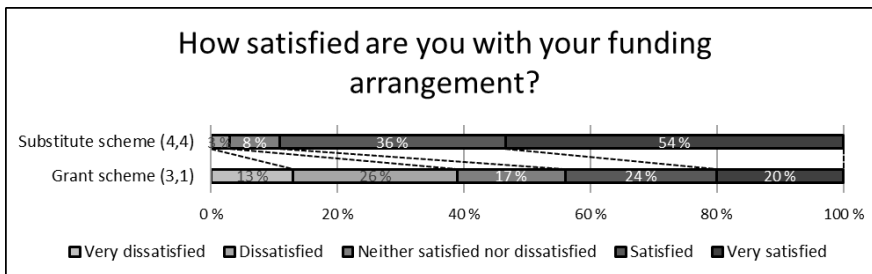


Figure 5.12: Students' degree of satisfaction with their funding arrangement.

The majority of the teachers interviewed were affiliated with the grant scheme. All stressed the fact that this was a very demanding scheme, particularly owing to the amount of work the programme involves. A number mentioned that, given the opportunity again, they would have preferred the substitute scheme:

The programme is really good, and its value can be transferred to disciplines outside of mathematics, but based on the amount of work involved, I wouldn't recommend it to anyone unless they were on a substitute scheme. (free text response, survey)

I work an 80% full-time position and really need that extra day to keep my head above water. It also takes up a lot of time from my weekends and public holidays. I think the best thing would have been to be on a full substitute scheme as the programme requires a lot of time. (free text response, survey)

The advantage of the grant scheme is, according to one respondent, the fact that it increases the chance of multiple participants from each school, with the accompanying advantages – for example, when a

number of colleagues participate in the programme together, they can discuss their studies at work amongst themselves.

I chose the grant scheme. A lot of work, but we do get money to take time off work and for buying books. But taking time off is demanding: it requires a lot of planning, and I can see the benefit of the substitute scheme as you have fixed days off. With the grant scheme, it's more sporadic. There are lots of us from our school, maybe 10, which is an advantage – had I done this alone, it would have been too tough. I think I'd have de-registered. Meetings with colleagues were a bit sporadic, but we would see each other at work – lots of discussions during lunch breaks, etc. (Respondent 5, School E)

Individuals also noted that they would not choose the same scheme again, as the work generally had to be done after the end of the working day. Incidentally, the grant and substitute scheme students valued progression and flexibility slightly differently. Those on the substitute scheme were more likely to report that they had sufficient time to fulfil the work requirements and meet deadlines:

The people who are the most eager and have the best agreements with their substitute scheme have made an early start with their studies and want to get the video meetings done as quickly as possible, whereas those who haven't finished the previous course have to jump back and forth a bit awkwardly to meet the group's needs for progress. (Respondent 10, School I)

The examples in the above show that those on the grant scheme would have chosen the substitute scheme if given a second chance. However, some of the students did express a preference for the grant scheme:

No, I have a grant, I don't like being away. And I haven't taken any time off either; I think arranging time off is a bit of a hassle. (Respondent 7, School E)

However, many of those who chose the grant scheme did not appear to have been aware of what this would involve in a purely practical sense. The above examples illustrate that these students would have chosen differently if given the chance. Several emphasised the fact that the amount of study time on the substitute scheme would have been more predictable as the scheme makes it possible to set aside study days within the school's working hours. By contrast, students on the grant scheme must study alongside their work as a teacher, and although many reported that they had reduced their working hours to 80 per cent of a full-time position, they felt that it was difficult to maintain progress in their studies. This is partly explained by the school's organisation and partly by the workload and requirements for progression in the programme. Some of the students on the grant scheme were also rather dissatisfied with the information they received about the financial framework surrounding that scheme. Some of them stressed that they were surprised to discover that the grant was taxable and therefore presented little financial gain once tax was deducted and the prescribed texts purchased:

Was disappointed that the grant was liable to tax. That wasn't clear. I rang the tax office; they said it was tax-free.

Didn't know in advance that the grant would be taxed. Have never heard of a taxable grant. It should be called a salary supplement instead. Still don't know how much tax will be deducted on this. I'd have been much better off financially with a 37.5% reduction in working hours from my full-time position.

It's a cheat to call it a grant scheme. Half of it goes in tax. It should have said: 'extra salary'.

Unacceptable work levels with a full-time job and study on top of that; 54% (sur)tax on the grant left me with 23,000 of the 50,000 paid. I feel robbed, duped and naive for not checking this more thoroughly (but that wasn't what I was thinking about when I applied).

The above quotations were taken from the free text fields provided in the survey. We can see that many students felt cheated or duped for having entered the grant scheme for financial considerations. The belief that continuing education should be free or that the employer or another party should bear the financial responsibility is, nevertheless, not unique to these students. Studies of employees taking part in continuing education and training in Norway have shown that there is a clear expectation among employees that the employer should bear such costs. However, this is not necessarily the case in other countries (Tømte et al., 2015). It does appear that a number of the grant scheme students felt that they had not been sufficiently well informed of the specifics of the scheme. In addition to the lack of information regarding taxation, some of the students had not had enough information about when payments would be made:

We don't get the second half of the grant until after graduation. Really bad scheme if you need the money due to a reduction in working hours/salary.

Being paid after Christmas makes it hard for me to take days off. Payment doesn't happen until after graduation.

These quotations were also from the free text responses from the survey, but we heard echoes of them in the interviews with the students. At the same time, in the survey, the majority stated that the process of getting the funding in place went well, and very few considered the application process to be particularly difficult (see figure 5.2). We interpret this as an indication that getting the application and formalities in place went well but that the implications of the grant scheme in itself had not been thoroughly communicated. Thus, one could say that the information given about the Competence for Quality initiative could have been clearer about the practical aspects of the grant scheme.

When it came to finding times for video meetings, it became clear that students on the substitute scheme preferred to have them during the day. Conversely, the grant scheme students preferred evening time as they often had work tasks to perform during the day. In groups of both grant and substitution scheme students, it was particularly difficult to find a suitable time for video meetings, as illustrated in the following quotation:

What I think that isn't so good is that, in our group, there are lots of people who don't have time off, so they put the meetings in the evening, so there are a number of meetings I can't attend. They choose a time that most people can make, which is fine, but I applied for a day course because I have leave, and it's not convenient every evening. Many people don't have time off work, so no one wants to have them during the day... It should be set up so that those who have leave can be in their own group. (Respondent 4, School D)

For this reason, one might in future consider the possibility of grouping participants based on whether they have chosen the substitute or grant scheme.

5.8.2 The schools' accommodation of the substitute and grant schemes and head teachers' evaluations

In Chapter 2.2, we highlighted a number of workplace conditions that are particularly important for participants to be able to benefit from a continuing education programme. Such conditions include: a positive and supportive attitude towards continuing education at the participant's workplace; a positive environment in which teachers have the chance to test, present and discuss what they have learnt; a focus on collaboration between colleagues within the school and, not least, the school having a long-term focus on development work to enhance the quality of teaching. When Gjerustad and Salvanes (2015) investigated schools' accommodation of teacher participation in continuing education and training, they found that the teachers on the grant scheme did not receive the same attention as students on the substitute scheme. The grant scheme differs from the substitute scheme in the sense that the workplace has significantly less responsibility for accommodating studies. This can mean that teachers on the grant scheme are left to fend for themselves. At the same time, the authors highlight the fact that

the number of students pursuing continuing education in 2015 has increased from previous years, and this may also explain why the percentage of those who felt that their workplace had made good arrangements for them to be able to study was lower in 2015 than in the previous year. The increase in the number of teachers pursuing continuing education probably means that more schools have a number of teachers taking part in continuing education programmes at the same time. This can make it more difficult to accommodate these teachers' studies (Gjerustad and Salvanes, 2015, p. 80).

In the MatematikkMOOC continuing education provision, participation from a multiplicity of teachers from the same school has been actively encouraged. The majority – though not all – of these are on the grant scheme, although for some schools, we found that teachers represented a mix of both substitute and grant schemes. We also found evidence of other practices and arrangements locally:

At our school, we were told that no one was getting on the substitute scheme; everyone had to opt for the grant scheme. Yet, at the start of the programme, some people had actually got onto the substitute scheme. The headteacher wants us to take as little time off as possible. It has been a challenging course so far.

But I have not cut back my working hours as much as I could have due to our school's management and lack of consideration for colleagues.

It compromises your working week; you have to have joint meetings after working hours on study days; that makes things inconvenient. My employer needs me to come to work between 14:30 and 16:00 on the day they have allocated for my study. Makes studying a little inconvenient.

If you look at how much time you spend on the work for the course, it's an extremely low 'hourly wage'. This year, I'm working a 60-hour week (job as a class teacher + studies), it's extremely tiring. I'd have sooner chosen the substitute scheme.

I applied for the substitute scheme and two days off work, but the head teacher gave me the grant scheme. She'd selected the wrong thing, she said, and tried to change it afterwards, but the Norwegian Directorate for Education and Training didn't allow it. (free text response, survey)

Both of the head teachers interviewed viewed the grant scheme more positively than the substitute scheme – which is in line with the strategy's intentions – however, both were also aware of the advantages of the substitute scheme for students.

I do have to see how it will affect the school. I am very appreciative of a grant-based arrangement so that I can still have A (current teacher) here full time. The others are working at 60% and 40% of a full-time position, which means that I have three year-long substitutions. They are classroom teachers, after all; some of them work two days and are then out for two days, etc. Of course it's challenging looking after the children when you're a class teacher pursuing continuing education. Sending that many teachers – and still giving the students what they need – would turn the school upside down. It costs us a bit, so we are happy the teachers get these 30 points. I of course understand from A (current teacher) that it's extremely tough working towards 30 credits on the side; you aren't left with much free time. (School 1, head teacher)

As a head teacher (...) I'm a supporter of the grant scheme, but if I were a student, I would think the substitute scheme was better. The teacher on the grant scheme applied for a reduction in working hours, so she's not working full time. She thought it was pretty demanding working full time as a teacher alongside the course, and I have heard the students say that the programme is demanding. There's a lot to submit and do. (School 2, head teacher)

Thus, both head teachers show an understanding of the challenges linked to studying alongside everyday school work. However, as managers, they also have a responsibility for the school as a whole with regard to staffing, continuity and – not least – the children.

5.9 Students who have considered quitting

In the survey, we asked the students whether they had at any point considered quitting their studies. A full 40 per cent stated that they had. See figure 5.13.

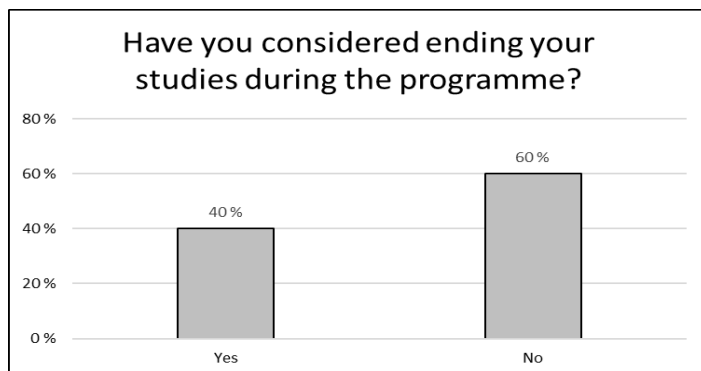


Figure 5.13: The share of students who have considered quitting.

We compared those who had considered quitting with those who had not in order to identify factors that could lead to a lower completion rate. The most substantial difference between the two groups of students was the fact that the former did not find the programme to be as 'practice-oriented' or 'relevant to their teaching practice' as the latter. Of those who had chosen to quit, 35 per cent 'strongly agreed' that the programme was practice-based, whereas almost twice as many of those who had not considered quitting, 66 per cent, strongly agreed with this. In addition, 54 per cent of those who had decided to quit felt that the programme was relevant for their teaching practice, whereas the figure was 81 per cent for those who had not considered quitting. This can be seen in conjunction with the fact that those who did quit were also the most dissatisfied with the information given prior to studying.

In addition, the students who chose to quit felt that the 'programme's deadlines' and 'the programme's workload' were more challenging than those who had not considered quitting. Of those who had considered quitting, 45 per cent and 39 per cent, respectively, felt that these two factors had constituted a 'major challenge'. In comparison, 17 per cent and 19 per cent of the other students, respectively, felt the same way. Again, one can question whether there is a connection between these students' expectations and the information they received concerning workload and deadlines prior to studying.

It was also interesting to see the areas in which the groups of students who had and had not considered quitting *did not* differ from each other: there was no difference between those participating alone and those participating with others. This is slightly surprising. It therefore does not appear to be the case that those participating on their own are more likely to consider quitting. A possible explanation for this would be that those who had participated alone had already quit before responding to the survey. At the same time, dropout rates from the start of the programme up to the time of the survey were so low that they likely had no effect on the results.

In addition, as far as collaboration was concerned, the two groups were in agreement about the benefits of having discussions at school with other programme participants, the programme's set-up for collaboration, the video meetings, the informal chats at the end of video meetings and feedback from

peers. They had the same impression of the platform and all technical solutions, and they evaluated which resources offered the best learning outcomes in the same ways.

5.10 Sense of learning outcomes

In the survey, we asked the students about the type of learning outcomes they had achieved with the different programme resources. The answers are presented in figures 5.14 and 5.15. These show above all that the students were satisfied and believed that they had learnt a lot. At the same time, we can see that different aspects of MatematikkMOOC were evaluated differently. The students themselves stated that they had taken a lot away from the course materials, prescribed texts and from working on assignments and discussing subjects at their own schools. However, there appears to be some room for improvement in terms of supervision, video meetings, peer assessments and web-based academic discussions.

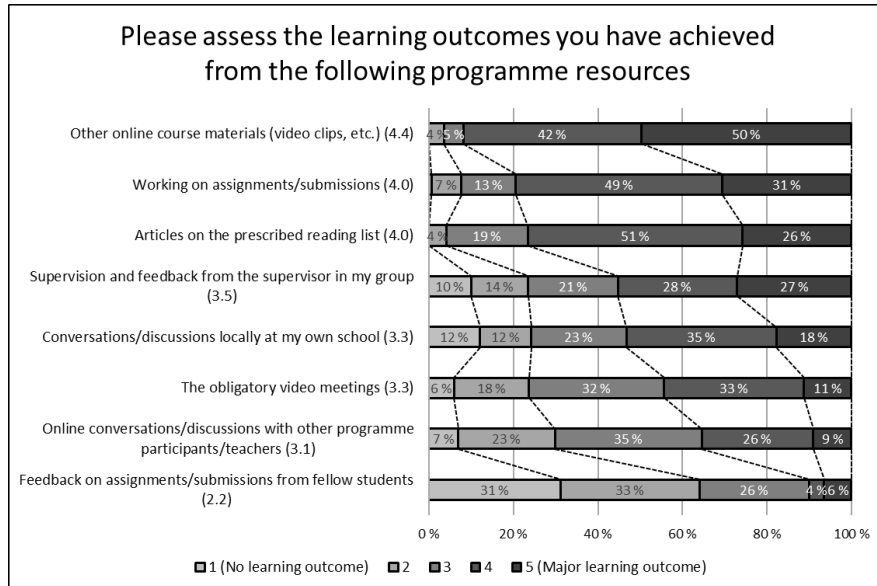


Figure 5.14: Students' evaluation of the learning outcomes from different resources.

Overall, the students were satisfied with what they gained. Figure 5.15 shows that nine out of ten MatematikkMOOC students achieved the learning outcome of 'as expected' or better.

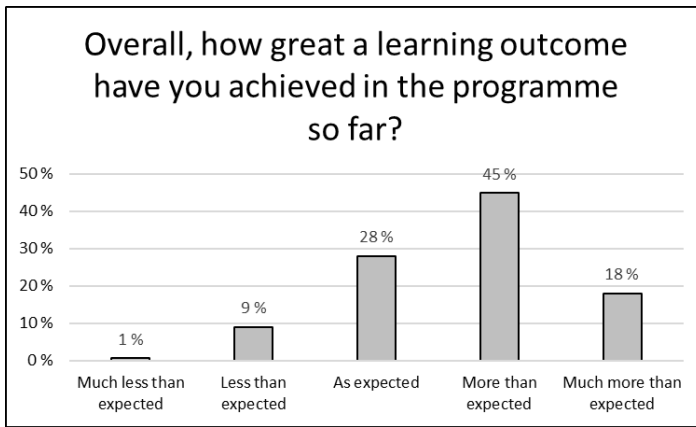


Figure 5.15: The students' evaluation of their overall learning outcomes from the programme.

5.10.1 Student learning outcomes

In our visits to schools with teachers participating in MatematikkMOOC, we interviewed a number of groups of students from different years. The students recounted that their mathematics classes had been taught in new ways, which was 'fun', 'different' and 'interesting'. Based on the students descriptions of what one hour of mathematics used to be versus what they were now experiencing, it was clear that the teachers had implemented teaching plans involving several practical exercise elements that were new to them. It may well be the case that their teachers would have tried new teaching methods regardless of their participation in MatematikkMOOC. However, the testimonies do suggest a change in teaching practice over a short space of time at the schools in question.

5.11 Summary

The content of the MatematikkMOOC provision was positively assessed by many respondents and interviewees. The students felt that the programme was relevant and practice-oriented and believed that they had achieved good learning outcomes. At the same time, we have also demonstrated areas with room for improvement, such as the organisation of the programme, workload, the amount and format of supervision and whether parts of the prescribed reading should continue to be in English. MatematikkMOOC's current format, involving frequent deadlines and a close monitoring of student progress, has worked better for students on the substitute scheme than those on the grant scheme. We have illustrated different aspects of these two funding arrangements, and it appears that the implications of the grant scheme were not sufficiently well communicated; neither the students nor the head teachers appear to have had sufficient knowledge of what this arrangement would involve in terms of practical organisation.

6 Technological solution

6.1 Introduction

MatematikkMOOC is based on the Canvas technological solution. Canvas is a more recent generation of learning platform with a greater degree of transparency than traditional learning platforms in the higher education sector. It is available as a commercial product in an open-source format. MatematikkMOOC uses the open-source version of Canvas. The programme's facilitators have put a lot of work into adapting the open solution to meet the requirements of good ICT pedagogy design in the development of the study provision. At the end of MatematikkMOOC's pilot, the Norwegian Centre for ICT in Education will leave the project. After this, support duties will be taken over by UiT's IT support department.

In this chapter, we shall explore the experience of working with MatematikkMOOC's technological solution and reflections on this by the Norwegian Centre for ICT in Education, the educational institutions and the students.

6.1.1 *The experience of developing the platform*

According to the Norwegian Centre for ICT in Education, there has been a good deal of contact with Canvas through the Instructure company and its representatives in northern Europe. Instructure owns Canvas, and its representatives have conducted training sessions with supervisors on how to use the platform. There have also been a number of meetings with the Canvas developer community, a co-operation described as positive.

In addition, the Norwegian Centre for ICT in Education has explained that in adapting the platform, a few changes have been made to Canvas' basic code. Changes made to the basic code had to be approved by Instructure so that they could be included in future platform updates. The Norwegian Centre for ICT in Education felt that making changes to the basic code without such an approval would have left the platform vulnerable with regard to future maintenance and updates. The technological development work has resulted in a system that they themselves believe to be a user-friendly. Whether the project should have made use of the paid version of Canvas on Instructure's servers has been discussed along the way, but it has been important politically that the provision be open and accessible and that maintenance be simple.

We have heard from the educational institutions that they were not consulted on the choice of platform and that, for a time, they were involved in the technological development work only to a limited extent. Over time, they were brought into the project and assumed a greater role, which they have assessed as important. Their enquiries regarding the platform have gone through the Norwegian Centre for ICT in Education and not directly through Canvas.

6.1.2 The experience of using the platform at the educational institutions

The collaboration between the academic developers at the educational institutions and those who were responsible for technology at the Norwegian Centre for ICT in Education has been evaluated as very good by all parties involved. There have been more technological challenges than expected, and the educational institutions claim that the Norwegian Centre for ICT in Education has offered good technological support.

In the interviews, the supervisors recounted that the use of the platform presented a steep learning curve. Although in August 2015 a joint introductory course was held for all supervisors, this was felt to be very general. A number of questions and problems arose over the course of the programme. After the introductory course, UiT arranged a workshop with the Norwegian Centre for ICT in Education to give its supervisors more concrete training. The Norwegian Centre for ICT in Education also provided support to the supervisors. However, the supervisors stressed that the platform's user interface was not tailored for academic co-ordinators. In particular, supervisors responsible for more than one group felt that they had to put a lot of time into navigating the platform.

The platform generates considerable amounts of user log data. None of the interviewees said that they had used this to monitor student progress. There is probably some potential here. Systematic work with such data could, among other things, help to identify students who are at risk of dropping out. One could probably do more with this in the future. In order to make this happen, adaptations to the panel are needed, with an adapted user interface for supervisors and academic staff. As mentioned, in the current version, this is lacking for supervisors. Should such a panel be developed further, one can see the potential for integrating these possibilities into the platform.

6.1.3 The students' evaluation

For their part, the students were generally happy with the technological solution. Figure 6.1, which is based on the survey, reveals that the vast majority of students felt that the platform worked as intended in terms of technology and navigation and that it was straightforward.

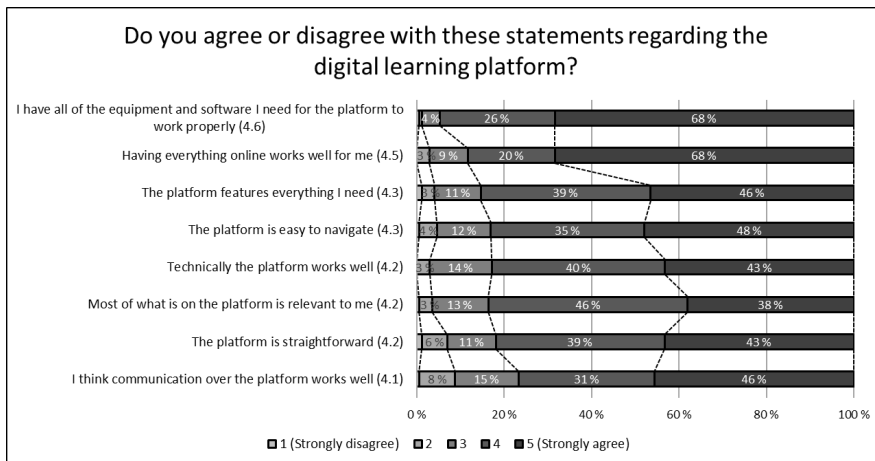


Figure 6.1: The students' evaluation of the learning platform.

At the same time, the interviews revealed that some individual students found it difficult to find their way around the platform, particularly in terms of finding formal information about the programme such as subject descriptions.

One thing that I think is missing is that I can't really find any information anywhere about the programme. When something new happens, it's completely random; and the exam: I can't find information anywhere, what it contains. I've tried looking for it, but it isn't anywhere. It was very much by chance that I signed up for the programme, so I, like, haven't properly gone through its contents. For me, it's all just, 'oops, were we supposed to do that?' Especially in relation to examinations – like I suddenly got an e-mail, and I read that we were supposed to submit a bunch of the same things again, but I hadn't known. I think it's a bit frustrating that there isn't any real overview of the programme's contents. Even just a course description with learning objectives and that? (Respondent 4, School D)

In her master's thesis, Kristoffersen notes that the structure of the platform could also be a reason why students do not go back to the discussions to read new posts. She stresses the fact that in the interviews, a number of people noted that there were no notifications for events occurring on the platform – for example, when fellow students write a post (Kristoffersen, 2016, p. 46). This is not simply a matter of logging into the MatematikkMOOC platform. The students have to go into each individual discussion to check whether new posts have been added. The majority find this very inconvenient and mention the functionality of social media like Facebook where such considerations are taken care of: 'But Facebook, everyone has that on their mobiles and then you get a beep when something comes up and you can reply more or less on the spot'. Many students have therefore set up their own Facebook groups alongside the platform and use these to exchange information and set up meetings, among other things. Using social media as a collaborative tool and communication channel in this way has, over time, become rather widespread among students in higher education settings (see, for example, Norwegian Agency for Digital Learning in Higher Education, 2015; Fosslund, 2015; Tømte and Olsen, 2013).

In the survey, we also asked how students perceived the technological solution in light of the possibility of interaction in the video meetings. Figure 6.2 shows that the students tended to think that this works.

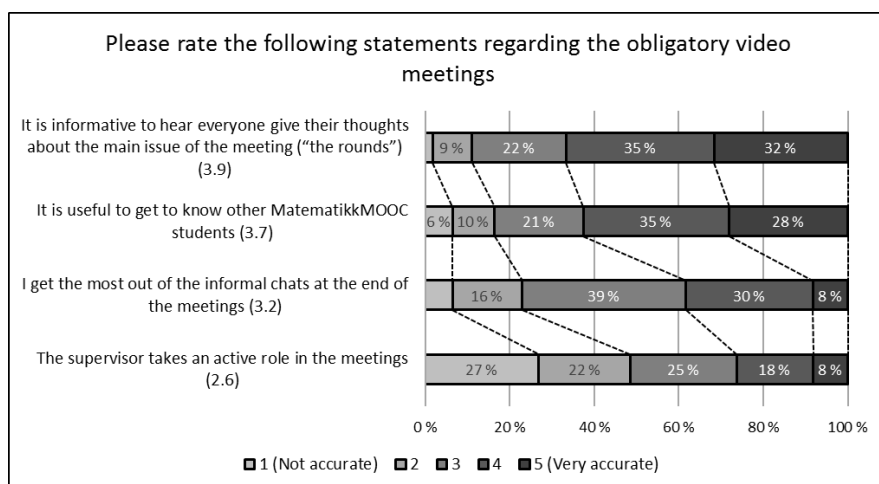


Figure 6.2: The students' evaluation of the video meetings.

6.2 Summary

In general, MatematikkMOOC's technological solution appears to work well. The majority of the students felt that the platform worked, was easy to navigate and, not least, was straightforward. The vast majority of students also stated that they had the necessary technological equipment and software to be able to use the platform and that they were satisfied with such a web-based solution. They did, however, ask for a better user interface for when 'something new happens' on the MatematikkMOOC platform. Although the students received e-mail notifications about new posts, they still had to log into the Canvas platform and then find their way to this. Although Canvas is a more recent generation of learning platform, it appears to have some shortcomings in relation to this type of responsiveness. As a result, students created their own local solutions for this unfulfilled need, most often in the form of their own Facebook groups. A future solution would, if technically possible, benefit from integrating functionality in a way similar to that of Facebook.

Where supervisors are concerned, however, we do see a need for a better user interface that is adapted for the needs of supervisors who are responsible for several groups. One should, where possible, seek to integrate user log data into such an interface so that supervisors can make use of such data to monitor students academically and to pick up on those who might be at risk of dropping out. This can be done in various ways, and it would most likely be possible to draw on other international educational institutions' experience of log data and the analysis of these – such as those of the UK's Open University – and perhaps to receive assistance from SLATE at the University of Bergen.¹⁰

¹⁰SLATE: the Centre for the Science of Learning & Technology. www.slate.uib.no

7 MatematikkMOOC as a model for continuing education

7.1 Introduction

Chapter 7 is split into two parts. We shall first look at how MatematikkMOOC can work as a model for continuing education. In this section, we also make some recommendations for the further development of the provision, founded on the experience gained from the implementation of the provision in 2015-2016. We will then evaluate the different funding models for such a form of continuing education and training from the perspective of both the higher education sector and school owners.

7.2 Evaluation of the MatematikkMOOC format as a model for continuing education

An overall evaluation of all the data suggests that the MatematikkMOOC format works well. This is substantiated by the rate of programme completion in the pilot year. At the same time, this report has revealed areas in which changes might need to be considered. The arguments in favour of such changes relate, in particular, to an understanding of scalability. We see that the existing version of MatematikkMOOC is largely influenced by an understanding of quality that is closely related to that held by campus-based teacher training courses; here, a close monitoring of student progress is key to aiding their development towards becoming good teachers as well as to prevent dropouts. As such, the MatematikkMOOC solution is similar to a number of other web-based teacher training solutions in Norway (see, for example, Tømte and Kårstein, 2013; Tømte, Olsen, and Kårstein, 2013). In the study of didactics, a close monitoring of student progress is crucial to success. The question is, nevertheless, whether one can make further use of the technology to do this. Could one, for example, envisage technological solutions taking on a greater role in the monitoring of student progress, thereby economising on the teaching resources required? We believe that the potential lies in the MatematikkMOOC platform. By adjusting the design in this direction, we could make progress in efforts to improve scalability.

Our study encompasses the management and user levels and is based on several sources of data. The report discussed and shed light on several aspects that are relevant to these two levels. As regards the management level, we examined the interaction between the educational institutions and government agencies involved. With a longer-term perspective than that permitted by our study, it could be interesting to explore the extent to which as well as the ways – if any – in which the pedagogical innovations and multi-party co-operation originating from MatematikkMOOC are further spread at the institutions involved or to other institutions.

Our study offers limited insight into how school owners and head teachers at individual schools have evaluated the opportunities offered by the MatematikkMOOC concept for the continuing education of teachers. It could be interesting to shed light on this in a future study as this would give us insight into how such scalable, web-based provisions can help to enhance skills both within individual schools and between schools at the municipal level.

As regards the user level, we looked at the students' evaluation and use of the MatematikkMOOC provision. The two master's theses linked to this evaluation allowed us to delve into students' interaction patterns. However, neither our evaluation nor the master's theses have shed considerable new light on the interaction between teachers and/or supervisors and students. This is an interesting field of research in which one could probably benefit from looking at international studies. It would also have been interesting to follow up on these students in two to three years' time to explore whether they feel that their teaching practice has changed – whether they feel that they have become better teachers.

Another unexplored field, but which we believe has potential, is how different log data generated by MatematikkMOOC could help shed light on interaction patterns and the use of its different learning resources. A systematic review and analysis of such data could reveal something about the areas of the design and the resources that offer the best learning opportunities. These are possibilities that most likely belong to the future; nevertheless, it might not be a very distant future.

7.2.1 Recommendations

- The pilot project of the MatematikkMOOC continuing education provision was organised as a three-part co-operation between two teacher training departments and one external government, agency-appointed competence centre. We observed the innovative and demanding yet feasible nature of this work.
- As a model, MatematikkMOOC was developed with consideration for its transferability and reuse. Should such a managerial and organisational model be extended and/or spread to other teacher training courses and higher education settings, it is important to bear in mind the inherent complexity of such a model, both in terms of how it is grounded in an institution's management, administration and academic staff and the need for an adequate technological infrastructure and – not least – good procedures and systems for communication and dialogue.
- Given the desire for scalability, we deem the grant scheme to be more favourable from a financial viewpoint and with regard to school capacity. At the same time, in our analyses, we pointed to a number of weaknesses with this arrangement in the existing version of MatematikkMOOC. In order to succeed with the study grant scheme, students will require greater flexibility and predictability with regard to MatematikkMOOC's study programme, for example, through easier access to a calendar overview of coursework deadlines, syllabuses and exams for the entire academic year. Students on the continuing education programme are self-regulated learners and most likely well organised. Such an overview would therefore be highly beneficial to them in planning their work. One could thus also consider reducing the number of obligatory coursework submissions. The scope of the content, programme format and financial aspects of the study grant scheme must be made clearer and be better communicated to school owners, head teachers and potential students. Our findings revealed many misunderstandings and, consequently, much frustration felt by those who have used this arrangement. It would also appear that school administrations do not necessarily have an understanding of how these students should be accommodated. There remains, in all likelihood, some work to be done to communicate how the schools can best do this.
- Based on what we have learnt from closely following students and educational institutions over the course of one academic year, we believe that there are grounds for changing how supervision is organised. There is no doubt that supervision is important. However, the evaluation revealed that in MatematikkMOOC, this function is variously organised. In addition,

the role of supervisor is performed by people with different areas of expertise at the two educational institutions – something that could go some way towards explaining the students' varying perceptions of supervision. A large number of supervisors working only on a part-time basis do contribute to a fragmented understanding of the supervisory task. Organisationally, we therefore recommend reducing the number of supervisors and giving each supervisor responsibility for two or more study groups. This will give them a better understanding of the group dynamics in web-based solutions as well as a broader base on which to identify relevant academic topics and the general challenges faced across groups. Supervisors should also work closely together to develop and maintain a shared understanding of the supervisory role.

- We recommend that video meetings be structured differently. These functioned only partly satisfactorily as an arena for academic discussion. We recommend that smaller groups hold their own video meetings without supervisors so that all participants feel more compelled to contribute to discussions. Academic discussions and reflecting on one's own practice are important in teacher training. In particular, students who are the only MatematikkMOOC participants from their schools should feel the added benefit of such web-based meeting places. With smaller groups, it will probably be easier to agree on a time for video meetings. In addition to having smaller groups with their own video meetings, we recommend holding larger video meetings with a number of groups and supervisors. Each group can send in topics or questions in advance of each meeting for the supervisors to look at. Small group meetings should be held more often than larger ones.
- With the above suggestions for amendment, we believe that it would be possible to use the MatematikkMOOC format in other disciplines. Here, an important point for reflection will be the distinctive characteristics of the subject at hand. While the MatematikkMOOC format has the potential for transferral to other subjects, one can imagine that language subjects, for example, would need more opportunities for communication and co-operation than what we have seen in MatematikkMOOC. Another point of reflection linked to the transferability of the format is whether future provisions should cover a subject or subject *didactics*. Arrangements for monitoring student progress can be organised in different ways based on these two approaches, bearing in mind that MatematikkMOOC is an example of mathematics didactics teaching via the internet.

7.3 Assessment of the funding model, including funding via higher education institutions and the grant/substitute scheme

Universities and university colleges offering continuing education and training finance these provisions in different ways: through tuition fees, external funding such as the Competence for Quality initiative, internal funding and through educational institutions receiving payments for each credit produced. The mapping of the higher education sector's continuing education and training provision conducted in 2015 portrayed a high level of variation in the tuition fees of these continuing education provisions. For 443 provisions, the price was not stated, and the majority of these were within teacher training/pedagogy and health/social fields.¹¹ For 271 of the provisions, tuition fees were required, whereas for the remaining 836 programmes – just over half – there were course fees.¹² The fees varied from just over NOK 1,000 to NOK 370,000, for a master of business and administration in strategic management, which runs over two years. Course fees are most common for programmes in management, economics and administrative fields as well as in some healthcare subjects like nursing. Competition from other educational institutions plays into the setting of the course fee; prices are either lowered, because many

¹¹ For teacher training/pedagogy, this probably relates to the government agency initiative, Competence for Quality.

¹² Tuition fees cover the administrative costs associated with the registration and monitoring of students and can in many cases be likened to what is known as a 'semester fee'. However, course fees are the participants' course costs, which may include different course-related costs such as teaching resources and academic monitoring.

offer similar courses, or are increased because the provision is unique within the market (Tømte et al., 2015).

Figures from the Database for Statistics on Higher Education (DBH) show some variation between educational institutions with regard to the proportion of provisions that they themselves fund and those that are externally funded either fully or in part.¹³ Some of the state university colleges, such as Bergen University College, Buskerud and Vestfold University College¹⁴ and Oslo and Akershus University College, have a relatively high share of provisions that are externally funded either fully or in part. At the other end of the spectrum, we find the Norwegian Police University College, for example, where 22 of 24 provisions are internally funded, and BI Norwegian Business School and NLA University College, which state that all of their provisions are internally funded. At 26 of the educational institutions, fully internally funded provisions constituted over 50 per cent of their portfolios, whereas 13 of the institutions had more study provisions that were externally funded either fully or in part than self-funded ones. What is common to the latter is that they are all larger universities and university colleges. If we look at UiT and HiST¹⁵, figures from DBH show that UiT had a relatively large number of continuing education and training provisions (55), with a rather even spread of external and internal funding. For its part, HiST had fewer provisions, 30, the vast majority of which with internal funding (Tømte et al., 2015).

7.3.1 What does it cost for educational institutions to develop and run continuing education and training in teacher training?

MatematikkMOOC forms part of the Competence for Quality initiative, the government's major focus on continuing education and training for teachers. In the aforementioned mapping of continuing education and training provisions, we found that 24 of a total of 49 educational institutions had continuing education provisions funded through this scheme. Educational institutions normally compete for funding for continuing education and training through this programme, and they put considerable amounts of resources into the application process. It is most common for it to be the academic communities themselves that take the initiative to develop new continuing education and training provisions, followed by the educational institutions' administrative teams, whereas public sector bodies such as the Norwegian Directorate for Education and Training and the municipalities and county authorities are key external drivers in the development of new provisions. The creation of MatematikkMOOC represents another way of establishing new continuing education and training provisions. The initiative was the product of government agencies, and these government agencies have, to a large extent, driven the development of the provision – in close collaboration with local academic communities and the management and administrative teams at NTNU and UiT. By developing a new provision, the educational institutions involved in MatematikkMOOC have avoided entering into a situation characterised by competition. They have been in a relatively unique position as they have had close monitoring and have earmarked resources in order to develop a provision that departs from traditional continuing education and training provisions, both in terms of the technological solution and format. Through the interviews, we heard that the educational institutions believed that they put considerable amounts of their own resources into putting the provision in place and running it. As shown above, educational institutions often use their own resources to develop new continuing education and training provisions. The Norwegian Centre for ICT in Education informed us that UiT and NTNU received financial support that corresponded with two full-time positions between September 2014 and July 2015, inclusive. In addition, they committed to contributing 25 per cent of what had been funded over their own budget.

We know from previous studies of web-based teaching that it is at least as resource-intensive to develop content, drive skills enhancement relating to online teaching and, not least, develop design and user interfaces tailored to an online format as it is to run campus teaching (Fossland, 2015; Tømte and Kårstein, 2013). The earning opportunities can, over time, lie in achieving scalability with the

¹³ For a full overview, see Tømte et al. (2015:28-29).

¹⁴ Post-merger: University College of Southeast Norway.

¹⁵ This refers to HiST as the figures were collected before HiST merged with NTNU, i.e. in the spring of 2015.

participation of more students. With a good design, as that described earlier in this chapter, we would be able to economise on teaching resources. Nevertheless, it is worth bearing in mind the limitations of scalability with regard to the continuing education and training of teachers in Norway. Such limitations lie in the number of teachers who will be eligible for continuing education and training in different disciplines. For example, if one were to develop a provision that hit the mark for Spanish teachers at a lower secondary level, there would be little benefit to it being scalable from 100 up to 1,000 students as there are not as many as 1,000 Spanish teachers at the upper primary level in Norway. It is only for the major subjects, such as mathematics and Norwegian, that there is any real purpose in developing a provision that is scalable up to several hundreds of participants. Even for these subjects, the courses must have a broad range where year groups are concerned.

7.3.2 Funding models for MatematikkMOOC

If one is to evaluate whether MatematikkMOOC should continue to be funded via the Competence for Quality model or through other funding models, several points must be considered.

The advantage of the Competence for Quality model is that it is well known among teacher training courses and Norwegian schools more generally. From the previous mapping of teachers in continuing education and training, it emerged, for example, that only 11 per cent of survey participants had taken subjects that were not covered by the Competence for Quality initiative (Gjerustad and Salvanes, 2015). Compared with 2014, in 2015, there was an overall increase in the proportion of participants in this initiative who were pursuing continuing education in mathematics, arithmetic as a basic skill or the sciences (61 per cent as opposed to 24 per cent in 2014). We currently do not have any figures relating to how this looks for the 2015-2016 year, but there is reason to assume a relatively similar picture. As such, for the 2015-2016 school year, MatematikkMOOC was competing with a number of other apparently similar continuing education and training provisions, despite the fact that the majority of these were most likely session-based (see Tømte et al., 2015). The educational institutions involved in MatematikkMOOC consider online studies to be more at risk of dropout: 'There is a risk, as dropout rates will probably be higher in an online programme than in campus-based study. The institutions are taking a risk relating to student dropouts' (respondent, educational institution). For traditional MOOCs, this is a real risk, but for online studies where student progress is closely monitored by the educational institution, the risk is not necessarily as high (Tømte and Kårstein, 2013).

Other possible funding models are course fees, tuition fees or funding via study points produced. Both course and tuition fees imply that (parts of) the cost of running the study provision fall on the participants or their employers. With such arrangements, the educational institutions do not receive payments for study credits offered. As previously mentioned, in Norway, it is a widespread practice for the employer to pay for employee's skills development. The extent to which schools or school owners are willing or able to contribute financially and pay for employees to have access to continuing education and training is uncertain, although school owners do have a formal responsibility for their teachers' skills enhancement. Such an approach would, in addition, break with one of the main principles of the MOOC – openness and unhindered access. The majority of MOOC provisions developed in Norway are a result of additional resources being earmarked for the development of such provisions, and they are open in the sense that the students only pay semester fees to the educational institution providing the MOOC. In the case of funding continuing education and training through credits offered, educational institutions are given compensation from the government per study credit offered. Educational institutions consider alternative teaching formats such as MOOCs to be relatively risky and are uncertain about the sustainability of MOOC provisions given that there are generally – in Norway as well as internationally – higher dropout rates among MOOC students. As shown, MatematikkMOOC's very low dropout rate is an exception. Over time, as MatematikkMOOC has found a format that can be justified from the standpoint of scalability and pedagogy, and given its stable, high completion rate, educational institutions might consider a study credit-based funding scheme instead of the Competence for Quality model. Such a consideration should then be seen in light of the fact that the existing Competence for Quality scheme is not only the most widespread model for the continuing education of teachers but also recognised by schools in Norway more generally.

7.3.3 Different views on the Competence for Quality model

Our interviews with the Norwegian Directorate for Education and Training revealed that there are some tensions in the Competence for Quality scheme regarding whether continuing education and training should happen locally, regionally or nationally. At the school owner level, led by the Norwegian Association of Local and Regional Authorities, there is scepticism towards a model that brings in participants on a national level. The Norwegian Directorate for Education and Training has been focused on finding different solutions locally and regionally. Some school owners prefer regional sessions. The Norwegian Directorate for Education and Training considers MOOC solutions to be one of a number of options. In some places, school owners pool together and set up session-based continuing education and training provisions at local educational institutions. Teachers apply for specific study provisions and specific funding schemes, after which school owners approve and prioritise. The approval rate is fairly high in mathematics. According to the Norwegian Directorate for Education and Training, there have been no strikingly low approval rates for MOOC provisions.

Some provisions may be narrow and specialised and, for that reason, may be difficult to offer within individual counties or regions. In such cases, national solutions may be a good option in ensuring that there is a sufficiently broad recruitment and funding base. School owners have otherwise faced difficulty regarding continuing education provisions organised as sessions, even where these have online support. Such provisions are paid and offer teachers and schools little flexibility. Teachers must in such cases be removed from the classroom to take part in sessions, which incurs costs if schools need to bring in a substitute, in addition to any travel costs. Web-based provisions that do not involve offline sessions – such as MatematikkMOOC – can be provided to more teachers who can participate from home or from their own school. Thus, there are savings to be made in both time and money when provisions are not location-dependent.

The grant model offers teachers financial remuneration for the purpose of study. This does not give the same reduction in teaching hours as the substitute scheme (see Chapter 5.8), but it does mean that teachers can combine their continuing education with a full-time job and gain greater flexibility. We have seen an increase in the number of teachers using the grant scheme as a funding model, but this model is still new. Consequently, we do not yet know enough about its workability, and this evaluation of the MatematikkMOOC continuing education provision has given more insight into this.

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