EDUCARE

ISSN: 2004-5190

ARTICLE: PEER-REVIEWED

2026:1

doi: 10.63310/edu.2026.1.63511

Discourses of Cultural and Linguistic Diversity in Mathematics Teacher Education Policy in Sweden

Huda Alhadi Alhasani

Malmö University
https://orcid.org/0009-0002-4245-0299
huda.alhadi-alhasani@mau.se

Petra Svensson Källberg

Malmö University
https://orcid.org/0000-0002-8012-6310
petra.svensson@mau.se

Helena Roos

Malmö University
https://orcid.org/0000-0002-4429-988X
helena.roos@mau.se

This study investigates how cultural and linguistic diversity is discursively construed in mathematics teacher education for Grades 4–6 in Sweden at policy level. Discourse analysis was used to examine 55 mathematics course syllabi and 20 educational curricula from various Swedish universities. The analysis uncovered how cultural and linguistic diversity is framed in policy, and what assumptions and values underpin these framings. The analysis identified two dominant Discourses: the *cultural and linguistic homogeneity Discourse*, which emphasises a monolingual norm, and the *cultural and linguistic plurality Discourse*, which acknowledges and values students' diverse backgrounds. Further, it revealed that cultural and linguistic diversity is largely marginalized in the policy documents. Tensions and inconsistencies in how diversity is addressed were identified, suggesting incoherence in the guidance provided to pre-service teachers. These insights aim to encourage policymakers and teacher educators to critically reflect on how diversity is framed and addressed in teacher education, thereby preparing pre-service teachers for the realities of culturally and linguistically diverse mathematics classrooms.

Received 1 Jan 2025; **Accepted** 13 Jan 2026; **Published** 30 Jan 2026

MALMÖ UNIVERSITY PRESS

Keywords: cultural and linguistic diversity, discourse analysis, mathematics teacher education, policy

Introduction

Mathematics is commonly viewed as culturally neutral (Nasir et al., 2008) because it entails universal definitions and has a symbolic language, which are similar across all cultures (Parker Waller & Flood, 2016). This view may conceal linguistic, cultural and epistemological aspects that teachers and students meet in school mathematics (Ryan et al., 2021). This view also implies that students who are emergent in the language of instruction and/or have experiences of learning mathematics in other cultures and languages could learn mathematics at school with relative ease, since mathematics is the 'same' everywhere (Parker Waller & Flood, 2016). However, this is not the case. Linguistic, cultural, and epistemological aspects embedded in different languages influence how culturally and linguistically diverse students understand mathematical concepts (Ryan et al., 2021). Language plays an epistemic role beyond mere communication and code-switching (Prediger et al., 2019). For instance, fractions in German are pronounced with the part read first, for example, 3/5 is read "three-fifths", whereas in Turkish the whole is read first, "five therein three", which may mean different ways of knowing fractions that students may have to handle (Prediger et al., 2019). Consequently, mathematics teachers must have knowledge about language use in culturally and linguistically diverse mathematics classrooms as well as epistemological dimensions of language (Ryan & Parra, 2019). These contemporary demands should be integrated into today's mathematics teacher education, with policies such as curricula and course syllabi designed to address cultural and linguistic diversity. However, research on mathematics teacher education has paid limited attention to cultural and linguistic diversity (Eikset & Meaney, 2018) and the importance of including training on cultural and linguistic diversity in mathematics teacher education is recognized internationally (Essien, et al., 2016; Thompson et al., 2016). Yet, Swedish teacher education has been identified as lacking standardised solutions for incorporating cultural and linguistic diversity (Paulsrud & Lundberg, 2021), and courses that prepare pre-service teachers for culturally and linguistically diverse classrooms are currently not mandatory for a teaching degree (Paulsrud et al., 2023). This issue is further reflected in the findings of Paulsrud and Zilliacus (2018), who reported that pre-service teachers often feel unprepared to teach in culturally and linguistically diverse settings, and that teacher educators face challenges in addressing this complexity.

Since mathematics is shaped by language and culture, it is crucial to examine how these aspects are integrated into teacher preparation. In Sweden, there is limited understanding of the extent to which, and the ways in which, pre-service teachers are prepared to engage with cultural and linguistic diversity in their teaching. Hence, we investigate *how* cultural and linguistic diversity is discursively construed in policy that governs Swedish mathematics teacher education for Grades 4–6. By *how*, we refer to the ways in which, and the extent to which, such diversity is represented and constructed in the policy texts. The aim of this study is to examine the clarity and implications of how cultural and linguistic diversity is described in mathematics teacher education policy. By doing so, the study seeks to uncover underlying assumptions that shape teacher preparation for teaching in culturally and linguistically diverse classrooms.

The guiding research question is:

- How is cultural and linguistic diversity discursively construed in policy regarding mathematics teacher education?

Background

This section begins with a brief overview of *the Swedish educational context*, shaped by national policies and curricula. Thereafter, it presents research on cultural and linguistic diversity in relation to *teacher educators*, *pre-service teachers*, and *mathematics teaching*.

The Swedish Educational Context

Teacher education curricula in Sweden are regulated by the Higher Education Ordinance (SFS 1993:100) and the Higher Education Act (SFS 1992:1434), which establish general objectives. Universities have the autonomy to add local objectives. Educational policies shape what is valued, expected, and enacted in education (Popkewitz, 2012). They represent the system's perspective on what teachers need to know; in this context, how to teach mathematics in culturally and linguistically diverse classrooms. Another dimension is language policy. The Language Act (SFS 2009:600) and the Education Act (SFS 2010:800) guide language use in education. Swedish is the main language of instruction, but both laws support the right to learn national minority languages

and one's mother tongue. Together, they reflect Sweden's commitment to linguistic and cultural diversity.

The local, national, and international policies that govern school mathematics in Sweden prioritise Western linguistic, epistemological, and cultural dominant ways of knowing mathematics (Norén & Valero, 2022). Paulsrud et al. (2020) found that the national curriculum reflects a monolingual ideology, with limited acknowledgment of the increasing diversity in classrooms. Consequently, mathematics activities at school are framed within the logic of Western ideals. There are cultural differences regarding how mathematical competence is defined. In Western traditions, it is often associated with logical reasoning and the ability to explain one's thinking verbally, whereas in many Middle Eastern contexts, being mathematically knowledgeable is more closely linked to memorising formulas and applying them effectively (Alhadi Alhasani et al., 2022). Further, mathematics word problems are framed in Western contexts (Caligari et al., 2021), and both non-Western calculation methods and students' mother tongues are often undervalued in the mathematics classrooms (e.g. Svensson Källberg & Ryan, 2024). This can be related to the concept of abyssal thinking, introduced by Santos (2014), which has become central to understanding how certain forms of knowledge dominate while others become invisible. Abyssal thinking refers to a distinction between two sides of a line. One side represents the visible, typically Western, scientific, and institutionally recognised knowledge, while the other, invisible side includes non-Western or Indigenous knowledges. These latter forms are not only devalued but are often treated as if they do not exist at all within dominant discourses. This process of invisibilisation has been described as a form of epistemic violence (Heleta, 2016; Mudaly, 2018), where certain realities and experiences are marginalised or excluded from what is considered legitimate knowledge. In response, Santos (2014) proposed post-abyssal thinking, a way of thinking that acknowledges and values epistemological diversity, allowing for the coexistence of multiple knowledge systems.

Teacher Educators

Eikset and Meaney (2018) examined how teacher educators in Norway navigate decisions about when and how to address language diversity with pre-service teachers. Their findings suggest that such discussions often arise only when language diversity is seen as a problem, rather than as an opportunity to enrich mathematics learning. This underscores the importance of more intentional and reflective engagement with language diversity in teacher education. Similarly, Essien et al.

(2016) explored how mathematics teacher educators understand and respond to language diversity in their professional contexts in South Africa, Malawi, and Catalonia-Spain. While educators were aware of the multilingual nature of the classrooms their pre-service teachers would enter, their practices were often shaped by institutional limitations and dominant language ideologies. Consequently, language diversity was not consistently integrated into mathematics teacher education, highlighting the need for more deliberate and supportive approaches. Additionally, Crespo et al. (2021) examined how mathematics teacher educators in the US can help pre-service teachers shift from deficit-based to asset-based discourse. By deficit-based discourse, the authors refer to pre-service teachers' tendency to emphasize what multilingual students lack or cannot do, often framing their primary language as a barrier to learning. In contrast, asset-based discourse highlights students' strengths and capabilities, recognizing their linguistic resources as valuable tools for mathematical thinking and learning. The results shows that while many pre-service teachers began to recognise students' language practices as strengths, few explicitly valued students' home languages, highlighting the need for more intentional support from teacher educators in this area.

Pre-Service Teachers

In the US, McGraw et al. (2024) examined diversity in relation to equity and found that, despite some awareness of equitable practices, diverse students are still often viewed through a deficit perspective. Meaney and Rangnes (2024) studied how to prepare pre-service teachers to teach mathematics in diverse classrooms in Norway and emphasised advocacy in language-diverse settings. They argued that mathematics teacher education should explicitly prepare pre-service teachers to take on this advocacy role, both within and beyond the classroom. The findings indicate that teacher educators face challenges in raising awareness of this responsibility, particularly when it involves questioning pre-service teachers' existing language ideologies. Fernandes (2020) investigated language orientations of pre-service mathematics teachers in the United States, focusing on how they perceive the role of language in diverse classrooms. The findings showed that these future teachers held different views, seeing language as a barrier, irrelevant, or as a resource. According to Fernandes, these results highlight the need for teacher education programmes to promote language awareness and prepare teachers for inclusive, multilingual learning environments. Further, pre-service teachers noticing how language-diverse students use

multimodalities to make meaning has been investigated to identify when their expectations about the students' learning were disturbed or confirmed (Rangnes & Meaney, 2021). That Norwegian study found that pre-service teachers' interpretations of students' use of resources (gestures, objects, and spatial arrangements) were shaped by contextual factors, and that their assumptions were often challenged when students demonstrated understanding through non-verbal or non-traditional modes of communication.

Mathematics Teaching

Within mathematics education research, two main strands can be distinguished that address the support multilingual students' mathematics learning: *multilingual mathematics teaching* (e.g., Adler, 2001; Planas & Chronaki, 2021; Planas, 2018) and *language responsive mathematics teaching* (e.g., Prediger & Zindler, 2017; Smit et al., 2016; Wessel & Erath, 2018). In the former, students' mother tongues are treated as resources (Planas & Setati-Phakeng, 2014; Planas, 2018) and the use of students' full linguistic repertoires, including their mother tongues are emphasised in teaching. This includes allowing students to code-switch between languages (Planas & Setati-Phakeng, 2014), but also broader strategies, such as using semiotic tools like illustrations, graphs, and metaphors (Caligari et al., 2021; Moschkovich, 2015a), as well as drawing on students' cultural backgrounds (Barwell, 2018). More recently, translanguaging has been explored as a response to the complexities associated with the use of multiple languages in mathematics classroom discourse (Planas & Chronaki, 2021; Ryan et al., 2021). A translanguaging pedagogy emphasises equitable valuing of all languages present in the classroom, recognising them as resources for learning (García & Wei, 2014).

Language-responsive mathematics teaching, grounded in second-language acquisition theories (e.g., Cummins, 2014; Gibbons, 2009), focuses on supporting students' learning of mathematics in the language of instruction. Strategies within this strand aim to develop students' academic language specific to mathematics by addressing both lexical and discursive demands (Prediger & Zindel, 2017; Wessel & Erath, 2018). Scaffolding strategies such as contextualising word problems and making concepts explicit (Norén & Caligari, 2020), teachers' revoicing (Moschkovich, 2015b) and genre-based interpretation (Smit et al., 2016) have been investigated in relation to access to mathematics.

Theoretical Approach

We used discourse analysis (DA) as a theoretical approach to investigate how cultural and linguistic diversity is discursively construed in mathematics teacher education for Grades 4–6 in Sweden at policy level. Rooted in critical theory, DA examines language in context to uncover deeper meanings, extending beyond written or spoken text to interpret how language shapes understanding (Gee, 2014a; Potter & Wetherell, 1987). In this study *discourse* refers to "culturally and historically rooted conventions that shape and regulate linguistic, cognitive, and social processes" (Trappes-Lomax, 2004, p. 136). We apply DA both as a theoretical approach and an analytical tool by adopting Gee's (2014a; 2014b) perspective, which emphasises a descriptive view of language in use. Gee distinguished between two theoretical key concepts *Big Discourses* and *small discourses*, henceforth big Discourses (with a capital D) and small discourses (with a lower-case d). (D)iscourses refer to socially accepted ways of using language and behaving in particular ways. These Discourses combine language, actions, values, beliefs, symbols, and other elements to construct identity and activity:

> If you put language, action, interaction, values, beliefs, symbols, objects, tools, and places together in such a way that others recognise you as a particular type of who (identity) engaged in a particular type of what (activity), here and now, then you have pulled off a Discourse. (Gee, 2014a, p. 52)

For instance, a Discourse can be *Western school mathematics*. In Western school mathematics you talk and act in certain ways, which include expectations of logical reasoning and the ability to explain one's thinking verbally. (d)iscourse pertains to the patterns and flow of language within the context of Discourses. It represents how the language is used in particular situations, the small stories in language. These discourses are tools for communication, expressing thoughts and negotiating meaning, and influencing others in a given moment. Gee (2014a) emphasised that "language in use is about saying, doing, and being" (p. 31). As Gee (2015) notes, discourse analysis explores how language interacts with bodies and objects to shape society and history. In this way, Discourses are construed through discourses, the discourses influence the Discourses, which helps construe broader patterns of ideas. But, the specific words and phrases (discourse) also reflect and reinforce broader cultural values and ideologies (Discourse), illustrating their mutual constitution.

Methodology

In this section, we present the data collection and material and describe how DA has been applied in the analysis of the material.

Data Collection and Material

The empirical material includes policy documents regulating teacher education in Sweden: educational curricula and mathematics education course syllabi. Initially, 20 universities offering teacher education programmes for Grades 4–6 were identified, as the authors are licensed to teach these grades and are familiar with the relevant content. In the next step, an online search was conducted to collect the most recent versions of educational curricula and mathematics education course syllabi for these programmes. Only documents from the regular teacher education programme were included, since alternative formats (such as work-integrated programmes) share the same content. In total, 55 mathematics education course syllabi (see Table 1) and 20 educational curricula were selected for analysis.

Table 1

Selected mathematics education course syllabi

University	Number of mathematics education course syllabi and credits
Dalarna University	2 x 7.5 hp and 1 x 15 hp.
Halmstad University	1 x 7.5 and 1 x 30 hp.
Jönköping University	4 x 7.5 hp.
Karlstad University	1 x 30 and 1 x 15 hp.
Kristianstad University	2 x 7.5 hp and 1 x 15 hp.
Linköping University	2 x 15 hp.
Linnaeus University	2 x 15 hp.
Luleå University	2 x 15 hp.
Malmö University	1 x 15 hp, 1 x 12 hp and 2 x 9 hp.
Mid Sweden University	2 x 7.5 hp and 1 x 15 hp.
Mälardalen University	2 x 7.5 hp and 1 x 15 hp.
Stockholm University	2 x 7.5 hp and 1 x 15 hp.
Södertörn University	4 x 7.5 hp.
Umeå University	4 x 7.5 hp.
University of Borås	2 x 15 hp.
University of Gothenburg	2 x 15 hp.
University of Gävle	2 x 7.5 hp and 1 x 15 hp.
University West	1 x 7.5 and 1 x 9 hp.
Uppsala University	2 x 7.5 hp and 1 x 15 hp.

Örebro University	1 x 22.5 and 1 x 15 hp.

The Higher Education Ordinance (SFS 1993:100) and the Swedish Higher Education Act (SFS 1992:1434, Chapter 1, Section 8) require that all curricula include general objectives. To avoid analysing these repeatedly, we focused on curriculum content that extends beyond the general objectives. Based on our understanding that the educational curriculum applies to the entire teacher education programme but is not necessarily embedded in each individual course syllabus, we chose to analyse the two document types separately so that we could examine how cultural and linguistic diversity are addressed specifically within mathematics education.

Method of Analysis

We employed Gee's (2014b) toolkit for DA with 28 tools of inquiry, which are conceptualised as "thinking devices" designed to enable a deeper engagement with its nuances. Each tool is accompanied by a set of investigating tool-related questions and serves as a flexible guide, where the nature of the specific study determines which tools are most appropriate and how they should be adapted (Gee, 2014b).

Following a comprehensive review of all 28 tools, the first author identified those most relevant to the research question, which resulted in nine tools[1]. All authors discussed the nine tools collaboratively and agreed to focus four tools: *The Fill-in Tool*, *The Subject Tool*, *The Identities Building Tool* and *The Big "D" Discourse Tool.* This decision was based on a close reading of the tool-specific questions and testing them on texts from the material. The selection of the tools was not a straightforward process. Rather, it involved ongoing discussions among the authors and iterative testing. We explored different combinations, revisited our choices, and refined the selection based on how well each tool aligned with the research question and the nature of the data. After applying the four selected tools, we noticed that the analysis did not fully capture broader societal and policy narratives. To address this, *the Figured Worlds Tool was* added.

1 The nine tools initially considered were: The Fill-in Tool, The Making Strange Tool, The Subject Tool, The Why This Way and Not That Way Tool, The Significance Building Tool, The Identities Building Tool, The Politics Building Tool, The Connections Building Tool and The Figured Worlds Tool.

As recommended by Gee, we adapted and selectively used the tools and questions based on relevance. We acknowledge that our interpretations are shaped by our personal backgrounds, and while subjectivity cannot be eliminated, we addressed it through the transparent application of analytical tools.

The Fill-in Tool was employed to identify formulations that are assumed to be familiar to the reader but are not explicitly stated. This tool enabled us to identify possible intentions and implicit assumptions and background knowledge that the texts build on but does not explicitly state. This tool was valuable for uncovering normativity embedded within the texts, as well as for illuminating the potential interpretations that teacher educators might make when engaging with these texts in preparation for their teaching.

The Subject Tool was applied to examine how texts organise information through subjects and predicates; we used it to identify how cultural and linguistic diversity is positioned within the data and how and why it is articulated as a subject in the text. This tool supports identification of themes in which cultural and linguistic diversity is addressed and shows how language positions individuals and groups.

The Identities Building Tool was used to provide an understanding of identities in the texts. This tool helped us examine how students' cultural and linguistic backgrounds are acknowledged and represented in the policy documents, and how language is used to portray students in particular ways and position them to take on specific roles.

The Big "D" Discourse Tool was used to investigate which Discourses the language surrounding cultural and linguistic diversity in the documents are part of. The tool enabled an examination of the kinds of actions, interactions, values, norms, beliefs, objects, tools, technologies, and environments associated with this language use. This tool required moving beyond the textual level to connect the small discourses to broader societal Discourses. This tool required an interpretive approach that considers not only the content of the policy, but also how its language aligns with, reinforces, or resists dominant ideologies.

The Figured Worlds Tool is related to *the Fill-in Tool*, because the underlying assumptions in the text can be filled in by the reader (Gee, 2014b), thereby capturing what is considered typical and normal in the descriptions. The Figured Worlds Tool allowed us to examine how imagined roles,

relationships, and expectations are shaped within specific cultural and institutional contexts and functioned as a bridge between individual positioning and overarching ideological structures.

The analysis began with a close reading of the documents to identify text related to cultural and linguistic diversity. This implied a broad approach including all text that connotated with teaching in culturally and linguistically diverse classrooms and students with diverse backgrounds and needs. Relevant texts were selected and compiled into a single document. These texts were then grouped based on linguistic patterns to identify "small stories" through which discourses could be construed by employing the selected tools. The process of construing the D(d)iscourses was carried out collaboratively by the three authors, with the D(d)iscourses being revisited and reorganized multiple times to achieve meaningful coherence in the interpretation. The use of the tools in the analysis is exemplified in Table 2.

Table 2

The questions adapted from Gee (2014b) and an exemplification of their application in the analysis.

"The importance of the language in mathematics teaching, both mathematics as a linguistic practice and multilingualism in mathematics teaching" (University of Gävle, 2020).		
Tool	Questions	Analysis
The Fill-in Tool	What additional information is required to be filled to ensure clarity? What remains unsaid but is implicitly assumed to be known or inferable by the readers? What assumptions and inferences must the reader make to interpret the message as the speaker intended?	The language = one language = the language of instruction = Swedish. The importance of (= students cannot manage without) the (Swedish) language in mathematics teaching, both in terms of mathematics as a linguistic practice (to reason, argue, or describe?) and multilingualism in mathematics teaching (as a problem or a resource?).
The Subject Tool	What has been positioned as the subject? How is the subject represented in relation to others? Is the subject passive or active in the discourse? What assumptions are made about the subject's knowledge or background?	The importance of the language is framed through two lenses: as a tool for reasoning and as a factor in multilingual contexts. Passively presented, language is positioned as crucial, implying that without proficiency, students may struggle to fully engage in mathematical practice.

The Identities Building Tool.	What socially recognisable identity or identities are the policy documents trying to enact or get others to recognise? How are these identities positioned in relation to the readers?	Teachers are seen as linguistically aware educators who integrate language into mathematics. Multilingual students are positioned as needing to adapt to the instructional language (Swedish) to succeed.
The Big D Discourse tool.	What is the big idea behind the description? What values, beliefs and norms are behind the way language is used? How this Discourse shape our way to see others?	Mathematics learning is culturally and linguistically situated, yet the dominant language of instruction (Swedish) is valued above others, reflecting a cultural and linguistic homogeneity norm. Multilingual students are expected to adapt, while teachers manage diversity within the dominant language, reinforcing the idea that mathematical success depends on language proficiency rather than students' full linguistic resources.
The Figured Worlds Tool	What typical stories does the data invite the reader to assume? Which participants, languages, roles, and values are represented or assumed within these figured worlds?	The teacher is presented as a knowledgeable guide who understands that mathematics is shaped by the language of instruction. Swedish is prioritised, reflecting a monolingual norm. Students are expected to adapt, while the teacher navigates this process within the dominant language framework.

Constructed D(d)iscourses

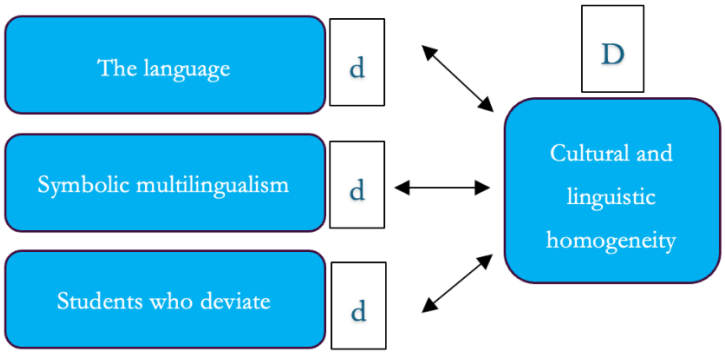
This section first describes how cultural and linguistic diversity is construed in mathematics teacher education policy through D(d)iscourses, illustrated by selected texts. Thereafter, the distribution of the discourses and potential tensions between them are described.

Cultural and Linguistic Homogeneity Discourse

This Discourse has been construed through three discourses: *the language, symbolic multilingualism* and *students who deviate* (se Figure 1).

Figure 1

The cultural and linguistic homogeneity Discourse and related discourses



The Language

A discourse was construed through the use of the term *the* language, such as:

Språk**ets**[2] betydelse i matematikundervisning	The importance of **the language** in mathematics education (University of Gävle, 2020).
Språk**ets** roll	The role of **the language** (Kristianstad University, 2023).

The descriptions emphasise language as a tool for learning mathematics, but do not specify which language is being referred to. By filling in assumptions and inferences in these excerpts, we recognise the definite form of *the* language, which suggests a particular language, but without explicit clarification. This ambiguity allows for multiple readings; it could refer to students' mother tongues or any language within their broader linguistic repertoires. Given the context of Swedish education, it is assumed that the term refers to Swedish, the official language of instruction. This points toward a cultural and linguistic homogeneity as a norm in mathematics classrooms. Furthermore, in both citations, language is positioned as the central subject. It is represented as a key factor in mathematics education, but it remains passive by influencing the learning rather than acting. The identity of the multilingual students is positioned as learners who must adapt to the language of instruction to succeed in mathematics.

Symbolic Multilingualism

Another discourse was construed through the word *multilingualism* in the following descriptions:

2 Bold text indicates the focus of analysis.

Redogöra för flerspråkiga elevers kunskapsutveckling och begreppsbildning i matematik. Vidare belyses hur val av arbetssätt kan påverka flerspråkiga elevers möjlighet till matematiklärande. Kursen ger också en beredskap att tillämpa olika arbetsformer.	Describe the knowledge development and concept formation in mathematics of multilingual students (University of Borås, 2023b). Furthermore, the course highlights how the choice of working methods can affect multilingual students' opportunities for learning mathematics. The course also prepares students to apply different working methods (University of Borås, 2023b).

The first description suggests that multilingual students have unique ways of acquiring knowledge compared to the 'general' mathematics student, highlighting a differentiated perception of their understanding of mathematical concepts. Although the focus is on multilingual students and their development in mathematics, they are portrayed as passive learners, affected by external factors like teaching methods, rather than as active agents in their own learning. Using the fill-in tool, it remains unsaid that multilingual students may face linguistic barriers in accessing mathematical content, requiring teachers to adapt their methods to support them. The teachers' identities, implied by the indefinite subject, are positioned as active and responsible agents in selecting and applying appropriate methods, in relation to the multilingual students' identities, who are passive recipients of instruction. The second description underscores the importance of didactical choices, particularly in how they influence the learning opportunities of multilingual students, as if these students require specialised methods. While this description suggests that the course should include examples to illustrate this approach, it lacks concrete guidance on implementation.

Another way to address multilingualism is by using the phrase "first- and second-language perspective" in relation to "subject-specific language":

Visa kunskap om och förmåga att beakta sambandet mellan det **ämnesspecifika språket** och elevers kunskapsutveckling ur ett **första- och andraspråksperspektiv**.	Demonstrate knowledge of and ability to consider the relationship between **subject-specific language** and students' knowledge development from a **first- and second-language perspective** (Malmö University, 2023).

Even though this excerpt addresses first and second languages, we interpret it as separating students' languages into isolated entities. Here, the language of instruction is positioned as necessary for success, particularly in relation to "subject-specific language" and "students' knowledge development". The approach of separating languages stands in contrast to a translanguaging approach, in which languages are viewed holistically as part of a unified linguistic

repertoire (e.g., García & Li, 2014). Through the use of the fill-in tool, students with different linguistic backgrounds may experience unequal access to mathematics. This excerpt enacts the identity of the professional, responsible, pedagogically and linguistically competent teacher, while also positioning students as learners whose success depends on the teacher's ability to address linguistic issues in mathematics.

Multilingualism is also evident when it is positioned in contrast to the language of instruction:

Språkets betydelse i matematikundervisning, både matematik som **språklig praktik** och **flerspråkighet i matematikundervisning**.	The importance of **the language** in mathematics teaching, both mathematics as **a linguistic practice** and **multilingualism in mathematics teaching** (University of Gävle, 2020).
Visa förmåga att reflektera över språkets roll i matematikundervisningen och **flerspråkselevers lärande i matematik**.	Demonstrate the ability to reflect on the role of the language in mathematics teaching and the **learning of multilingual students in mathematics** (Jönköping University, 2022).

The first excerpt starts by pointing to "*the* language," which, by filling in assumptions, we interpret as referring to Swedish. The importance of this language is then divided into "mathematics as a linguistic practice" and "multilingualism in mathematics teaching." The former is interpreted to referring to the use of "the language" as a communicative tool for mediating mathematical knowledge. This highlights the role of the Swedish language in supporting interaction and understanding. The latter focuses on the importance of the Swedish language for multilingual students' learning in mathematics. In this case, multilingual students are expected to acquire Swedish to succeed in mathematics education. This way of framing positions Swedish as the norm and contributes to a cultural and linguistic homogeneity Discourse. Similarly, the second excerpt emphasises the role of "the language" in mathematics in relation to multilingual students' learning. Hence, a monolingual approach is implicitly present, signalling a symbolic action in relation to multilingualism. Following this, a discourse of symbolic multilingualism is construed.

Students Who Deviate

Another discourse is construed by the use of the wordings "students in need" and "students' differences". These wordings position the students as students who deviate from a norm:

Differentiering av matematikundervisning i årskurserna 4-6, med speciellt fokus på elever **i behov** av extra anpassningar, elever i behov av särskilda utmaningar samt elever med **olika språkliga och kulturella bakgrunder**. Vidare behandlas elevers olikheter i relation till **exempelvis genus, klass, etnicitet och normalitet/avvikelse och dess inverkan på lärande och undervisning i matematik**.	Differentiation of mathematics teaching in Grades 4–6, with a special focus on students **in need** of extra adaptations, students in need of special challenges, and students with **different linguistic and cultural backgrounds** (Mälardalen University, 2023) Furthermore, **students' differences are addressed in relation to, for example, gender, class, ethnicity, and normality/deviation and their impact on learning and teaching in mathematics** (Linköping University, 2013)

In the first description, the emphasis is on compensatory demands directed at students framed as *in need*. These needs may be interpreted in various ways: as special educational needs, additional challenges, or difficulties related to limited proficiency in the language of instruction. This framing positions them as deviating from the norm and as requiring special attention from the teacher. This suggests that deviation from the linguistic majority norm is a problem to be addressed. Consequently, the discourse might contribute to a cultural and linguistic homogeneity Discourse in which multilingual students require specialised knowledge and skills to be effectively supported in their education. The subject tool highlights how the teacher is positioned as an active agent, expected to make pedagogical decisions and adapt instruction based on student differences.

The second description enhances differentiation aspects by using the word *ethnicity*, along with normality/deviation, which impact learning and teaching mathematics. By filling in assumptions, the description implicitly frames the students' differences as an issue that the education system must deal with, rather than as an asset that can enrich the mathematics classroom. There is also an assumption that social categories shape mathematics education. Students' identities are positioned as passive, while educators' identities are positioned as active and expected to respond to these differences. This enactment of identities leads to the construction of a teacher who reflects on how broader social structures influence learning and is expected to take on the role of facilitator. It also assumes that mathematics education is not neutral, but is shaped by societal norms, with students' differences playing a central role in teaching and learning.

The discourse "students who deviate" was also framed through a deficit perspective on cultural diversity:

Kunna redogöra för begreppet särskilda utbildningsbehov i matematik (SUM) samt **kulturella och sociala aspekter på lärande i matematik ur ett specialpedagogiskt perspektiv**.	Be able to describe the concept of special educational needs in mathematics (SUM), as well as **cultural and social aspects of learning in mathematics from a special educational perspective** (Linnaeus University, 2014)

This description shows the importance of considering cultural and social aspects from a special education perspective. The cultural aspects can be assumed to include the challenges multilingual students face in understanding mathematical concepts within the Swedish context due to cultural differences in interpreting and working with mathematical concepts. This perspective positions cultural and linguistic diversity as potential obstacles to mathematics learning, framing multilingual students' identities as requiring special education support to overcome these challenges. Hence, the special education perspective may unintentionally reinforce a discourse of cultural and linguistic homogeneity by treating diversity as a deviation from the norm.

Summary

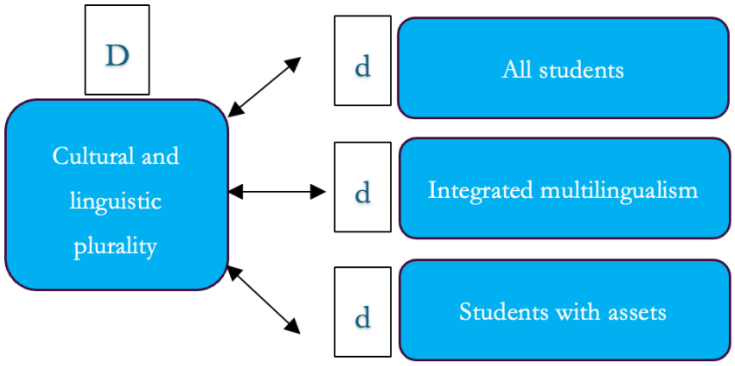
The cultural and linguistic homogeneity Discourse is narrated by a figured world where the Swedish language is seen as superior, and other languages are viewed as obstacles that the education system must compensate for. The educators' identities are portrayed as experts and helpers, while students with multilingual backgrounds are seen through a deficit perspective, lacking the necessary knowledge and requiring support. This creates a power imbalance, positioning the teacher as the authority and the student as the one who shall adapt. While such power dynamics are inherent to most educational settings, the Discourse reinforces a particular asymmetry where the teacher is construed as the active, knowledgeable agent responsible for recognising and addressing student differences, whereas students are portrayed as passive recipients without influence. Languages are treated as separate reinforcing a monolingual norm where Swedish is the only legitimate language for learning. In this figured world, teacher educators shall promote a compensatory pedagogy, encouraging pre-service teachers to adopt it in mathematics classrooms. This emphasises conformity to the dominant language and culture.

Cultural and Linguistic Plurality Discourse

This Discourse has been construed through three discourses: *all students, integrated multilingualism,* and *students with assets* (se Figure 2).

Figure 2

The Cultural and Linguistic Plurality Discourse and related discourses.



All Students

A discourse was construed by the use of the word "inclusion" in the curriculum, such as:

Lärarutbildningen [...] skall baseras på ett **inkluderande** perspektiv, vilket innebär strävan efter att lärarstudenterna utvecklar förmågor att **anpassa verksamheten** utifrån **alla elevers förutsättningar, behov och olikheter.**	Teacher education [...] should be based on an **inclusive** perspective, which means striving for teacher students to develop the ability **to adapt** activities based **on all students' conditions, needs, and differences** (Jönköping University, 2024)

In mathematics education course syllabi inclusion in relation to students' differences was used by descriptions such as:

Studenten ska utveckla förmåga att genomföra en **varierad, lustfylld, meningsfull och inkluderande matematikundervisning** om aritmetik som **tar hänsyn till elevers olika intressen och förutsättningar att lära matematik.**	The student should develop the ability to conduct **varied, enjoyable, meaningful, and inclusive** arithmetic **teaching** that takes **students' different interests and conditions for learning mathematics** into account (Halmstad University, 2022)

Inclusion was also used by relating it to all students in different phrasings such as "each student", "every student" and "all students":

Visa fördjupad förmåga att skapa förutsättningar för **alla elever** att lära och utvecklas.	Demonstrate an advanced ability to create conditions for **all students** to learn and develop (University of Gothenburg, 2020).

When encountering 'all students' and connotating phrases, we filled in and assumed that they are intended to include culturally and linguistically diverse students. The assumptions and inferences in these excerpts show that they promote an inclusive and student-centered approach to mathematics teaching, where the teacher is positioned as an active agent who responds to learners' differences. In this context, students' identities are construed as diverse individuals with unique potential. This way of expressing inclusion by emphasising every individual student is interpreted as aligning with a cultural and linguistic plurality Discourse, where mathematics teaching is expected to ensure equitable learning opportunities for all learners. However, the discourse remains vague about how such inclusion should be implemented in the classroom.

Intergrated Multilingualism

The discourse integrated multilingualism was construed by descriptions such as:

Visa kunskap om **flerspråkighet i relation till lärande** och ha kunskap om **språk- och kunskapsutvecklande arbetssätt** så att lärande möjliggörs **oberoende av elevers bakgrund** samt visa kunskap om **hur** sådan undervisning kan organiseras i praktiken.	Demonstrate knowledge of **multilingualism in relation to learning** and have knowledge of language and **knowledge-developing approaches** so that learning is enabled **regardless of students' backgrounds,** and demonstrate knowledge of **how** such teaching can be organised in practice (University of Gothenburg, 2020)

This description explicitly acknowledges multilingualism in relation to learning by presenting a specific pedagogical approach, "language- and knowledge-developing approaches". Although this approach could risk reinforcing a cultural and linguistic homogeneity perspective centring the dominant language, the phrase "enabled regardless of students' backgrounds" counteracts this risk. Furthermore, the description addresses not only the "what" but also the "how", emphasizing the importance of equipping pre-service teachers to apply these practices in their future teaching. By using the subject tool, the teacher is positioned as an active agent, implying both responsibility and initiative. The policy constructs the identity of a linguistically aware and inclusive teacher as a

professional who understands multilingualism and is capable of translating that understanding into equitable teaching practices, particularly in relation to the students' backgrounds.

Students with Assets

Another discourse is construed through the use of the terms: *students' interests*, *conditions*, and *experiences*. These wordings assume that students come to school with experiences shaped by their cultural and linguistic backgrounds, among other things, for example:

Under utbildningen ska studenten utveckla medvetenhet om och förhållningssätt till värdegrund, hållbar utveckling, jämställdhet**, kulturell mångfald och människors skilda utgångspunkter och erfarenheter** i enlighet med rådande styrdokument.	During the education, the student should develop awareness and attitudes towards core values, sustainable development, gender equality, **cultural diversity, and people's different perspectives and experiences** in accordance with current governing documents (Kristianstad University, 2020)
Visa förmåga att **anpassa sig till elevers tidigare kunskaper och intressen** samt verksamhetens behov.	Demonstrate the ability **to adapt to students' prior knowledge and interests,** as well as the needs of the educational setting (University of Borås, 2023a)
Kursens fokus är att studenterna utvecklar en fördjupad förståelse av grundläggande matematik och fördjupade kunskaper om hur olika kvaliteter i elevers lärande kan bedömas samt **hur olikheter i elevers lärande av matematik kan ses som en tillgång.**	The course focuses on students developing an in-depth understanding of fundamental mathematics and advanced knowledge of how different qualities in students' learning can be assessed, as well as **how differences in students' learning of mathematics can be seen as an asset** (University of Borås, 2023b).

These descriptions emphasise adapting mathematics teaching to the diversity, rather than adapting students to fit into the teaching. They highlight students' diversity, interests, prior knowledge, and differences as assets that can enhance teaching. By filling in assumptions and inferences in these descriptions, we recognise an attempt to challenge the homogeneity norm in mathematics education by valuing cultural and linguistic diversity. Furthermore, the discourse promotes a norm where teaching is about creating meaningful and accessible learning for all.

However, using the fill-in tool, the phrase 'can be seen' (kan ses) suggests that prevailing societal assumptions may still frame students' differences as problems. The focus is on seeing these differences as assets, yet there is no explanation of how or why they should be recognised, used, or integrated as resources in the mathematics classroom.

Another way to address students with assets is by recognising that mathematics is shaped by diverse cultures; therefore, mathematics teaching should reflect this diversity:

Matematiska influenser från olika kulturer.	**Mathematical influences from different cultures** (Uppsala University, 2022)
Geometriska grundbegrepp i ett **historiskt och kulturellt perspektiv** samt om **personer av betydelse för matematikens utveckling**.	Basic concepts of geometry from a **historical and cultural perspective**, as well as about **individuals significant to the development of mathematics.** (Jönköping University, 2022).

Using the fill-in tool, there is an underlying assumption that mathematics is understood as not culturally neutral and its development has been shaped by global cultural history. Another possible assumption is a willingness to challenge Eurocentric narratives in mathematics education. These descriptions present mathematics as a cultural practice and affirms the contributions of various cultures. In doing so, it positions different ways of knowing and doing mathematics as valuable resources. Mathematical knowledge is not confined to Western traditions alone. Similarly, the second formulation acknowledges the role of mathematics in a broader cultural context by highlighting how mathematical knowledge has been shaped by contributions from diverse cultures and individuals.

Summary

The cultural and linguistic plurality Discourse is narrated by a figured world where teachers are expected to adapt their teaching to meet the diverse needs of students, rather than expecting students to conform to the existing system. While teachers still hold a central role in this Discourse, they are seen as facilitators, and their didactical choices are crucial in shaping education that is responsive to all students' backgrounds. Students are active participants with their own interests, conditions, and needs, which influence both teaching and learning. This perspective decentralises the normative assumptions of a dominant language of instruction and instead emphasises multiple ways of teaching and learning mathematics, drawing on cultural and linguistic diverse experiences. Language remains a key tool for communication, but multilingualism is recognised as an integrated and valued resource within the educational context. Teacher educators in this figured world go beyond theoretical discussions of multilingualism in mathematics education, providing practical examples for pre-service teachers on how to implement transformative and critical pedagogies.

These pedagogies aim to ensure that all students are recognised and acknowledged, regardless of their language and cultural background. This approach aligns with what can be described as a recognition pedagogy, which actively acknowledges, values, and legitimises cultural and linguistic diversity in mathematics education.

Exploring the Distribution of the Construed D(d)iscourses

As mentioned, the general objectives outlined in the educational curricula are identical across all universities. To avoid redundant analysis, we focused on curriculum content that extends beyond these general objectives. However, it is worth noting that cultural and linguistic diversity is not explicitly addressed within the general objectives. Instead, these aspects are indirectly referenced through broad and inclusive formulations, such as "all students."

Our results show that eight out of twenty educational curricula (40%) merely reflect the identical policy descriptions of cultural and linguistic diversity in the general objectives, without further elaborating of these aspects. In these documents, references to cultural and linguistic diversity are absent both in the descriptive sections and in the locally defined learning objectives. Consequently, the inclusion of cultural and linguistic diversity remains vague and unspecified.

Thirty-two out of the 55 (approximately 58%) analysed course syllabi do not address aspects of cultural and linguistic diversity. This indicates that such perspectives are largely absent and marginalised in the policy documents governing mathematics teacher education in Sweden. The remaining mathematics education course syllabi and educational curricula where cultural and linguistic diversity was addressed (12 educational curricula and 23 course syllabi) were used to construe the D(d)iscourses previously presented. Table 3 presents the distribution of identified D(d)iscourses across curricula and syllabi, forming the basis for analysing their prevalence, dominance, sporadic occurrence, and the tensions between them.

Table 3

Distribution of the discourses.

Cultural and linguistic homogeneity Discourse					
The language		Symbolic multilingualism		Students who deviate	
Curriculum	Syllabi	Curriculum	Syllabi	Curriculum	Syllabi
3	13	2	3	0	13
Cultural and linguistic plurality Discourse					

All students		Integrated multilingualism		Students with assets	
Curriculum	Syllabi	Curriculum	Syllabi	Curriculum	Syllabi
7	23	1	0	12	12

Tensions

We identified three tensions between the six discourses. The first tension found is between the discourse "all students" and the discourse "the language". As Table 3 shows, "all students" is a dominant discourse, which we attribute to the Higher Education Ordinance (SFS 1993:100) and the Swedish Higher Education Act (SFS 1992:1434) emphasising inclusion of all students across all educational practices. However, the policy documents also promote a discourse of "*the* language," which positions Swedish as the primary and necessary language for learning and succeeding in mathematics. This creates a tension as, while the discourse of "all students" suggests that all learners should be equally supported and included, the discourse of "the language" implicitly prioritises students who already have proficiency in Swedish. Consequently, multilingual students may be disadvantaged, despite the inclusive intentions.

The second tension is between the discourse "symbolic multilingualism" and the discourse "integrated multilingualism". The results show that multilingualism is almost entirely absent. Although the language used suggests an intention to include multilingualism in mathematics education, our analysis reveals that such inclusion is predominantly symbolic. Multilingual aspects are mentioned, ostensibly to promote inclusion, but the way they are framed, risks reinforcing othering and exclusion. Out of the 75 documents analysed, we found only one formulation in one educational curriculum that adopts an integrated multilingual approach.

The third tension found is between the discourse "students with assets" and "students who deviate." The tension arises from whether students are recognised for their diverse contributions or framed as lacking due to limited proficiency in the instructional language. The discourse "students who deviate" portray certain students as deviating from a norm. This latter discourse tends to emphasise differentiation and othering within mathematics education. We found that the discourse of "students with assets" is clearly reflected from the educational curricula into the course syllabi, as its distribution remains consistent across both document types. In contrast, the discourse of "students who deviate" is entirely absent from the educational curricula, although it appears

prominently in the mathematics education course syllabi. This suggests that mathematics teacher education is framed through a Western pedagogical lens which may undervalue alternative cultural approaches to learning.

Discussion

In this article we aimed to examine the clarity, and the implications of how cultural and linguistic diversity is described in mathematics teacher education policy. This by answering the research question, *how cultural and linguistic diversity is discursively construed in mathematics teacher education for Grades 4–6 in Sweden at policy level*. Two dominant discourses emerged from our analysis: the discourse of cultural and linguistic homogeneity, which reinforces a monolingual norm, and the discourse of cultural and linguistic plurality, which recognizes and values students' diverse backgrounds. Further, our findings indicate that cultural and linguistic diversity are marginally addressed in the policy documents that guide mathematics teacher education. When mentioned, the descriptions are often vague and lack clear direction, limiting their practical application. Consequently, it is not unexpected that pre-service teachers report feeling unprepared to address the needs of culturally and linguistically diverse learners, as shown by the findings of Paulsrud and Zilliacus (2018) and Meaney and Rangnes (2024).

The way teacher educators interpret and implement course syllabi significantly shapes pre-service teachers' assumptions and knowledge about teaching and learning mathematics. The absence of explicit guidance may result in insufficient attention to the needs of students from culturally and linguistically diverse backgrounds within mathematics teacher education. Consequently, pre-service teachers are often left to manage cultural and linguistic diversity without sufficient support. Drawing on the cultural and linguistic homogeneity Discourse, teacher educators are expected to promote a compensatory pedagogy, encouraging pre-service teachers to adopt it in their classrooms. This approach emphasises conformity to the dominant language and culture, rather than challenging or transforming the educational system to become more inclusive. In contrast, drawing on the cultural and linguistic plurality Discourse, a recognition pedagogy is promoted, aligning with post-abyssal thinking (Santos, 2014), actively valuing and legitimising cultural and linguistic diversity in mathematics education.

Although a discourse that frames students' languages as assets could be construed as indicating some guidance, the policy documents do not specify *how* students' full language repertoires can be meaningfully integrated into mathematics teaching. Even though prior research has emphasised the importance of multilingual mathematics teaching (e.g., Adler, 2001; Planas & Chronaki, 2021; Planas, 2018) and language-responsive mathematics instruction (e.g., Prediger & Zindler, 2017; Smit et al., 2016; Wessel & Erath, 2018), these approaches are not reflected in the analysed policy documents. Thus, responsibility for addressing cultural and linguistic diversity is left to individual teacher educators and pre-service teachers.

A key question is why cultural and linguistic diversity is so scarcely addressed. One explanation could be the dominance of Western ideals and conceptions of mathematical competence (Alhadi Alhasani et al., 2022; Heleta, 2016; Mudaly, 2018). Although efforts have been made to acknowledge epistemological diversity in mathematics teacher education policy, the identified tensions show that colonial perspectives (see Santos, 2014) persist in policy documents. The tensions also allow for varied interpretations and approaches to diversity. Hence, in the absence of clear guidance, educators may default to dominant, often monolingual and Western-centric, frameworks, risking diversity being sidelined or addressed only superficially. While multilingualism is mentioned explicitly, our analysis reveals that such references are largely symbolic and can be viewed as a reinforcement of a Western-centric view of mathematics education. Therefore, these perspectives continue to uphold Western mathematics as the dominant form of knowledge (Norén & Valero, 2022). The role of students' mother tongues in mathematical learning is notably absent, as are epistemological perspectives on multilingual reasoning. Embedded epistemological aspects, as highlighted by Prediger et al. (2019), are ignored, and the need to address these issues is also overlooked, as also concluded by Ryan and Parra (2019).

We argue that the inclusion of cultural and linguistic diversity in mathematics teacher education must move beyond symbolic representations. Merely referencing multilingualism does not guarantee meaningful inclusion. As identified in the discourse of *symbolic multilingualism*, such descriptions may unintentionally signal exclusion, implying that teachers require special expertise to address linguistic barriers. Further, vague formulations, such as "all students", can sometimes serve an inclusive purpose by avoiding exclusion. However, other ambiguous expressions, such as "the language," should be specified in plural form to create space for multiple languages. This

avoids legitimizing one dominant language and marginalizing students with other cultural and linguistic repertoires.

This framing risks positioning culturally and linguistically diverse students as deficient. Therefore, we advocate for a clearer framework in which these students are recognized as active agents in their own learning, where their cultural and linguistic repertoires are seen as assets that enrich mathematical thinking and broaden others' mathematical horizons. Pre-service teachers should be educated to act as facilitators of diversity within and beyond the classroom in accordance with Meaney and Rangnes (2024) by adapting their instruction to meet the needs of diverse learners, using students' languages and cultural knowledge as resources and engaging in institutional change to promote inclusion. Our findings indicate that policy tends to treat students' languages as separate entities, which stands in contrast to García and Li's (2014) translanguaging perspective, which views students' linguistic resources as a unified whole. Furthermore, framing diversity as deviation risks shaping pre-service teachers' attitudes and expectations in ways that undermine the identities of culturally and linguistically diverse students. In the long term, this may lead to passivity in the mathematics classroom, where students' repertoires are neither valued nor utilized, reinforcing abyssal thinking (Santos 2014), invisibilisation, and epistemic violence (Heleta, 2016; Mudaly, 2018).

Conclusions

While we recognise the professional autonomy of teacher educators in interpreting policy documents, our findings, reinforces Paulsrud and Lundberg (2021) result that cultural and linguistic diversity is not sufficiently addressed in teacher education. Therefore, clearer guidance and concrete examples in policy documents could support teacher educators in integrating these aspects into their mathematics education teaching. Consequently, we conclude that there is a need for policy reform that explicitly addresses epistemological, cultural and linguistic diversity particularly within the course syllabi of mathematics teacher education. In line with Santos (2014), we suggest a reform that challenges epistemological hierarchies and embraces knowledges that have historically been rendered invisible by abyssal thinking. To exemplify this, we present a reformulated course objective that addresses cultural and linguistic diversity.

Original	**Reformulated**
Demonstrate the ability to reflect on the role of the language in mathematics teaching and the learning of multilingual students in mathematics (Jönköping University, 2022).	Demonstrate the ability to reflect on the role of languages in mathematics teaching, and how teaching can be designed to recognize, value, and integrate multilingual students' cultural and linguistic repertoires as resources to enrich the mathematical learning for all students.

The revised formulation embraces students' full cultural and linguistic repertoires as pedagogical resources. It supports the development of their identities by recognizing these repertoires and positioning the teacher as a facilitator who actively promotes their use and appreciation in the mathematics classroom. This shift can support mathematics teaching in recognizing all students' engagement, promoting equity, and fostering deeper mathematical understanding.

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