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Norwegian teachers' perspectives on inclusive practices in the mathematics classroom

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ABSTRACT

In this paper, we explore Norwegian teachers' perspectives on inclusive teaching practices in the mathematics classroom, defined as practices which maximise every pupil's potential regardless of prior attainment. As previous research suggests, both mathematics teachers' perspectives in general and the conceptualisation of inclusion, inclusive education, and inclusive practices are culturally situated, varying significantly across countries and educational systems. We draw on data from a large project in Norway focusing on the use of grouping by attainment and its relation to policy and pedagogical practices around inclusion in mathematics. Participants were 13 primary and lower-secondary mathematics teachers from six schools in the Oslo area. Analysis of semi-structured interviews focusing on strategies for inclusion of all pupils in mathematics classrooms reveals the cultural particularities of mathematics teachers' perspectives on inclusive practices, highlighting the value of similar investigations in other cultural contexts.

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Introduction

Despite the popular usage of the terms *inclusion*, *inclusive education* and *inclusive practices*, meanings attributed to these concepts appear to differ across educational systems (Florian 2014). In fact, the widespread acceptance of inclusive education as a research field and policy imperative might well prove to be a major obstacle in defining associated terms, leading to complex, contradictory, and confusing interpretations (Slee 2019). As a result, the day-to-day professional lives of teachers and school leaders become particularly challenging when they attempt to create inclusive schools and classrooms (Lindner and Schwab 2020), and even more so in the contested area of inclusive mathematics teaching, where achievement levels and how to maximise them for all pupils are frequently the object of political comparisons and policy initiatives (Swanson, Yu, and Mouroutsou 2017). This paper draws on a project conducted in Norway, a country in

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which discussion about creating a *school for all* had taken place long before the commonly known 1994 Salamanca Statement (Fasting 2013; Nes, Demo, and Ianes 2018). With the aim of contributing to international dialogues on what inclusive practices might mean in different contexts, we first discuss the cultural location of mathematics teachers' perspectives and the variability of accounts of the meaning of inclusion in mathematics teaching and learning. We situate these issues in the Norwegian educational context, followed by a presentation of our methodology, the main findings, and our discussion.

The cultural location of mathematics teachers' perspectives

The academic field of mathematics is widely perceived as acultural/pancultural, despite research in ethnomathematics arguing for the opposite (e.g. d'Ambrósio 2006). Such conceptions have, consequently, generated similar assumptions about school mathematics (Jaworski and Phillips 1999). Simply put, it is not atypical for many people to perceive mathematics as the school subject least influenced by cultural matters. Nevertheless, comparative mathematics education research contradicts such misconceptions. Specifically, regarding mathematics teachers and teaching, several studies have concluded that pre- and in-service teachers' beliefs, knowledge, and practices are culturally located and socially situated (Andrews 2009; Horn and Garner 2022; Xenofontos 2018). In other words, there are more similarities between teachers within specific cultural contexts, educational systems, and countries than across them. In this paper we use the term *perspectives* to refer to a combined understanding of both teachers' beliefs and narratives (Xenofontos 2019). Beliefs can be defined as 'the incontrovertible personal 'truths' held by everyone, deriving from experience or from fantasy, having a strong affective and evaluative component' (da Ponte 1994, 199). Narratives capture teachers' professional stories (Kaasila 2007), and may provide information on their knowledge, thinking, and practice.

Inclusive practice in mathematics education as a contested area

Agreeing on what constitutes inclusive practice in mathematics teaching and learning is not straightforward: a review of the literature reveals a wide range of interpretations, representations, and manifestations. For instance, Hagman's (2021, 78) discussion of access in tertiary education defines inclusive mathematics practices very broadly as 'actions that support the full participation of a diverse pupil population within the classroom community and within the broader departmental and institutional communities'. In turn, Prediger and Buró (2024, 125) seek to understand such practices in terms of the 'recurrent ways by which teachers work with pupils with diverse [ability] profiles', focusing on how teachers work with diversity in pupils' pre-knowledge, metacognitive regulation, selective attention, and working memory. Picking up on the concept of ability, Ollerton (2009, 5) focuses on equality of opportunity, arguing that inclusion

pertains to what a school, a mathematics department, or an individual teacher seeks to do in order to provide the learners with their entitlement to the statutory national curriculum for mathematics. This entitlement is, or should be, made accessible to all pupils irrespective of notions of so-called 'ability', or socioeconomic background

As Ollerton's comment hints, part of the problem lies in the dominance of social constructions of ability in interpretations of inclusion, making the development of equitable practices not only challenging and complex but also fundamentally hindered by conceptions of mathematics as hierarchical and purely intellectual and hence excluding of those who 'lack ability' (Swanson, Yu, and Mouroutsou 2017). Indeed, a recent article reviewing 76 studies in the area (Roos 2019) concludes that inclusion is typically used either to describe ideological dispositions (along with other related terms like equity and social justice) or a way of teaching (typically concerned with interventions for mathematical engagement, for maximising opportunities in mathematics for all children, and valuing diversity in pupil contributions). As Roos (2019) points out, the two uses of the term are often treated independently of each other, possibly because, as Swanson, Yu, and Mouroutsou (2017) also argue, there is a need for discussion which brings societal and classroom level visions together (see also Holmedal 2023). In this paper we aim to contribute to the discussion by straddling both perspectives: we analyse classroom practices/strategies reported by mathematics teachers in their attempts to create learning environments which enable all pupils to engage and progress against the background of Norwegian ideological interpretations of educational inclusion which permeate both policy and practice.

The Norwegian context of 'school for all'

In Norway, the principle of *a school for all* was established more than 100 years ago (Bjørnsrud 1999), long before the 1994 Salamanca declaration. This principle of the unitary school is evident in the Norwegian core curriculum (Ministry of Education and Research 2017), which emphasises broad inclusion in terms of equality of opportunity and the value of diversity, belonging and education for participation in a democratic society (Faldet, Knudsmoen, and Nes 2022). In addition to a long-standing concern with the promotion of an inclusive and participatory community, the curriculum also prioritises development of 'the all-round person', emphasising the value of 'experience and practical challenges' and a 'broad range of activities', both individually and in interaction with others (p.11). It advocates an 'inclusive environment that promotes health, well-being and learning for all' (18). A key related concept in the current curriculum is that of *Tilpasset opplæring* (TPO), frequently translated as 'adapted education' (Bjørnsrud and Nilsen 2021; Strømstad, Nes, and Skogen 2004) or as 'differentiated instruction' in the official Ministry translation. This concept recognises that '[i]n spite of their personal efforts and use of learning strategies some pupils will have learning challenges' (Ministry of Education and Research 2017, 14), while 'pupils come to school with different experiences, prior knowledge, attitudes and needs' (19). Addressing these differences through variations and adaptations in teaching is a matter for teachers' professional judgement; TPO is a core principle of school practice, and is a central focus for school leaders rather than the vaguer idea of inclusion (Knudsmoen, Mausethagen, and Dalland 2022; Mausethagen, Knudsmoen, and Dalland 2022).

However, the nature of TPO is itself open to interpretation. Writing in 2009, Jenssen and Lillejord (2009) identified shifts in the meaning of TPO which had already taken place since its inception in 1975, moving from its original emphasis on integration and acceptance of difference, to individualisation and personalisation focusing on individual pupil rights, to a focus on teaching quality and teacher competence. More recently, Holmedal (2023) comments on an increasing interpretation of TPO as means of

classifying pupils in terms of levels and targets within Norway's increasingly performative culture (see also Gray et al. 2024). The curriculum leaves the demands of managing the tension between nurturing diversity and including the individual to teachers' professional judgement and values (10), and it is not clear how teachers should use diversity 'as a resource' (18). Consequently, teachers experience tensions between consideration for pupils' individual rights emphasised in the Education Act versus the collective learning environment (e.g. Bjørnsrud and Nilsen 2021; Faldet, Knudsmoen, and Nes 2022; Mausethagen, Knudsmoen, and Dalland 2022). Such tensions are exacerbated by a new emphasis on testing alongside that of teacher quality – New Public Management-driven accountability is now part of the Norwegian system (Solhaug 2011), leading Fasting (2013, 273) to suggest that 'the principle [of inclusion] seems to have partly vanished in the name of providing efficient education'. In the context of mathematics education, these tensions are frequently experienced as a dilemma between mixed and grouped attainment classes, where teachers' concern to avoid the stigma of grouping in the interest of pupil wellbeing and self-esteem conflicts with a strong political push towards grouping by attainment in order to maximise the performance of high achievers (Eriksen et al. 2022; Holmedal 2023; National Centre for Science Education 2015).

Given the importance of cultural context noted above, and the particular tensions evident in Norwegian education policy and values, we explore the following research questions: *What perspectives on inclusive classroom practices are held by Norwegian primary and lower-secondary mathematics teachers? What conflicts/dilemmas do they report, and how do they deal with them?*

Methodology

This paper draws on data from a wider project in Norway (Norwegian Research Council 2019) which focuses primarily on how inclusion and adapted education (TPO) are conceptualised, operationalised, and enacted at different educational sites (local authorities, schools, mathematics classrooms). Relevant to this paper is a particular focus in the project on the introduction of attainment grouping as a means of delivering TPO in a clear departure from Norwegian norms (and law) which prioritise teaching in comprehensive classrooms (see Eriksen et al. 2022; Holmedal 2023). Here we focus on interviews with primary and lower-secondary teachers of mathematics in which we explored their perspectives on giving all pupils opportunities to succeed and be challenged in mathematics. The methodology can be described as a *collective case study* involving 'more than one case, which may or may not be physically collocated with other cases' (Goddard 2010, 164).

Participants and data collection

Participants were 13 teachers working in 2 primary (grades 1–7, ages 6–13) and 4 lower secondary (grades 8–10, ages 13–16) schools in and around Oslo. A number of teachers were recruited to the larger project study at the end of 2019, with the aim of including a variety of school types in terms of demographics (catchment area levels of affluence, rural versus city, ethnic mix), size, national test performance and grouping practices. Schools in Norway recruit pupils from their local areas and consequently differ according to

population trends in those areas; for instance, schools in the east side of the city draw on a greater proportion of minority ethnic and lower socio-economic status families than those on the west side. We studied details of Oslo schools on the Oslo Municipality website (<https://www.oslo.kommune.no/skole-og-utdanning/#gref>) and approached schools of different types and their teachers in a variety of locations across the wider municipality. Since most members of the larger research team were teacher educators, some teachers were recruited on the basis of prior connections. In other cases, school leaders were contacted by the research team and invited to nominate teachers. Teachers ranged from >1 to 30 years' experience and – apart from Eirik (see below), who was interviewed by a former tutor on his master's programme – did not know their interviewers. We followed ethical procedures of the Norwegian National Committees for Research Ethics (2016) and approved by the Norwegian Centre for Research Data (NSD). The Covid-19 pandemic and subsequent school closures meant that the final dataset was incomplete, however, and the final group of schools included a range as follows: (schools and teachers are anonymised): Ask School (primary, high socio-economic status and test profile) with Anita and Arne; Edel School (lower secondary, mid-range socio-economic status and test profile) with Eirik; Fredly School (primary, inner city, lower socio-economic status, high number of children with Norwegian as a second language) with Fred and Fride; Nure School (lower secondary, rural, lower socio-economic status and test profile) with Nils, Nina, and Noah; Rogn School (lower secondary, high socio-economic status and test profile) with Reidar and Rune; and Syrin School (lower secondary, very high socio-economic status and test profile) with Samuel, Sara, and Sindre. Grouping practices varied, including 'nurture groups' for struggling pupils (Fredly, Edel, Nure), 'special interest groups' for those to need more challenge (Ask, Fredly) or accelerated progression (Ask). Edel and Rogn regularly split classes to increase the teacher-pupil ratio, while Ask, Nure, Rogn and Syrin occasionally split according to pupil choice of topic, difficulty or type of mathematics.

This paper is based on semi-structured interviews with the teachers before any observations of their teaching. Eleven participated in individual interviews, while the two teachers at Fredly School (Fred and Fride), who co-teach, were interviewed jointly. Each interview lasted 30–60 minutes, and teachers were invited to share perspectives on (a) how they understood and addressed inclusion and adapted education; (b) how they typically conducted mathematics lessons; (c) how pupils were organised/worked in their mathematics classrooms and why; and (d) what challenges and dilemmas arose in their efforts to include all pupils and how they addressed these. Since the interviews were semi-structured and the goal was to cover these general topics and follow up on what teachers offered, not all interview questions were asked in the same way or order. The interviews were transcribed in full in the original Norwegian, and subsequently translated into English by the team, who include both native Norwegian and native English speakers; extensive discussion among the team aimed to capture sense in plausible English rather than literal translation.

Analysis

Since our focus is on teachers' perspectives on inclusive mathematics teaching, we employed Molbaek's (2018) four dimensions (framing, relational, didactic,

organisational) of inclusive teaching strategies in order to analyse their responses. This framework enabled us to capture not just teachers' in-class understandings, aims and strategies in adapting their practice to meet all pupils' needs, but also their accounts of the wider school culture and organisation for inclusion, and their related values. The framing dimension refers to rules and routines of classroom management and the need for clarity and flexibility in learning practices in order to meet the needs of all pupils. It therefore includes how teachers respond to interruptions and non-compliance. The relational dimension concerns teachers' understandings of normal learning and development and how they communicate to and about their pupils. This includes support for pupils' academic and social participation and management of the balance between individual and community. It also relates to teachers' communication with pupils and other members of staff within the school culture, and the development of democratic and dialogic classrooms. The didactic dimension relates to teacher knowledge, skills and strategies in adapting their practice to support individual pupils' learning and development. It includes modes of feedback and assessment and the ways in which pupils are party to discussion about their own learning. Finally, inclusive teaching is underpinned by the organisational dimension, that is, a school's norms and values and the extent to which these are discussed and integrated into teachers' professional practice. It includes issues of ownership over the work of schooling, and the extent to which those working in the school are able to discuss contradictions and find common ground.

To apply these dimensions, we subjected the transcribed interviews to a thematic analysis, based on the ideas of coding and categorisation (Kvale and Brinkmann 2009), as well as the constant comparison process outlined by Strauss and Corbin (1998). Table 1 illustrates an example of how data excerpts were coded, and how codes were clustered to form categories (sub-themes), under Molbaek's (2018) organisational dimension. We repeated this process for all four dimensions (serving as our main themes).

To strengthen the trustworthiness of this process, we shared emerging categories with Norwegian colleagues in academia and school teachers, who acted as critical friends (Baskerville and Goldblatt 2009) and provided useful feedback.

Findings

We begin this section with analysis of the organisational dimension since this frames the rest of the data. As noted above, Norwegian education policy generates tensions for teachers between humanist values of comprehensive schooling and new pressures of accountability via test results. These tensions are most visible in their discussion of the use of grouping by attainment/interest both inside and outside the classroom and the general problems they face in supporting all pupils' needs and well-being. They also relate to the nature and content of mathematics itself, as the teachers strive to make the subject part of everyday life, and their concern to enable all pupils to engage fully with it.

The organisational dimension – school cultures and discussion about inclusion

Removing pupils from the mainstream classroom

Many teachers are very concerned about pressure to perform and its impact on inclusion, drawing on the 'whole-person' concern of the curriculum and its emphasis on

Table 1. An example of attributing codes to data excerpts, leading to the creation of sub-themes under Molbaek's organisational dimension.

From open to axial coding – from codes to themes			
Teacher excerpt/quote	Code	Sub-theme	Theme (Molbaek's dimension)
<p>Fride: [talking about the special interest group]: 'lots of activities around functional thinking, and how to make generalisations by examining numbers and patterns'</p> <p>Anita: 'I have at least two pupils who are super curious in mathematics. And then I have a couple more who are very good at following up on what they are taught'</p>	After-school group for those with 'special interest'; teaching for high attainers	Removing pupils from the mainstream classroom in order to accommodate different needs in order to provide adapted education	The organisational dimension – school cultures and discussion about inclusion; how challenges are met
Reidar: 'I work on either preparing them for participation in the next lesson (...) or we work with something completely different, if what's going on in the class is very advanced'	Out-of-class grouping of 'weak' pupils; 'nurture' groups		
Reidar [talking about taking students out during class]: 'As teachers, we should not just care about the academic development of our pupils, but also about their emotional well-being. Some children are traumatised from past experiences when they were forced to attend specific classes'	Up to pupils to decide whether they want to join; prioritising emotional well-being with relation to grouping	Giving pupils the autonomy to make decisions as part of promoting emotional well-being in academic life	
Samuel [talking about choosing tasks]: 'Pupils can choose the level of the task they want (...) Everyone should have the opportunity to challenge themselves (...) I want pupils to feel comfortable to choose whatever they want'	Prioritising choice in order to avoid academic pressure; promoting self-challenge and reflection		
Sindre [on homework]: 'they need to make decisions. What is the best for each individual? What do I need to practice? Am I ready to move on?'			
Fride: 'We always talk afterwards, giving tips and feedback. We are lucky to have each other. I get lots of inspiration from Fred'.	Discussions with colleagues about practice	The importance of discussion with colleagues and participation in school decisions	
Eirik [talking about arguing with school leaders about attainment grouping]: 'I told them what I think, and have said that it's nearly abuse'	Challenging leadership about school-level decisions		

community. Fred's (Fredly school) usual approach to teaching is to encourage collective work in his classroom and he is supported in this by Fride as they work together as lead teacher and assistant to support all the pupils in the class, but he notes the tension between his emphasis on a learning community and the need to get pupils through tests 'Even if you are [...] anti testing regime [...], you have all these computational skills, they will be measured, parents will be informed ...'. Even though most teachers hold strong beliefs in support of mixed-ability teaching in the mainstream classroom which are embedded in the Norwegian unitary school tradition, almost every participant shares stories of the difficulties of meeting the needs of all pupils. Typical is Sara, at Syrin School, who feels that she doesn't always manage to ensure that the 'weakest pupils' are included and able to contribute in her classes. Most of the teachers conclude that these pupils' needs are best addressed outside the mainstream classroom in 'nurture groups'. Fred emphasises his ideal of teaching all pupils collectively, but nevertheless runs two nurture groups as part of the regular timetable with Fride, focusing on mathematical language (many Fredly pupils do not have Norwegian as a first language) and greater use of representations. At Nure School, Nina, Nils and Noah reject attainment grouping but experiment with nurture groups in order to increase pupil grades by building motivation, which they see as the major problem for their pupils. At Rogn, Reidar explains his role as a support teacher, sometimes working with individual pupils in the classroom, and other times taking a small group out to 'work on either preparing them for participation in the next lesson (...) or we work with something completely different, if what's going on in the class is very advanced'. Many teachers are concerned about the other end of the attainment spectrum. Anita at Ask School explains that some pupils are selected for accelerated learning classes at their local lower secondary school but the school also runs a 'special interest' group: 'I have at least two pupils who are super curious in mathematics. And then I have a couple more who are very good at following up on what they are taught'. These pupils attend 'this extra group which is offered for those who have special interests' in mathematics. At Fredly School, there is also an after-school mixed grade group run by Fred for those with special interests, described by Fride as 'lots of activities around functional thinking, and how to make generalisations by examining numbers and patterns' and by Fred as 'very dialogical'. In line with his beliefs about learning communities, it is important to Fred that all pupils have a chance to participate in this group, and membership is limited to just one semester. Furthermore, he claims, participation is not just for high achievers: pupils with behaviour problems can also join and benefit. Sara describes a more formal system at Syrin School which offers after-school sessions for grade 10 pupils in their final semester (which includes national-level tests) with different levels of challenge.

Giving pupils the autonomy to make decisions

For many teachers, giving pupils the autonomy to make decisions regarding organisation of their own learning is important, and to some degree this appears to resolve some of their conflicts over how to organise for inclusion. Several teachers reported that pupils had choices about attending 'special interest groups'. At Nure, Nina says that pupils have a choice about whether or not to join her nurture group: 'I don't pressure anyone. They won't come if they don't want to. But I try to encourage them to attend ...'. Likewise, Fred talks about a pupil who wanted to attend his special interest class

but who later ‘withdrew, because he was not interested in how the class was structured. The activities were very dialogical and collaborative, and he preferred working on his own’. At Rogn School, Reidar argues that pupil autonomy is important because ‘[a]s teachers, we should not just care about the academic development of our pupils, but also about their emotional well-being. Some children are traumatised from past experiences when they were forced to attend specific classes’.

Such autonomy also extends to classroom level at Syrin School, where pupils self-select for the grade 10 after-school groups, choosing the level of challenge they want to work on. Samuel describes how, within the regular classes, pupils ‘can choose the level of the task they want (...) Everyone should have the opportunity to challenge themselves (...) I want pupils to feel comfortable to choose whatever they want, it’s ok to choose Task 1, it’s ok to choose Task 2 (...) They should be able to take initiative about their own learning’. Likewise, Sindre explains that pupils can choose which tasks to do for homework: ‘they need to make decisions. What is the best for each individual? What do I need to practice? Am I ready to move on?’

The importance of discussion with colleagues and participation in school decisions

The large amount of discussion and commentary that the teachers report about what is inclusive practice in mathematics is striking. Frida explains how she and Fred discuss their teaching: ‘we always talk afterwards, giving tips and feedback. We are lucky to have each other. I get lots of inspiration from Fred’. Discussion extends to confrontation with school leaders sometimes. Eirik, at Edel School, relates how he cited research evidence to push back against his school principal’s suggestion that the school grouped by attainment (‘I told them what I think, and have said that it’s nearly abuse’), and Nils at Nure School similarly tells how the teachers demonstrated to their school leaders that their attainment grouping policy would not improve mathematics teaching. Anita at Ask is critical of the school’s use of acceleration as self-promotion because ‘I don’t quite believe in it’. However, while tensions clearly exist within schools and for teachers themselves about how to organise for inclusion, we see that teachers have some degree of autonomy and that there are opportunities for discussion of these contradictions.

The relational dimension – communicating in a collaborative context

Avoiding labels – mixed attainment pairing/grouping

Following on from their concerns about grouping and the importance of pupil well-being, most of the teachers expressed discomfort with using labels such as *strong* or *weak* to describe their pupils, preferring to avoid references to ability. Anita, for example, argues that ‘I don’t think there is anything special’ about pupils who do well in mathematics; ‘they are quite ordinary people, but maybe they are more interested in the subject’. From this perspective, Arne talks about a girl in his classroom who ‘is very curious (...) and has built a wider conceptual apparatus than the rest of the children’. Likewise, Nina comments on how she ‘doesn’t like the word *weak*. It’s not about being weak, it’s about facing challenges’. This stance is closely associated with their overall favouring of mixed-ability pairing or grouping of children, often on the grounds of care for pupils’ self-image. Eirik, for instance, holds strong opinions

against attainment grouping, calling it ‘a form of abuse, both for teachers and pupils’. Similarly, Rune explains how it can harm pupils’ motivation and self-esteem, whereas in a mixed group ‘they don’t think *okay*, now I am in the bad group (...) Think about it. Children create narratives about who they are as mathematics learners, *this is who I am in mathematics*’.

To make sure everyone gets to collaborate with everyone, Samuel sets ‘learning partners’ who are ‘randomly set. We run a rotation in class every other week. Children sit with a new partner. I don’t set the pairs by level’. He explains that this decision is ‘conscious because if those who face challenges sit next to each other all the time, then they won’t always be able to lift themselves. And, those who have a special interest in mathematics benefit by helping those who face challenges’.

The importance of communication in the mathematics classroom

Many of the teachers emphasise the importance of pupil talk, arguing that all pupils should be given the time and space to talk to each other and with the whole class, to communicate their thoughts and ideas, and explain their thinking processes. Anita’s reasoning is typical:

I’m less interested in throwing out questions that pupils will then answer one by one. Everyone must have the opportunity to talk together, get some time to think, and use their language on it.

Noah emphasises the teacher’s role in building on pupil conversations:

When pupils have conversations in the mathematics classroom, then the teacher can build on these: *What made you think this? Why did you do this?* It’s easier to get them to think mathematically when they work with each other (...) They feel more comfortable explaining their thoughts to each other.

Sara explains further how she uses low threshold tasks which all pupils can participate in, and find different solution strategies:

I regularly use tasks pupils need to solve with a learning partner, tasks that everyone can help solve (...) Everyone is encouraged to find a different way to solve. Then they can talk to each other to explain their thinking. There is so much to gain by working in groups and talking to each other.

These comments underline many teachers’ deeply embedded values in favour of collaborative learning which benefits all pupils, in spite of the difficulties that they report in meeting every pupil’s needs.

Framing – clarity of purpose in the classroom

Relevance and motivation

A central debate in school mathematics concerns its use-value versus its exchange value (Williams 2012), and the tension between teaching mathematics for life versus mathematics for progression through the educational system. Resonating with the values of the core curriculum, teachers argued that mathematics should be ‘put in context, the sort of everyday context, real life situations where it can be used’ (Sindre), and for this reason teachers should, ‘whenever it is possible, connect mathematics to real, concrete

situations' (Anita). Eirik argues that mathematics can be found in 'every single profession in society. My goal is not for every pupil to become a mathematician. But they need to understand that, whatever profession they choose in the future, mathematics should not be a hindrance or a limitation to them'. He goes on to give an example of mathematics and hairdressing: 'The other day, I was having this conversation with a hairdresser. When they mix bleach and dye, they need to have an understanding of ratios. I want pupils to be able to see this'. Likewise, Nina shares an incident from her classroom, when a pupil questioned the practical usefulness of Pythagoras' theorem; she relates how she asked him what his career plans were and was pleased that another pupil argued that Pythagoras was very relevant to his plan to study carpentry.

Alongside this emphasis on relevance, the teachers were concerned that mathematics classrooms should be motivating and 'fun'. For Rune, it is important 'to present mathematics with dedication and humour (...) maybe those pupils who are not so fond of mathematics from before might get a better relationship with the subject if I present it in a humorous, fresh way'. Similarly, for Eirik, this is important not least because many pupils 'had very negative experiences with mathematics during primary school'; he wants to help them appreciate the subject as 'meaningful, (...) and fun, (...) not boring and obligatory'.

Each teacher provides examples of how they do this. Arne talks about 'appetising openings' of his lessons, giving an example of a football-related introductory activity: 'The score at the break was 3-2 or something. The boys, especially, were on fire right away'. Co-teachers Fred and Fride make connections between mathematics and other school subjects, like arts-and-crafts and physical education. This way, according to Fred, 'it's not ordinary mathematics for them. It's mathematics in the arts, or mathematics in sports and physical activity'. As Fride adds, 'our main goal is that pupils should leave our class and like the subject, think that mathematics is fun'. Nina likes to conclude her mathematics lessons with a joke or fun activity: 'We end either with *the maths joke of the day* or some fun task like *how many triangles are there?* (...) Those who get the right answer will get a little reward, like a candy from the teacher, or sometimes it's just about the honour and glory (laughter)'.

We see the teachers as working here to make mathematics meaningful and engaging to their pupils, most particularly those who are less interested, it seems. While issues of the relevance of mathematics resonate with the core curriculum emphasis on citizenship and the world outside of the school, the emphasis on 'fun' is less clearly connected to promoting inclusion as the teachers clearly intend, particularly since some practices ('firing up the boys', or instituting a culture of reward) may in fact be excluding.

The didactic dimension – meeting all pupils' learning needs

Using different tasks and 'self-differentiating' tasks

The teachers' intentions for inclusion are clear in terms of their perspectives on grouping, communication within the classroom and the purpose of mathematics. As we have seen, they report difficulties in meeting all pupils' needs in mixed-attainment classrooms, but they describe in some detail the importance of using tasks with different cognitive demands or self-differentiating tasks. Regarding the former, Samuel uses different tasks with varying degrees of challenge in his lessons:

... so that each pupil can keep up with their pace. Usually, I have three tracks of tasks, track three being the most difficult. Pupils must adapt a little and choose what they want to attempt. And, of course, I keep telling them that they can jump between tracks; it's not so risky to begin with Track 1 and then jump to Track 2.

Samuel acts here within the Syrin culture of pupil choice – he emphasises that pupils must have ‘some responsibility and some ownership’.

Eirik emphasises the principle of TPO, echoing the rights language in the core curriculum: ‘everyone has the right to it’. He uses what he calls ‘self-differentiating tasks’, which ‘allow you to solve them in many ways, without specific mathematical knowledge’. He gives an example of a task about a growing geometric pattern, in which pupils were asked to find the underlying pattern:

It was a simple number problem presented in geometric figures. Can you see a pattern in how it grows? Can you draw the next figure? Can you count how much it is growing and find a pattern in this? (...) Everyone can do it, even those facing challenges.

We observe that the didactical dimension is strongly associated with the organisational dimension, specifically with giving pupils the autonomy to make decisions. In other words, teachers’ didactical choices of using different tasks or self-differentiating tasks appear to be related to the organisational cultural value of giving pupils space to take responsibility for their own learning.

Discussion and conclusions

This paper is based on the premise that context is vital in two ways. The first concerns mathematics teachers’ perspectives in general, which, despite popularised (yet erroneous) views about their cultural neutrality, are deep-rooted in the social, cultural, historical, and political specificities of context (Gray et al. 2024; Xenofontos 2018; 2019). The second acknowledges that meanings attributed to terms like inclusion, inclusive education and inclusive practices vary significantly across countries (see for example Florian 2014). To understand and make sense of the mathematics classroom practices reported as inclusive by our participants, we applied Molbaek’s (2018) four dimensions of inclusive classroom practices: framing, organisational, relational, and didactic. Below, we discuss how each of these dimensions operates in the formation of teachers’ practices and their perception of these practices as inclusive, noting how issues highlighted within the organisational dimension underpin and connect with the teachers’ responses within the other three dimensions.

The organisational dimension has to do with the school-level policies, decisions, and practices in which individual teachers operate (Molbaek 2018). In the context of this study, this dimension is primarily expressed in terms of the difficulty of delivering TPO in large mixed classes, and how teachers and schools respond to this. Some schools are able to have a teacher and another adult in the classroom (a co-teacher, a special educator, or a teaching assistant). This is a relatively common occurrence in Norway (Jortveit and Kovač 2022). More frequently, however, our teachers talked about the need to employ various modes of grouping, both after school and during regular teaching time. Their discomfort with this is clear, and we see in the relational dimension how teachers avoided labels which suggested that they were seeing pupils

in terms of ability. While the groupings described were often associated with attainment levels, they were labelled as ‘special interest’ or ‘nurture’ groups, and some teachers are keen to argue that special interest groups might include a range of different pupils. One potential resolution to the teachers’ dilemmas over grouping is their ideological disposition towards pupil autonomy and the importance of making decisions about their own learning, also noted elsewhere in Norway (Chalkley et al. 2022). Thus, teachers report several opportunities for pupils to make decisions on the level of tasks they want to work on in the mainstream mathematics classroom and attending an out-of-class clubs only if they want to.

The relational dimension (Molbaek 2018) is perhaps the one that underpins teachers’ self-reported practices most intensively. As we have seen, participants emphasised the importance of working in mixed-ability groups and with learning partners, a widely used practice in Norwegian schools (Sandal et al. 2022). In addition, they stressed the importance of talk, use of language, and dialogue in the mathematics classroom, consistent with prior research in this area within the context of Norway (Bergem and Klette 2010) and internationally (Morgan et al. 2014). These practices reflect the Norwegian curricular expectations of creating classroom environments with a strong emphasis on collective processes and collaborative learning (Faldet, Knudsmoen, and Nes 2022).

The framing dimension is concerned with rules and routines of classroom management and their transparency (Molbaek 2018). Teachers argued that mathematics needs to be linked to the real world and be presented in meaningful contexts that pupils are familiar with. Furthermore, teachers highlighted the importance of ‘fun’ in the mathematics classroom, in line perhaps with their interpretation of curricular expectations of creating safe learning environments that promote pupils’ health and emotional well-being (Ministry of Education and research 2017), although we can interpret their approach as potentially excluding because of the assumptions it makes about the need to nurture lower attainers in particular and ensure that mathematics is ‘painless’ as noted by Mazenod et al. (2019).

The didactic dimension refers to teachers’ strategies for teaching and assessment which meet all pupils’ needs (Molbaek 2018) and we focused on how our participants perceived their mathematics teaching as inclusive. Many talked in detail about supporting differentiation through their choice of tasks, a practice which was also associated with giving pupils the autonomy to make decisions about their own learning (Chalkley et al. 2022).

As noted above, the realisation of TPO, or adapted education, despite being emphasised in policy documents and the wider educational discourse of Norway, still remains a ‘nebulous concept that has experienced difficulties realising its practical potential’ (Maxwell and Bakke 2019, 101). Overall, we can see how teachers subscribe strongly to the Norwegian education ideology expressed in the core curriculum of ‘school for all’, equality of opportunity and the value of diversity and pupil well-being. Driven by a belief that uniformity is valued within the mainstream classroom, where everyone is together, they resolve their concerns over their ability to successfully deliver TPO by addressing individual needs separately in groups outside the classroom which are, essentially, based on ability. In terms of the international picture, we point to Frostenson and Englund’s (2020) observation of the way in which performative mechanisms are channelled through a humanist ideology in both Norway and Sweden. Our analysis adds to our

understanding of the impact of performativity on teachers' practices by showing how cultural context mediates the interpretation and enactment of mechanisms of accountability, particularly in the highly divisive context of success in school mathematics. We hope to have shown the value of asking questions about what kind of classroom practices are perceived as inclusive by mathematics teachers in a particular context, and understanding the role of cultural context, expressed clearly here in the Norwegian curriculum and its underpinning ideology.

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References

- Andrews, P. 2009. "Mathematics Teachers' Didactic Strategies: Examining the Comparative Potential of low Inference Generic Descriptors." *Comparative Education Review* 53 (4): 559–581. <https://doi.org/10.1086/603583>.
- Baskerville, D., and H. Goldblatt. 2009. "Learning to be a Critical Friend: From Professional Indifference Through Challenge to Unguarded Conversations." *Cambridge Journal of Education* 39 (2): 205–221. <https://doi.org/10.1080/03057640902902260>.
- Bergem, O. K., and K. Klette. 2010. "Mathematical Tasks as Catalysts for Student Talk: Analysing Discourse in a Norwegian Mathematics Classroom." In *Mathematical Tasks in Classrooms*

- Around the World*, edited by Y. Shimizu, B. Kaur, R. Huang, and D. Clarke, 35–62. Rotterdam: Sense Publishers.
- Bjørnsrud, H. 1999. *Den inkluderende skole. Enhetsskolens idealer, dilemmaer og hverdag*. Oslo: Universitetsforlaget.
- Bjørnsrud, H., and S. Nilsen. 2021. *De uferdige utdanningsreformer og Fagfornyelsen (LK20)*. Oslo: Gyldendal.
- Chalkley, A. E., M. B. Mandelid, M. Thurston, A. Daly-Smith, A. Singh, I. Huiberts, and H. E. Tjomsland. 2022. ““Go Beyond Your Own Comfort Zone and Challenge Yourself”: A Comparison on the Use of Physically Active Learning in Norway, the Netherlands and the UK.” *Teaching and Teacher Education* 118: 103825. <https://doi.org/10.1016/j.tate.2022.103825>.
- d’Ambrósio, U. 2006. *Ethnomathematics: Link Between Traditions and Modernity*. Rotterdam: Brill.
- da Ponte, J. P. 1994. “Mathematics Teachers’ Professional Knowledge.” In *Proceedings of the Eighteenth International Conference for the Psychology of Mathematics Education*, edited by J. P. da Ponte, and J. F. Matos, 195–210. Lisbon: University of Lisbon.
- Eriksen, E., Y. Solomon, A. H. Bjerke, J. Gray, and B. Kleve. 2022. “Making Decisions About Attainment Grouping in Mathematics: Teacher Agency and Autonomy in Norway.” *Research Papers in Education* 39 (3): 379–399. <https://doi.org/10.1080/02671522.2022.2135014>.
- Faldet, A. C., H. Knudsmoen, and K. Nes. 2022. “Inkluderingsbegrepet under utvikling? En analyse av de norske læreplanverkene L97, LK06 og LK20.” *Nordisk Tidsskrift for Pedagogikk og Kritikk* 8: 171–188. <https://doi.org/10.23865/ntpk.v8.3434>.
- Fasting, R. B. 2013. “Adapted Education: The Norwegian Pathway to Inclusive and Efficient Education.” *International Journal of Inclusive Education* 17 (3): 263–276. <https://doi.org/10.1080/13603116.2012.676083>.
- Florian, L. 2014. “What Counts as Evidence of Inclusive Education?” *European Journal of Special Needs Education* 29 (3): 286–294. <https://doi.org/10.1080/08856257.2014.933551>.
- Frostenson, M., and H. Englund. 2020. “Teachers, Performative Techniques and Professional Values: How Performativity Becomes Humanistic Through Interplay Mechanisms.” *Cambridge Journal of Education* 50 (6): 695–710. <https://doi.org/10.1080/0305764X.2020.1761943>.
- Goddard, J. T. 2010. “Collective Case Study.” In *Encyclopedia of Case Study Research*, edited by A. J. Mills, G. Durepos, and E. Wiebe, 164–166. Thousand Oaks, CA: SAGE.
- Gray, J., T. Foyn, S. Holmedal, and Y. Solomon. 2024. “On the Learning Train: Problematising the Good Lesson, submission to the Conference Proceedings of NORMA, The Tenth Nordic Conference on Mathematics Education, Copenhagen.”
- Hagman, J. E. 2021. “The Eighth Characteristic for Successful Calculus Programs: Diversity, Equity, & Inclusion Practices.” *PRIMUS* 31 (1): 70–90. <https://doi.org/10.1080/10511970.2019.1629555>.
- Holmedal, S. 2023. *The Purpose of Education? Exploring the Contradiction of Inclusion Through Attainment Grouping in Norwegian Mathematics Teaching*. Unpublished PhD Thesis. OsloMet University.
- Horn, I., and B. Garner. 2022. *Teacher Learning of Ambitious and Equitable Mathematics Instruction*. New York: Routledge.
- Jaworski, B., and D. Phillips, eds. 1999. *Comparing Standards Internationally: Research and Practice in Mathematics and Beyond*. Oxford: Symposium Books.
- Jenssen, E. S., and S. Lillejord. 2009. “Tilpasset Opplæring: Politisk Dragkamp om Pedagogisk Praksis.” *Acta Didactica Norge* 3 (1): 1–15. <https://doi.org/10.5617/adno.1040>.
- Jortveit, M., and V. B. Kovač. 2022. “Co-Teaching That Works: Special and General Educators’ Perspectives on Collaboration.” *Teaching Education* 33 (3): 286–300. <https://doi.org/10.1080/10476210.2021.1895105>.
- Kaasila, R. 2007. “Using Narrative Inquiry for Investigating the Becoming of a Mathematics Teacher.” *ZDM – Mathematics Education* 39 (3): 205–213. <https://doi.org/10.1007/s11858-007-0023-6>.
- Knudsmoen, H., S. Mausesthaugen, and C. Dalland. 2022. “Ledelsesstrategier for utvikling av inkluderende undervisning.” *Nordisk Tidsskrift for Pedagogikk og Kritikk* 8: 189–203. <https://doi.org/10.23865/ntpk.v8.3435>.

- Kvale, S., and S. Brinkmann. 2009. *InterViews: Learning the Craft of Qualitative Interviewing*. London: Sage.
- Lindner, K. T., and S. Schwab. 2020. "Differentiation and Individualisation in Inclusive Education: A Systematic Review and Narrative Synthesis." *International Journal of Inclusive Education*, 1–21. <https://doi.org/10.1080/13603116.2020.1813450>.
- Mausethagen, S., H. Knudsmoen, and C. Dalland. 2022. "The Clustering of Public Values in Local Educational Governance: The Case of Inclusion." *Education Inquiry*, 1–16. <https://doi.org/10.1080/20004508.2022.2112013>.
- Maxwell, G., and J. Bakke. 2019. "Schooling for Everyone: Norway's Adapted Approach to Education for Everyone." In Sustainable Development Working Group (Ed.), *Including the North: A Comparative Study of the Policies on Inclusion and Equity in the Circumpolar North*, 89–107. Arctic Council Secretariat.
- Mazenod, A., B. Francis, L. Archer, J. Hodgen, B. Taylor, A. Tereshchenko, and D. Pepper. 2019. "Nurturing Learning or Encouraging Dependency? Teacher Constructions of Students in Lower Attainment Groups in English Secondary Schools." *Cambridge Journal of Education* 49 (1): 53–68. <https://doi.org/10.1080/0305764X.2018.1441372>.
- Ministry of Education and Research. 2017. *Core Curriculum – Values and Principles for Primary and Secondary Education. Laid Down by Royal Decree*. The National Curriculum for the Knowledge Promotion <https://www.udir.no/lk20/overordnet-del/?lang=eng>.
- Molbaek, M. 2018. "Inclusive Teaching Strategies–Dimensions and Agendas." *International Journal of Inclusive Education* 22 (10): 1048–1061. <https://doi.org/10.1080/13603116.2017.1414578>.
- Morgan, C., T. Craig, M. Schütte, and D. Wagner. 2014. "Language and Communication in Mathematics Education: An Overview of Research in the Field." *ZDM – Mathematics Education* 46 (6): 843–853. <https://doi.org/10.1007/s11858-014-0624-9>.
- National Centre for Science Education. 2015. *Rapport fra ekspertgruppa for realfagene.[Report from the Expert Group of Science and Mathematics Education]*. Nasjonalt senter for naturfag i opplæringa, Oslo, Norway. Accessed 4 March 2024. <https://www.regjeringen.no/no/dokumenter/Rapport-fra-ekspertgruppa-for-relafagene/id2343488/>.
- Nes, K., H. Demo, and D. Ianes. 2018. "Inclusion at Risk? Push-and Pull-Out Phenomena in Inclusive School Systems: The Italian and Norwegian Experiences." *International Journal of Inclusive Education* 22 (2): 111–129. <https://doi.org/10.1080/13603116.2017.1362045>.
- Norwegian National Committees for Research Ethics. 2016. *Guidelines for Research Ethics in the Social Sciences, Humanities, Law and Theology*. <https://www.etikkom.no/en/ethical-guidelines-for-research/guidelines-for-research-ethics-in-the-social-sciences-humanities-law-and-theology/>.
- Norwegian Research Council. 2019. "Inclusive Mathematics Teaching: Understanding and Developing School and Classroom Strategies for Raising Attainment". <https://prosjektbanken.forskningsradet.no/project/FORISS/287132>.
- Ollerton, M. 2009. "Inclusive Mathematics Classrooms." *Mathematics Teaching* 216: 5–7.
- Prediger, S., and R. Buró. 2024. "Fifty Ways to Work with Students' Diverse Abilities? A Video Study on Inclusive Teaching Practices in Secondary Mathematics Classrooms." *International Journal of Inclusive Education* 28 (2): 124–143. <https://doi.org/10.1080/13603116.2021.1925361>.
- Roos, H. 2019. "Inclusion in Mathematics Education: An Ideology, a Way of Teaching, or Both?" *Educational Studies in Mathematics* 100 (1): 25–41. <https://doi.org/10.1007/s10649-018-9854-z>.
- Sandal, A. K., I. Helleve, K. Smith, and S. M. Gamlem. 2022. "Feedback practice in lower secondary school: Exploring development of perceptions of feedback practice among students and teachers." *Cogent Education* 9 (1): 2101236. <https://doi.org/10.1080/2331186X.2022.2101236>.
- Slee, R. 2019. "Belonging in an Age of Exclusion." *International Journal of Inclusive Education* 23 (9): 909–922. <https://doi.org/10.1080/13603116.2019.1602366>.
- Solhaug, T. 2011. "New Public Management in Educational Reform in Norway." *Policy Futures in Education* 9 (2): 267–279. <https://doi.org/10.2304/pfie.2011.9.2.267>.
- Strauss, A., and J. Corbin. 1998. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. Thousand Oaks, CA: Sage.

- Strømstad, M., K. Nes, and K. Skogen. 2004. *Hva er inkludering?: rapport 1 fra evalueringsprosjektet 'En vurdering av om innføringen av Reform 97'*. Vallset: Oplandske bokforl og Norges forskningsråd.
- Swanson, D. M., H. L. Yu, and S. Mouroutsou. 2017. "Inclusion as Ethics, Equity and/or Human Rights? Spotighting School Mathematics Practices in Scotland and Globally." *Social Inclusion* 5 (3): 172–182. <https://doi.org/10.17645/si.v5i3.984>.
- Williams, J. 2012. "Use and Exchange Value in Mathematics Education: Contemporary CHAT Meets Bourdieu's Sociology." *Educational Studies in Mathematics* 80 (1): 57–72. <https://doi.org/10.1007/s10649-011-9362-x>.
- Xenofontos, C. 2018. "Greek-Cypriot Elementary Teachers' Epistemological Beliefs About Mathematics." *Teaching and Teacher Education* 70: 47–57. <https://doi.org/10.1016/j.tate.2017.11.007>.
- Xenofontos, C. 2019. "Primary Teachers' Perspectives on Mathematics During Curriculum Reform: A Collective Case Study from Cyprus." *Issues in Educational Research* 29 (3): 979–996.