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Challenges to learning mathematical concepts in Norwegian upper primary education: Teachers' perspectives

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ABSTRACT

This study aims to identify the most significant challenges to learning mathematical concepts among students in upper primary years (grades 5 to 7) in Norwegian primary schools, from the perspective of teachers. Using a descriptive-analytical method and a structured Likert-scale questionnaire, data were collected across six thematic axes: student factors, teacher factors, administrative and inspectional issues, textbook challenges, teaching methods, and local community involvement. The findings reveal that the most critical challenges relate to low student motivation, insufficient home support, and misalignment between curricular expectations and teaching materials. Statistical testing showed a significant difference in teachers' perceptions based on age, with younger teachers perceiving more challenges than their older counterparts. No significant differences were found based on gender or academic qualification. The study concludes with actionable recommendations to enhance mathematics instruction in the Norwegian context by addressing both student-related and systemic factors.

Keywords: mathematics education, learning challenges, teacher perceptions, primary education

INTRODUCTION

Mathematics education is foundational to developing critical thinking, problem-solving skills, and academic success for students worldwide. The upper primary years, especially grades 5 to 7, represent a crucial period where students transition from basic arithmetic to more abstract mathematical concepts (Kilpatrick et al., 2001). Despite its vital importance, students often encounter significant difficulties mastering these concepts, which can negatively impact their motivation and long-term achievement (Ashcraft & Krause, 2007; OECD, 2023).

Extensive research highlights that challenges to student success in mathematics are multifactorial, encompassing cognitive, affective, instructional, and environmental dimensions. Factors such as math anxiety, lack of foundational skills, and perceived irrelevance contribute to student disengagement (Ashcraft & Krause, 2007; Skaalvik & Skaalvik, 2017). Moreover, teacher preparedness and instructional methods significantly influence students' learning trajectories (Loewenberg Ball et al., 2008; Pettersen, 2018).

In the Norwegian education context, research has identified structural challenges for mathematics teaching, including variation in teachers' formal mathematics competence and the strong influence of students' social and family background on their opportunities to succeed in mathematics (Statistics Norway, 2022; OECD, 2023). These challenges can hinder sustained work with core mathematical concepts during the upper primary years, when students are expected to move from basic arithmetic to more advanced reasoning and problem solving.

While international research describes a range of challenges in mathematics education, Norwegian studies have mainly focused on issues such as task demands and competency-oriented teaching or teachers' professional development and views on good mathematics teaching (Pettersen, 2018; Svingen, 2021). At the same time, there appears to be limited Norwegian research that systematically captures primary teachers' perspectives on the challenges students face in learning mathematical concepts in upper primary (grades 5–7) classrooms.

This study aims to fill this gap by investigating the challenges that Norwegian mathematics teachers perceive as the most significant for students' learning of mathematical concepts in grades 5 to 7. Through a comprehensive survey instrument, the research identifies priority areas for support and development. Additionally, the study examines whether these perceptions differ by teachers' gender, age, and academic qualifications, providing empirical insights to inform future educational improvements and policy decisions.

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Objectives

The objective of this study is to systematically investigate the most significant challenges to learning mathematical concepts as perceived by teachers in Norwegian primary schools, specifically focusing on grades 5 to 7. The research aims to provide a comprehensive understanding of how these challenges are experienced across key dimensions, including student-related, teacher-related, administrative, textbook, teaching methods, and community factors. Furthermore, the study seeks to determine whether teachers' assessments of these challenges vary according to demographic variables such as gender, age, and academic qualifications. By examining both the breadth and depth of these challenges through quantitative survey data, this research aims to contribute empirical evidence that can inform targeted interventions, support teacher development, and guide future policy adjustments aimed at improving mathematics education outcomes in the Norwegian context.

LITERATURE REVIEW

Mathematics education in the upper primary years (Grades 5 to 7) is influenced by a range of student, teacher, and contextual factors. This literature review synthesizes research on key challenges faced in teaching and learning mathematical concepts in this educational stage, with a focus on teacher perspectives in Norwegian schools

Systemic and Structural Challenges

A recurring theme in the literature is the challenge posed by overloaded curricula and misalignment between curricular goals and classroom realities. Analyses of mathematics teaching in Norway have shown that teachers often feel pressured to cover a wide range of content within limited time, which can restrict opportunities for in-depth work with concepts and differentiated instruction (Alseth et al., 2003). International reviews similarly describe how ambitious curriculum expectations and accountability pressures can conflict with teachers' possibilities to adapt teaching to students' needs and pace of learning (OECD, 2020). These systemic tensions contribute to a focus on coverage rather than understanding, particularly in mathematics.

Syntheses of classroom research indicate that opportunities for individual feedback and formative assessment are crucial for learning but are more challenging to realize when teachers are responsible for many students at once (Hattie, 2009). Classroom studies also show that whole-class, teacher-centered patterns of interaction tend to dominate, which can make it harder to involve all students and to adapt instruction to diverse needs (Klette, 2007)

Pedagogical Competence and Teaching Methods

Teacher competence, encompassing both subject knowledge and pedagogical skill, is a critical factor in effective mathematics education (Loewenberg Ball et al., 2008; Shulman, 1986). Norwegian studies have documented both strengths and gaps in this area. For example, Pettersen (2018) found that while Norwegian teachers are increasingly aware of competency-oriented approaches, many still struggle to translate these into classroom practice. Hovtun et al. (2021) highlight that opportunities to learn mathematics in practice-based teacher education are varied, and that there is a need for more systematic development of both content knowledge and pedagogical skills.

Statistics Norway (2022) reported that a significant proportion of Norwegian primary teachers do not have formal qualifications in mathematics, which can affect both their confidence and effectiveness in teaching the subject. Svingen (2021) found that professional development initiatives can positively influence teachers' discourses and practices around good mathematics teaching but also noted that sustained and context-sensitive support is necessary for lasting change.

Despite curricular emphasis on inquiry-based and student-centered learning, research shows that Norwegian mathematics classrooms frequently employ theory-heavy and textbook-driven instruction (Alseth et al., 2003). Such approaches can limit opportunities for hands-on learning, collaborative problem-solving, and real-world application, which are known to support deeper conceptual understanding (Prediger et al., 2022).

Cognitive and Learning Barriers

A strong foundation in basic mathematical skills is essential for progression to more complex concepts. International assessments such as TIMSS and PISA consistently highlight persistent gaps in students' number sense, arithmetic fluency, and problem-solving abilities, both globally and in Norway (Geary, 2003; IEA, 2024; OECD, 2023). These foundational gaps can create cumulative barriers, making it increasingly difficult for students to engage with new material.

Specific learning difficulties, such as dyscalculia and ADHD, are recognized contributors to mathematics blockage (Butterworth & Campbell, 2005; Geary, 2011). Norwegian research (Næss et al., 2024) emphasizes the need for early identification and targeted interventions, yet teachers often report insufficient training and resources to adequately support students with special needs.

Emotional and Psychological Factors

Math anxiety is a well-documented phenomenon that significantly impairs students' performance and engagement (Ashcraft & Krause, 2007; Dowker et al., 2016). Anxiety can deplete working memory, reduce concentration, and trigger avoidance behaviours, creating a cycle of negative experiences and low achievement (Carey et al., 2016). Norwegian studies confirm that math anxiety is prevalent among upper primary students and is often exacerbated by high-stakes testing and negative feedback (Skaalvik & Skaalvik, 2017).

Student motivation and attitudes toward mathematics play a crucial role in learning outcomes. Research indicates that students who perceive mathematics as irrelevant, overly abstract, or unattainable are less likely to engage and persist in the face of difficulty (Middleton & Spanias, 1999; Hannula, 2006). Teachers note that fostering a positive classroom climate and connecting math to real-life contexts can help improve motivation and reduce resistance.

Assessment Practices

Assessment practices can either support or hinder conceptual learning. Norwegian and international studies (Black & Wiliam, 2009; Hopfenbeck et al., 2013) critique the overemphasis on summative, procedural assessments at the expense of formative, diagnostic approaches. Without regular formative assessment, teachers may overlook students' misconceptions and fail to provide timely, targeted support.

Contextual and Environmental Factors

The role of the home environment in mathematics learning is well established (Skwarchuk et al., 2014). Parental attitudes, involvement, and ability to support homework can significantly influence students' achievement and attitudes toward math. In Norway, as in other countries, disparities in parental support can contribute to widening achievement gaps, particularly for students from immigrant or low socioeconomic backgrounds (Bakken & Elstad, 2012).

With increasing emphasis on digital literacy in education, teachers' ability to effectively integrate technology into mathematics instruction is gaining importance. Studies (Erstad, 2010; OECD, 2015) show that while digital tools have the potential to enhance engagement and conceptual understanding, many teachers report a lack of training and confidence in using these resources effectively.

Student Factor

Recent research underscores the pivotal role of students' home environments and personal attitudes in shaping mathematics achievement. Large-scale international assessments show that students who have greater access to learning resources at home—such as books, quiet study space, and digital tools—tend to achieve higher levels of mathematical competence, while students from less advantaged homes are at increased risk of low performance (OECD, 2023). Negative attitudes toward mathematics, often rooted in earlier academic struggles or repeated experiences of low grades, are associated with avoidance behaviours and reduced persistence when faced with challenging tasks. Cultural influences, including parental expectations and broader societal perceptions of mathematics as either valuable or threatening, further affect students' motivation and engagement (Geesa et al., 2019).

Teacher Preparation, Professional Development, and Support

Research consistently shows that mathematics teachers often feel underprepared for the practical demands of the classroom, lacking confidence in their subject knowledge and struggling to adapt to curriculum changes and new technologies (European Commission, 2022; Loewenberg Ball et al. 2008; Prendergast et al., 2019). There is also a well-documented gap between pre-service teacher education and the realities of classroom practice (Shulman, 1987). These challenges underscore the importance of ongoing professional development, which is essential for equipping teachers with the skills and confidence to address diverse student needs and adopt innovative teaching methods (Desimone, 2009; Timperley et al., 2007). In the Norwegian context, teachers express a strong desire for more targeted training in both mathematics pedagogy and digital competence to better meet the evolving demands of their profession (Blikstad-Balas & Klette, 2020).

RESEARCH QUESTIONS

1. What are the most significant challenges to learning mathematical concepts for students in grades 5 to 7 in Norway, from teachers' perspectives?

   Sub-questions:

   - What are the challenges related to students?
   - What are the challenges related to teachers?
   - What are the challenges related to administration and inspection
   - What are the challenges related to the textbook?
   - What are the challenges related to teaching methods?
   - What are the challenges related to the local community?

2. Are there statistically significant differences (at $\alpha \leq 0.05$) in teachers' assessments of these challenges based on gender, age, or academic qualification?

   a. **Principle null hypothesis:** There are no statistically significant differences at the $\alpha \leq 0.05$ level in teachers' assessments of challenges to learning mathematical concepts based on the following teachers' variables: gender, age and academic qualifications?

   b. **Sub-hypothesis:**

Table 1. Interpretation of Likert scale scores

Mean Score Range	Interpretation
1.00 – 1.80	Strongly Disagree
1.81 – 2.60	Disagree
2.61 – 3.40	Neutral
3.41 – 4.20	Agree
4.21 – 5.00	Strongly Agree

- $H0_1$ (Gender-related null hypothesis): There are no statistically significant differences at the $\alpha \leq 0.05$ level in teachers' assessments of challenges to learning mathematical concepts based on gender.
- $H0_2$ (Age-related null hypothesis): There are no statistically significant differences at the $\alpha \leq 0.05$ level in teachers' assessments of challenges to learning mathematical concepts based on age group.
- $H0_3$ (Academic qualification-related null hypothesis): There are no statistically significant differences at the $\alpha \leq 0.05$ level in teachers' assessments of challenges to learning mathematical concepts based on academic qualification.

METHODOLOGY

This study employed a descriptive-analytical survey design to investigate challenges to learning mathematical concepts in Norwegian upper primary education (grades 5–7) from the perspective of teachers. Data collection was conducted using a structured anonymous online questionnaire comprising 45 Likert-scale items (1 = strongly disagree, 5 = strongly agree), divided across six thematic axes: student factors, teacher factors, administration and inspection, textbook challenges, teaching methods, and local community engagement. The interpretation of the Likert scale scores is presented in **Table 1**.

This study is explicitly situated within a quantitative research paradigm and employs a quantitative, descriptive-analytical survey design. The descriptive component summarises the prevalence and relative severity of the perceived challenges through measures of central tendency and dispersion, whereas the analytical component uses inferential statistics to test whether these perceptions vary systematically across teacher subgroups defined by gender, age, and academic qualification. The choice of a structured, closed-format questionnaire reflects the study's confirmatory and quantifying aim, namely, to measure and rank a predefined set of challenges across a large, geographically dispersed national sample rather than to generate new categories inductively.

Participants

Teachers from Norwegian primary schools who currently teach mathematics in grades 5–7 were invited to participate. In total, 236 responses were collected, comprising a diverse sample:

- **Gender:** 159 female, 77 male.
- **Age groups:** 49 (20–30 years), 61 (31–40 years), 57 (41–50 years), 69 (51+ years).
- **Academic background:** 101 held master's degrees, 133 held bachelor's degrees or lower.

Sampling Strategy and Representativeness

The study used a total-population (census-type) sampling approach with a two-stage distribution procedure: an invitation containing the survey link was emailed to the principals of 2,136 primary schools across all Norwegian counties, who were asked to forward it to the teachers of mathematics in grades 5–7 at their school. All such teachers were eligible, and participation was entirely voluntary. The target population — teachers of mathematics in grades 5–7 — constitutes a subset of the Norwegian primary-teaching workforce and is considerably smaller than the total number of primary teachers, although no exact national count of this subgroup is published. Because distribution was mediated by principals, the number of teachers who actually received the invitation cannot be determined, and a conventional response rate can therefore not be computed; the 236 respondents represent those eligible teachers who elected to participate. Recruitment was thus based on voluntary self-selection from the national population of eligible teachers, rather than on probability sampling from a stratified frame. The achieved sample of 236 respondents is distributed across all four age bands, both genders, and two qualification levels, and broadly mirrors the national teaching workforce in its predominance of female teachers and bachelor-level qualifications.

For descriptive population estimates, a sample of this size yields a conservative margin of error of approximately ±6–7% at the 95% confidence level; because sampling precision depends on the absolute sample size rather than on the sampling fraction, this estimate holds across the plausible range of population sizes for the target subgroup and, if anything, improves as the population becomes smaller. This precision is adequate for the descriptive and comparative aims of the study while remaining a recognised limitation (see Limitations). Moreover, the risk of unmodelled heterogeneity across school types is mitigated by the institutional structure of Norwegian primary education. The system is highly centralised in terms of governance and curriculum, strongly committed to egalitarian ideals, and predominantly public: 94.8% of pupils attend public primary and lower secondary schools (Statistics Norway, 2025), and all schools — public and private alike — operate within the framework of the common national curriculum established by the Ministry of Education and Research. The scope for methodological or structural variation across school types is therefore considerably narrower in Norway than in less centralised systems. It should be noted, however, that the sampling frame did not stratify or screen respondents by school type (public, private, or international), geographical setting (urban versus rural), or pedagogical orientation. Because the socio-economic and instructional context of schools may shape the

Table 2. Reliability coefficients for survey axes (Cronbach's Alpha)

Axis	Number of items	Cronbach's Alpha
Student-related challenges	9	0.865
Teacher-related challenges	7	0.710
Administrative/inspection challenges	7	0.710
Textbook-related challenges	9	0.891
Teaching methods challenges	5	0.744
Local community challenges	8	0.739
Total reliability	45	0.899

Table 3. Pearson correlations between survey axes and total score

Survey axes	Pearson Correlation (r)	p- value
Challenges related to the student	0.721**	.001
Challenges related to the teacher	0.613**	.001
Challenges related to administration and inspection	0.699**	.001
Challenges related to the designated textbook	0.617**	.001
Challenges related to teaching methods	0.614**	.001
Challenges related to the local community	0.627**	.001

Note. **p < .01 (two-tailed).

challenges teachers perceive, the absence of such stratification constrains the extent to which differences between school contexts can be examined; this is addressed explicitly as a limitation and as a direction for future, stratified sampling.

Instrument and Reliability

The survey was fully anonymous, and no personally identifiable information was collected. The five-point Likert scale ensured standardized quantifiable responses, facilitating robust statistical analysis. Internal consistency was validated using Cronbach's alpha, with all axes achieving reliability above 0.70 (range: 0.710–0.891). The reliability coefficients for each axis are presented in **Table 2**.

Instrument Development and Validation

Firstly, we drew on the questionnaire used in our previous research on difficulties in learning mathematics from the perspective of primary school teachers (Abuhasanein et al., 2025). The questions were reviewed and adapted to the Norwegian context. We supplemented this with a review of the literature on the challenges facing mathematics learning, which was organised deductively into six thematic areas (the pupil, the teacher, administration and inspection, textbooks, teaching methods, and family/community factors). Secondly, content validity was ensured through an expert review conducted by experienced mathematics teachers and researchers, who assessed each question in terms of its relevance, clarity and representativeness of its thematic area; questions were revised or deleted based on these observations. Thirdly, the refined instrument underwent pilot testing with a small group of teachers to verify the comprehensibility of the questions and the effectiveness of the response scale; minor adjustments were made to the wording before it was distributed nationwide. Construct validity was then examined through the correlations between the items and the total score for each dimension and the overall scale score (**Table 3**); all were moderate to strong and statistically significant ($p < .01$). Internal consistency reliability was confirmed using Cronbach's alpha for each dimension and for the full instrument (**Table 2**). The full instrument, comprising 45 items distributed across the six dimensions, is included in the appendix to support transparency and reproducibility.

Ethics and Informed Consent

The survey was administered through a fully anonymous online questionnaire and collected no directly or indirectly identifiable personal data (no names, contact details, IP addresses, or school identifiers). Under the Norwegian regulatory framework, research that does not process personal data falls outside the notification requirement of the data-protection services (formerly NSD). Formal ethics-committee approval was therefore not required for this anonymous, non-interventional educational survey; no approval code is applicable. Participation was entirely voluntary. Before accessing the questionnaire, all respondents were presented with an information page describing the purpose of the study, the anonymous nature of the data, and the absence of any personal-data collection. In line with standard practice for anonymous surveys, completion and submission of the questionnaire was taken to constitute informed consent.

Table 3 presents the Pearson correlations between each challenge axis and the total scale score to examine the structural consistency of the survey dimensions.

Structural consistency was confirmed for all axes, with all bivariate correlations with the total score being moderate to strong and statistically significant ($p < 0.01$).

Data Collection Procedure

Data were collected via an online survey. Invitations containing the survey link were emailed to the principals of 2,136 primary schools across all Norwegian counties, with a request to forward the link to the teachers of mathematics in grades 5–7 at their school. This two-stage, principal-mediated procedure provided nationwide coverage of the target population, although the exact number of teachers who received the link cannot be determined. Participation was entirely voluntary, and no personal identifying

Table 4. Student-related challenges

No.	Item	Arithmetic Mean	Standard Deviation	Relative Weight	Attitude	Rank
1	There are too many students in the class	3.49	1.28	69.96%	Agree	2
2	Students have a low level of competence	3.32	1.12	66.44%	Neutral	7
3	Students have low motivation	3.39	1.16	67.71%	Neutral	4
4	Students are not engaged, prepared, or participating in the lessons	3.03	1.19	60.68%	Neutral	9
5	Students lack skills and algorithmic understanding.	3.43	1.03	68.60%	Agree	3
6	Students lack basic skills	3.38	1.09	67.54%	Neutral	6
7	Students do not see the relevance of mathematics.	3.39	1.16	67.81%	Neutral	4
8	Students focus on results instead of cognitive development.	3.69	1.12	73.79%	Agree	1
9	Students have negative attitudes towards mathematics	3.11	1.12	62.13%	Neutral	8
	All items combined	3.36	1.16	67.18%	Neutral	

information was collected, ensuring full anonymity for all respondents. This approach facilitated efficient outreach to a diverse range of schools and teachers, aligning with recommended online survey methods in educational research.

Response Pattern Analysis

To assess potential non-response bias, response patterns were monitored throughout the data collection period. Analysis revealed no remarkable changes in response trends between early respondents (first 150 responses) and later respondents, suggesting consistency in perspectives across different response periods. This stability provides evidence supporting the reliability of findings within the responding sample.

Data Analysis

Responses were analyzed using descriptive statistics (mean scores, standard deviations, response frequencies) to rank and interpret challenge severity. Score interpretation followed standard Likert scale bands (1.00–1.80: strongly disagree; 1.81–2.60: disagree; 2.61–3.40: neutral; 3.41–4.20: agree; 4.21–5.00: strongly agree). Inferential statistics were used to examine differences in teachers' assessments based on demographic variables. Independent samples t-tests were conducted to compare responses by gender, while one-way analysis of variance (ANOVA), followed by LSD and Tukey HSD post hoc tests, was used to assess differences based on age and academic qualification.

In addition, to provide an inferential basis for interpreting item severity rather than relying on descriptive band labels alone, one-sample t-tests were conducted comparing each item mean against the theoretical scale midpoint (test value = 3.0, "Neutral"), and Cohen's d was computed as a measure of effect size. This procedure identifies which challenges are perceived as significantly above the neutral point and quantifies the magnitude of that departure.

RESULTS

Key findings were summarized across the six axes and top challenges were identified. Statistical differences were also explored across demographic groups.

The First Axis: Challenges Related to the Student

As presented in **Table 4**, the challenges related to students were of moderate to high intensity. "Students focus on results instead of cognitive development" ranked first (M = 3.69, 73.79%, Agree), followed by "There are too many students in the class" (M = 3.49, 69.96%). Several items, such as "Students have low motivation" and "Students do not see the relevance of mathematics," were rated as Neutral, but close to the agreement level. The overall mean for this axis was 3.36, indicating a general Neutral trend with a slight inclination toward Agreement.

The Second Axis: Challenges Related to the Teacher

According to **Table 5**, teachers rated most challenges as Neutral, with "Weak preparation of mathematics teachers in universities" standing out as the main issue (M = 4.08, Agree). The overall mean score for this axis was 3.00, indicating a Neutral level of perceived challenges.

Table 5. Teacher-related challenges

No.	Teacher-related item	Arithmetic Mean	Standard Deviation	Relative Weight	Attitude	Rank
1	Insufficient preparation of mathematics teachers at universities	4.08	1.02	81.62%	Agree	1
2	I give too little emphasis to deep understanding in math	2.45	1.12	49.07%	Disagree	7
3	I place too little emphasis on inquiry.	2.9	1.18	58.05%	Neutral	4
4	My teaching is too theoretical with little focus on practical application	2.79	1.15	55.85%	Neutral	5
5	I should place greater emphasis on diverse assessment methods.	3.07	1.09	61.44%	Neutral	2
6	I focus too much on the syllabus, which may limit students' deep learning.	2.77	1.25	55.42%	Neutral	6
7	I should strengthen my teaching competence.	2.97	1.25	59.32%	Neutral	3
	All items combined	3.0	1.25	60.08%	Neutral	

Table 6. Administrative and inspection-related challenges

No.	Item	Arithmetic Mean	Standard Deviation	Relative Weight	Attitude	Rank
1	There are too many laws and regulations to follow as a teacher	3.63	1.12	72.60%	Agree	1
2	I have less opportunity to practice classroom management than before.	3.11	1.39	62.22%	Neutral	2
3	I have too little pedagogical freedom.	2.32	1.09	46.44%	Disagree	7
4	I have too few assessment tools.	2.98	1.22	59.57%	Neutral	3
5	The professional development offered to teachers is inadequate	2.93	1.19	58.64%	Neutral	4
6	I focus too little on instructional didactics.	2.42	0.99	48.31%	Disagree	6
7	There is too much focus on evaluating my work rather than improving teaching.	2.62	1.1	52.31%	Neutral	5
	All items combined	3.0	1.25	60.08%	Neutral	

Table 7. Textbook-related challenges

No.	Item	Arithmetic Mean	Standard Deviation	Relative Weight	Attitude	Rank
1	The textbook content does not match the time allocated for teaching	3.59	1.25	71.74%	Agree	1
2	The textbook quality is poor.	3.1	1.26	61.97%	Neutral	5
3	The textbook does not promote students' reasoning skills.	3.24	1.12	64.87%	Neutral	2
4	Lack of connection of the book's topics with the students' daily life.	3.22	1.14	64.43%	Neutral	3
5	Presence of scientific and typographical errors in the book.	2.22	1.06	44.48%	Disagree	9
6	Lack of logical sequence in the presentation of topics in textbook.	2.87	1.19	57.45%	Neutral	7
7	The textbook is inadequate in relation to the curriculum.	2.74	1.17	54.72%	Neutral	8
8	The textbook has poor academic progression.	2.94	1.22	58.79%	Neutral	6
9	The textbook contains too little on exploration and problem-solving.	3.2	1.26	64.00%	Neutral	4
	All items combined	3.0	1.25	60.08%	Neutral	

The Third Axis: Challenges Related to Administration and Inspection

Table 6 reveals that the main administrative challenge perceived by teachers was the burden of laws and regulations (M = 3.63, Agree). Other aspects like limited classroom management opportunities (M = 3.11) and lack of assessment tools (M = 2.98) were rated Neutral. Lower challenges, rated as Disagree, included too little pedagogical freedom (M = 2.32) and focus on instructional didactics (M = 2.42).

The Fourth Axis: Challenges Related to the Designated Textbook

The results in **Table 7** show that the main textbook-related challenge was the mismatch between textbook content and the allocated teaching time (M = 3.59, Agree, Rank 1). Other items showed neutral attitudes, such as poor textbook quality (M = 3.10) and lack of promotion of students' reasoning skills (M = 3.24). The presence of scientific and typographical errors received the lowest mean (M = 2.22, Disagree, Rank 9). Overall, teachers moderately agree on the existence of several textbook-related challenges.

Table 8. Teaching methods challenges

No.	Item	Arithmetic Mean	Standard Deviation	Relative Weight	Attitude	Rank
1	I need to improve in selecting relevant and effective teaching methods.	3.25	1.04	65.08%	Neutral	2
2	I lack digital competence (digital tools, programming, etc.).	2.61	1.27	52.29%	Neutral	5
3	The training offered in modern teaching methods is poor.	3.34	1.09	66.87%	Neutral	1
4	I should have greater competence in developing and using appropriate teaching materials.	3.08	1.13	61.61%	Neutral	3
5	I should have better curriculum and teaching method competence.	2.81	1.14	56.10%	Neutral	4
	All items combined	3.0	1.25	60.08%	Neutral	

Table 9. Local community challenges

No.	Item	Arithmetic Mean	Standard Deviation	Relative Weight	Attitude	Rank
1	The home has negative attitudes toward mathematics.	2.85	1.14	56.95%	Neutral	5
2	The home is to blame for students developing math anxiety.	2.84	1.04	56.86%	Neutral	6
3	The home provides insufficient follow-up on students' schoolwork.	3.6	0.97	72.09%	Agree	3
4	The home lacks the ability to help students with mathematics.	3.67	0.91	73.47%	Agree	1
5	The family's view that mathematics is not useful in practical life.	2.47	0.99	49.37%	Disagree	7
6	The school and local community should cooperate more on mathematics.	3.54	0.92	70.89%	Agree	4
7	There is poor communication between home and school.	2.26	1.0	45.17%	Disagree	8
8	The school should leverage collaboration with families and local companies in mathematics instruction.	3.64	0.88	72.83%	Agree	2
	All items combined	3.0	1.25	60.08%	Neutral	

The Fifth Axis: Challenges Related to Teaching Methods

Table 8 shows that the most notable challenge related to teaching methods was the poor training offered in modern methods (M = 3.34, Neutral, Rank 1). Other issues like the need to improve in selecting teaching methods (M = 3.25) and developing teaching materials (M = 3.08) also received neutral responses. The lowest mean was for lacking digital competence (M = 2.61, Neutral, Rank 5). Overall, the challenges in teaching methods are moderately perceived by teachers.

The Sixth Axis: Challenges Related to the Local Community

Table 9 shows that the major challenges related to the local community include the home's inability to help students with mathematics (M = 3.67, Agree), and the need for better collaboration between schools and families (M = 3.64, Agree). Poor follow-up from home (M = 3.60) and insufficient school-community cooperation (M = 3.54) also ranked highly. In contrast, poor communication between home and school had the lowest mean (M = 2.26, Disagree).

After calculating the means, standard deviations, and the rankings for all the questionnaire items, we can identify the top ten challenges in learning mathematical concepts at the primary stage from the perspective of teachers in Norwegian schools as outlined in **Table 10**.

Table 10. Arithmetic means, standard deviations, and degree of measured attitude for the top ten challenges ranked in descending order

Axis	Item	Arithmetic Mean	Standard Deviation	Attitude	Rank
Teacher	Weak preparation of mathematics teachers in universities	4.08	1.02	Agree	1
Student	Students focus on results instead of cognitive development.	3.69	1.12	Agree	2
Local community	The home lacks the ability to help students with mathematics.	3.67	0.91	Agree	3
Local community	The school should leverage collaboration with families and local companies in mathematics instruction.	3.64	0.88	Agree	4
Administration and inspection	There are too many laws and regulations to follow as a teacher	3.63	1.12	Agree	5
Student	The home provides insufficient follow-up on students' schoolwork.	3.60	0.97	Agree	6
Textbook	The textbook content does not match the time allocated for teaching	3.59	1.25	Agree	7
Local community	The school and local community should cooperate more on mathematics.	3.54	0.92	Agree	8
Student	There are too many students in the class	3.49	1.28	Agree	9
Student	Students lack skills and algorithmic understanding.	3.43	1.03	Agree	10

Table 11. Results of the independent t-test for the first null hypothesis

Gender	N	Arithmetic Mean	Standard Deviation	df	t	p-value
Males	77	3.35	1.35	234	-1.235	0.109
Females	159	3.56	1.23			

Note. t, df, and p-value refer to the comparison between male and female teachers

Although all items in the top-ten list fall within the "Agree" category, two student-related items lie just below this threshold. Specifically, "Students have low motivation" (Mean = 3.39) and "Students do not see the relevance of mathematics" (Mean = 3.39) both fall in the upper end of the "Neutral" range (2.61–3.40) and are therefore very close to the cut-off for "Agree" (3.41). In addition, the item ranked 13th overall, "Students lack basic skills" (Mean = 3.38), is not included in the top-ten table but also lies near the boundary between "Neutral" and "Agree," indicating that many teachers perceive shortcomings in students' foundational skills and engagement with mathematics as real challenges. These values indicate a slight positive tendency toward agreement and suggest that a substantial portion of teachers perceive these issues as substantial obstacles. Given their proximity to the "Agree" threshold and their high placement in the overall ranking, these items are considered "borderline agreement" rather than clearly neutral.

To establish whether the highest-ranked challenges are statistically distinguishable from a neutral response rather than merely descriptively close to the "Agree" band, one-sample t-tests against the scale midpoint (3.0) were performed. The leading challenges differed significantly from neutral with small-to-large effect sizes: weak university preparation of mathematics teachers ($M = 4.08$), $t(233) = 16.11$, $p < .001$, $d = 1.05$; students' focus on results rather than cognitive development ($M = 3.69$), $t(234) = 9.39$, $p < .001$, $d = 0.61$; the home's limited ability to help with mathematics ($M = 3.67$), $t(235) = 11.34$, $p < .001$, $d = 0.74$; insufficient home follow-up of schoolwork ($M = 3.60$), $t(234) = 9.51$, $p < .001$, $d = 0.62$; and the burden of laws and regulations ($M = 3.63$), $t(234) = 8.60$, $p < .001$, $d = 0.56$. Importantly, even the two "borderline" student items — low motivation and the perceived irrelevance of mathematics (both $M = 3.39$) — were significantly above the neutral midpoint, $t \approx 5.1$, $p < .001$, $d \approx 0.33$. These results indicate that the prioritised challenges represent systematic departures from a neutral evaluation across the sample, and that the rankings reflect statistically reliable differences in perceived severity rather than chance variation around the scale midpoint.

Independent t-test Results Based on Gender

Table 11 presents the results of an independent samples t-test examining whether there are statistically significant differences in teachers' assessments of challenges to learning mathematical concepts based on gender.

The results of the independent-samples t-test showed that female teachers ($M = 3.57$, $SD = 1.23$) reported slightly higher levels of perceived challenges compared to male teachers ($M = 3.35$, $SD = 1.35$). However, this difference was not statistically significant, $t(234) = -1.235$, $p = 0.109$. Therefore, it can be concluded that gender does not have a significant effect on teachers' perceptions of the challenges to learning mathematical concepts.

Table 12 shows that teachers aged 20–30 years reported the highest level of perceived challenges ($M = 3.49$, $SD = 1.28$), followed by those aged 41–50 ($M = 3.39$, $SD = 1.16$) and 31–40 years ($M = 3.32$, $SD = 1.12$). Teachers aged 51 years and above reported the lowest mean score ($M = 3.03$, $SD = 1.20$). These results suggest that younger teachers tend to perceive more challenges related to learning mathematical concepts than their older counterparts.

Table 12. Arithmetic means and standard deviations for the age variable

Age	N	Arithmetic Mean	Standard Deviation
20-30 years	49	3.49	1.28
31-40 years	61	3.32	1.12
41-50 years	57	3.39	1.16
51 years and above	69	3.03	1.20
Total	236	3.32	1.19

Table 13. Results of the One-Way ANOVA test for the age variable

Source of variation	Sum of Squares	df	Mean Square	F	p-value
Between groups	20.912	3	6.971	5.445	0.001
Within groups	296.999	232	1.28		
Total	317.911	235			

Table 14. Post hoc LSD test results for age group comparisons

Age group	20–30 years	31–40 years	41–50 years	51 years and above
20–30 years	—	0.660	0.566	< .001*
31–40 years	0.660	—	0.882	0.002*
41–50 years	0.566	0.882	—	0.003*
51 years and above	0.001*	0.002*	0.003*	—

Note. Values represent p-values. * p < .05

Table 15. Post hoc tukey HSD test results for age group comparisons

Compared Groups	Mean Difference	p-value	Direction
20–30 vs 51+	0.726	0.004	20–30 higher
31–40 vs 51+	0.63	0.009	31–40 higher
41–50 vs 51+	0.599	0.018	41–50 higher

Table 16. Table on top of a column (font size: 9)

Educational Qualification	N	Arithmetic Mean	Standard Deviation
Master's degree	101	3.60	0.91
Bachelor's degree	133	3.48	1.27
Total	234	3.53	1.13

Note. Educational qualification was not reported for two teachers; therefore, percentages and means are based on the 234 teachers who provided this information.

To determine whether these differences are statistically significant, a one-way analysis of variance (ANOVA) was used to compare groups, as shown in **Table 13**.

Table 14 presents the results of the post hoc LSD test, indicating that teachers aged 51 years and above perceived significantly fewer challenges compared to younger age groups, while no significant differences were observed among the younger groups themselves.

Table 15 presents the results of the Tukey HSD post hoc analysis, showing that teachers aged 20–30, 31–40, and 41–50 years reported significantly higher levels of perceived challenges compared to those aged 51 years and above ($p < .05$). No significant differences were observed among the younger age groups themselves. These findings suggest that older teachers perceive fewer challenges in teaching mathematical concepts than their younger counterparts

Both the LSD and Tukey HSD post hoc tests confirmed that teachers aged 51 years and above perceived significantly fewer challenges to learning mathematical concepts compared to their younger colleagues, with no significant differences observed among the younger age groups themselves.

Table 16 presents the arithmetic means and standard deviations by educational qualification. Teachers with a master's degree ($M = 3.60$, $SD = 0.91$) reported slightly higher perceptions of challenges compared to those with a bachelor's degree ($M = 3.48$, $SD = 1.27$). This indicates that higher academic qualifications are associated with a slightly greater awareness of the challenges in teaching mathematical concepts.

Table 17 presents the results of the analysis of variance (ANOVA) examining differences in teachers' perceptions of challenges to learning mathematical concepts based on educational qualification. The results showed no statistically significant difference between teachers with a bachelor's degree and those with a master's degree, $F(1, 232) = 0.422$, $p = 0.517$. Although teachers with a master's degree reported slightly higher perceptions of challenges, the difference was not statistically meaningful.

Table 17. One-Way ANOVA Results for Educational Qualification

Source	Sum of Squares	df	Mean Square	F	p-value
Between groups	0.363	1	0.363	0.422	0.517
Within groups	200.766	232	0.858		
Total	201.129	233			

DISCUSSION

Student-Related Challenges: Motivation, Skills, and Classroom Dynamics

Survey results indicate that student-related challenges—particularly low motivation, insufficient basic skills, and what can be interpreted as lack of engagement—are among the most significant obstacles to mathematics learning in Norwegian primary schools. Teachers frequently observed that students tend to focus on results rather than cognitive development, with many reporting large class sizes as an organizational barrier. These findings align with the work of Middleton and Spanias (1999) and Hannula (2006), who emphasize how students' perceptions of mathematics and their motivation crucially affect learning outcomes. International studies such as TIMSS and PISA also underscore that gaps in number sense and arithmetic fluency persist globally, further validating the Norwegian teachers' concerns (IEA, 2024; OECD, 2023; Geary, 2003).

High levels of student disengagement and negative attitudes towards mathematics are also reflected in research on math anxiety, which Ashcraft and Krause (2007) and Skaalvik and Skaalvik (2017) show to be both a cause and a consequence of lower achievement. The survey's identification of "students lacking skills and algorithmic understanding" matches findings from Butterworth and Campbell (2005) and Geary (2011) regarding persistent barriers created by learning difficulties such as dyscalculia.

Teacher-Related and Structural Factors

Teachers in the survey reported that weak preparation during their university education is among the main systemic challenges, consistent with Loewenberg Ball et al. (2008), Shulman (1986, 1987), and Pettersen (2018). These studies underscore deficiencies in both content knowledge and practical pedagogical skills, leading to teachers feeling underprepared in real classroom settings. In Norway, Statistics Norway (2022) found that a considerable share of mathematics teachers lack formal qualifications, a point echoed by Svingen (2021) in the importance of sustained, context-sensitive professional development.

Survey responses show relatively less urgency for self-perceived pedagogical shortcomings, such as teachers' own preparation and classroom practices, but they indicate moderate agreement that there is a need to improve the use of more diverse, formative assessment methods in mathematics teaching—a theme further reflected in Black and Wiliam (2009) and Hopfenbeck et al. (2013), who argue that formative, diagnostic assessment is critical for supporting students' conceptual understanding in mathematics.

Administrative, Curriculum, and Textbook Challenges

A recurring issue highlighted by Norwegian teachers is the misalignment between the official curriculum, the content and organization of textbooks, and the instructional time available. The survey reveals moderate agreement that textbook content often fails to match curricular goals or classroom realities, and concerns are raised about the poor connection between textbooks and students' daily life. This substantiates findings by Alseth, Breiteig, and Brekke (2003) who report that ambitious syllabi and textbook-driven can constrain opportunities for deeper learning and differentiation in mathematics lessons.

Increased administrative burdens—such as complex regulations and insufficient pedagogical freedom—were also noted by survey respondents, supporting prior research indicating these constraints may inhibit effective teaching, especially for students with learning difficulties (Hattie, 2009; Klette, 2007).

Teaching Methods and Teacher Development

Teachers' moderate agreement about both the need for improved training in modern teaching methods and digital competence reflects findings by Blikstad-Balas and Klette (2020), who note a strong desire for more targeted professional development in mathematics pedagogy and technology use. Hovtun et al. (2021) similarly stress the variation in opportunities to learn mathematics in Norwegian teacher education and call for systematic content and pedagogical development.

Assessment practices continue to be a double-edged sword: survey responses indicate only moderate agreement about the use of diverse assessment methods, suggesting that many teachers still rely on a relatively narrow set of traditional assessments, which may limit the formative support needed for conceptual understanding in mathematics (Black & Wiliam, 2009; Hopfenbeck et al., 2013).

Contextual Factors: Home and Community Involvement

One of the most striking findings from the survey is the high ranking of challenges related to insufficient family support and poor home-school collaboration. The home's lack of ability to assist with mathematics and limited follow-up on schoolwork were top concerns, affirming the role of the family and local community in mathematics achievement as found in research by Skwarchuk et al. (2014) and Bakken and Elstad (2012).

Socioeconomic disparities in parental support and resources are shown to exacerbate achievement gaps, resonating with international results (Geesa et al., 2019; IEA, 2024; von Davier et al., 2024).

Differences by Demographics

Interestingly, while gender and academic qualification were not statistically significant factors in perceptions of challenges, age was, with younger teachers reported greater difficulties than their older counterparts. This trend may reflect more recent changes in curriculum, differences in professional experience, or the evolution of teacher training programs. Svingen (2021) suggests ongoing professional development is crucial for adapting to change, which may be more challenging for less experienced teachers.

Several mechanisms may help explain why younger teachers reported more pronounced challenges. First, early-career teachers typically have less accumulated pedagogical content knowledge and fewer routinised classroom-management strategies, which can heighten the salience of perceived obstacles before practical expertise consolidates. Second, recently qualified teachers entered the profession under the most recent curriculum reform and may be more acutely aware of the gap between ambitious curricular expectations and classroom realities. Third, older teachers may have developed coping repertoires and professional confidence that attenuate the perceived intensity of challenges, consistent with research linking experience to teacher self-efficacy (George et al., 2018; Grigaliuniene & Lehtinen, 2025). Comparative international evidence likewise shows that educators' attitudes and self-assessments vary with context and educator characteristics (Wardat et al., 2025), reinforcing the view that our observed differences are substantive rather than artefacts of the instrument. This pattern strengthens the case for sustained professional development that is deliberately differentiated by career stage, offering intensive support in the early years and continued opportunities for expertise refinement later on.

These findings can be situated within a growing body of recent international research on mathematics teaching, teacher preparation, and educational innovation. The prominence of weak initial preparation in the present data echoes work on pre-service mathematics teachers' proficiency and reasoning, including studies of word-problem solving (AlAli et al., 2024) and of logical-mathematical intelligence as a predictor of achievement among prospective teachers (Shirawia et al., 2023). The teachers' expressed need for stronger competence in modern and digital methods aligns with evidence that structured digital curricula can improve mathematics learning (Alkouri & Wardat, 2025) and with narrative syntheses of artificial-intelligence-supported tools and their instructional applications in mathematics education (Garcia et al., 2026). Finally, the salience of low student motivation in our results resonates with experimental evidence that active, learner-centred designs such as the flipped classroom can enhance motivation to learn mathematics (Mansour & Wardat, 2025). Collectively, this literature suggests that the challenges identified by Norwegian teachers are neither isolated nor purely local, and that internationally validated pedagogical and technological interventions offer promising avenues for addressing them.

A methodological point concerns the interpretation of items whose means fall in the upper part of the "Neutral" band. Because the study's aim is to identify and prioritise challenges across a national sample, the analysis emphasises the relative ranking of items and their statistical departure from the neutral midpoint, rather than treating only extreme "Strongly agree" responses as informative. The principal conclusions are accordingly anchored in specific high-ranking items that reached the agreement band ($M \geq 3.41$) — most notably weak university preparation of mathematics teachers ($M = 4.08$), students' focus on results over cognitive development ($M = 3.69$), and the home's limited ability to help with mathematics ($M = 3.67$) — rather than in overall axis means near the neutral point; items in the upper neutral range are treated as borderline and interpreted with corresponding caution.The one-sample t-tests reported above confirm that the prioritised challenges are significantly above neutral, and the convergence of these rankings with prior Norwegian and international findings further supports their substantive interpretation. At the same time, the generally moderate central tendency is itself a meaningful result: it indicates that Norwegian teachers do not perceive any single factor as overwhelming, but rather experience a constellation of moderately weighted, mutually reinforcing challenges — a pattern with direct implications for multi-level rather than single-target interventions.

Implications for Practice and Policy

Overall, these findings confirm that both student-centered issues (motivation, basic skills, engagement) and systemic challenges (teacher preparation, curricular alignment, family support) are critical areas to address. Recommendations include improving teacher education with practical and didactic training (Loewenberg Ball et al., 2008; Shulman, 1987), investing in textbooks with real-life relevance, enhancing professional development opportunities, and fostering better home-school collaboration. Policy efforts to address class sizes, assess curriculum demands, and support inclusive practices are supported by international research and Norwegian context-specific studies.

Limitations

This study has several methodological considerations that should be acknowledged when interpreting results. While the survey invitation was sent to the principals of 2,136 Norwegian primary schools with a request to forward it to teachers of mathematics in grades 5–7, the final sample comprised 236 respondents. Because distribution was mediated by principals, the proportion of eligible teachers who actually received the invitation is unknown, and a conventional response rate cannot be computed. Nevertheless, analysis of response patterns revealed no substantial changes between early and late respondents, which helps mitigate concerns about late-responder bias and supports the consistency of findings.

The stable response patterns throughout the data collection period provide some reassurance regarding the representativeness of findings within the responding sample. However, the possibility of non-response bias cannot be entirely ruled out, as non-respondents may differ systematically from respondents in ways not captured by response timing or other measured variables. Results should therefore be interpreted as representative of the responding sample of Norwegian mathematics teachers rather than making definitive claims about the entire population.

Despite these limitations, the comprehensive national distribution strategy, anonymous design, and consistent response patterns support the validity and reliability of the findings for understanding key challenges in mathematics education from the perspective of practicing Norwegian teachers.

A further limitation concerns the exclusive reliance on teachers' perceptions. Although teachers are uniquely positioned to observe classroom challenges, their self-reported perceptions provide a single vantage point and may diverge from the experiences of students, parents, and school administrators. The study therefore captures perceived rather than directly observed or triangulated challenges, and the findings should be interpreted accordingly.

Several design features also warrant caution. First, the sample was obtained through voluntary self-selection rather than probability sampling, and respondents were not stratified or screened by school type (public, private, or international), geographical setting (urban versus rural), or pedagogical approach; consequently, context-specific variation in challenges could not be modelled. Second, the instrument relied exclusively on closed Likert-type items. This was a deliberate methodological choice: mapping baseline systemic pressures across six macro-educational dimensions on a national scale requires a standardised psychometric instrument that yields comparable, reliable, and rankable scores amenable to inferential testing across a broad sample. The trade-off is that respondents could not introduce challenges beyond those listed; complementing the present quantitative baseline with open-ended items and qualitative data within a mixed-methods design therefore constitutes a vital pathway for future research.Third, the central tendency of many items lay in the upper neutral-to-agree range; while one-sample t-tests confirm that the leading items differ significantly from neutral, the moderate absolute magnitudes should be borne in mind when translating findings into policy.

CONCLUSION

This study has provided a comprehensive examination of the central challenges faced by Norwegian primary teachers in fostering mathematical concept learning for students in grades 5 to 7. The results show that both student-related challenges—such as low motivation, insufficient mastery of basic skills, and a focus on results over conceptual understanding—and systemic issues like weak teacher preparation, misalignment between curriculum and textbooks, and limited home support, remain persistent obstacles. These findings echo and reinforce the concerns raised in Norwegian and international research, which consistently highlight the multifaceted nature of barriers to effective mathematics education (Alseth et al., 2003; Kilpatrick et al., 2001; Loewenberg Ball et al., 2008; OECD, 2023). While the number of participating teachers is modest relative to the national population of eligible teachers, the consistency of response patterns throughout the data collection period supports the reliability of these findings among participating educators.

The survey results reveal a close alignment with previous studies showing that overcrowded classrooms and curriculum overload limit opportunities for differentiated, deep learning (Klette, 2007; Hattie, 2009). Teachers' recognition of inadequate university preparation and a lack of consistent professional development—despite their expressed desire for targeted training (Blikstad-Balas & Klette, 2020; Svingen, 2021)—further underscores the need for systemic changes to teacher education and ongoing support.

Challenges associated with assessment practices, as well as the disconnect between classroom teaching and students' everyday lives, were also pronounced in this study and resemble findings in both Norwegian research (Alseth et al., 2003; Pettersen, 2018) and international analyses (Black & Wiliam, 2009; Hopfenbeck et al., 2013). That younger teachers report more pronounced challenges than their older colleagues merits special consideration, suggesting that changes to curricula and teacher training have not fully addressed the practical realities confronting less experienced educators.

The findings highlight the critical importance of home-school collaboration, with insufficient family support and limited parental engagement in mathematics learning emerging as top concerns among teachers. This aligns with research demonstrating the crucial role of family involvement in mathematics achievement and the impact of socioeconomic factors on educational outcomes (Skwarchuk et al., 2014; Bakken & Elstad, 2012; Geesa et al., 2019).

While this research is grounded in robust survey analysis and aligns with global trends, it is limited to teachers' perspectives in Norwegian primary education and does not attempt to capture student voices or classroom observations. The nationwide distribution to the principles of all Norwegian primary schools provided broad coverage of the target group of the teachers of mathematics in grades 5-7, and the stable response patterns throughout data collection support the validity of findings. However, future research could productively explore the interplay between teacher, student, and institutional factors through qualitative or mixed-method designs, and evaluate how targeted interventions—such as curriculum reform, resource development, or expanded professional learning—impact both teaching practices and student outcomes.

In interpreting these conclusions, three limitations should be kept in view: the study relies exclusively on teachers' self-reported perceptions; the sample was obtained through voluntary, non-stratified recruitment; and several item means, while significantly above the neutral midpoint, are of moderate magnitude. These constraints define the boundary conditions of the conclusions and motivate the future studies outlined below

Future research should broaden the evidential base beyond teachers by incorporating the perspectives of students, parents, and administrators through mixed-method and multi-informant designs and should adopt stratified or probability sampling to enable comparison across school types and urban–rural contexts.

Beyond documenting challenges, future work should also design and empirically test concrete didactic responses. One promising direction is the development and classroom implementation of Study and Research Paths (SRPs) within the

Anthropological Theory of the Didactic and the emerging "paradigm of questioning the world" (Chevallard, 2015). In this perspective, SRPs organise learning around a generating question that students investigate over an extended sequence, using existing works and institutional answers as tools in an inquiry process that can support more active engagement, a stronger sense of the functional relevance of mathematics, and deeper conceptual understanding. These are precisely the kinds of areas — low motivation, perceived irrelevance of school mathematics, and result-oriented learning — that emerged as priorities in this study. Coupling such interventions with rigorous evaluation designs would help move the field beyond identifying challenges toward demonstrating which didactic organisations and task designs most effectively mitigate them in practice.

In summary, the findings reinforce that addressing mathematics learning challenges in Norway will require systemic, multi-level action: strengthening teacher education and professional development, aligning curricula, textbooks, and assessment policies, enhancing support for larger class sizes and diverse learning needs, and fostering stronger home-school-community partnerships. These actions are crucial not only for improving mathematical competence and confidence in Norwegian students but also for informing broader international debates about supporting equitable and meaningful mathematics learning. The consistency of teacher perspectives across the response period suggests these challenges are widely recognized among practicing educators, emphasizing the urgent need for coordinated policy and practice reforms to support mathematics education in Norwegian primary schools.

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