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Article

Addressing Language Diversity in Early Years Mathematics: Proposed Classroom Practices through a Live Brief Assessment

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Abstract: There is a growing emphasis on the role of language in teaching and learning mathematics, most significantly in classrooms with increased language diversity. Consequently, teachers face considerable challenges in accommodating diverse needs and must employ strategies to support all students. It is, therefore, crucial to provide prospective teachers with opportunities to enhance their pedagogical approaches while raising their awareness of the relationship between language and mathematics. In this respect, Live Brief assessments in Higher Education, which involve students working on authentic projects/tasks from a school, may be a promising avenue. This research draws on the 19 Live Brief group presentations prepared by a total of 118 Year 1 prospective primary school teachers, specifically focusing on the language-related challenges faced by a local school in early years mathematics. The data encompassed prospective teachers' proposed practices, including one-to-one, small group and whole class activities, that aimed to address language diversity. Data analysis was informed by Moschkovich's three perspectives on the relation between language and teaching and learning mathematics, namely lexicon, register and situated-sociocultural perspectives. While a lexicon perspective was commonly evident in the activities, the manifestation of a situated socio-cultural perspective mainly in the one–to-one activities is noteworthy, given its social and discursive nature. Three themes encapsulated a range of practices suggested in the findings: explicit vocabulary teaching, different strategies of scaffolding and utilising multi-sensory approaches. While the lexicon and register perspectives were commonly evident, the situated socio-cultural perspective was much less commonly manifested in the practices. We offer implications to initial teacher education curriculum, future research and policies about teaching and learning mathematics.

Keywords: language; mathematics; England; Live Brief assessment; language diversity; early years

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1. Introduction

The importance of language in teaching and learning mathematics has gained increasing attention, especially within diverse language contexts to promote equitable practices [1–8]. In Sfard and Kieran's (2001) [9] view, mathematical thinking and doing cannot be differentiated from the act of mathematical communication, which occurs through different channels, including multiple languages, different variations of the same language, gestures, diagrams, symbols, etc. It is, therefore, crucial that all pupils, especially if the language of instruction is different than their home language, need to be supported to be able to learn to communicate mathematically [3,10]. In this respect, the early years context is particularly significant. Research suggests that many socially disadvantaged children in early years are less likely to develop their spoken language and vocabulary [11], which makes early interventions essential to address issues around language skills and mathematics knowledge [12,13]. Nevertheless, there appears to be a research and practice gap in terms of how to prepare teachers to address language diversity in classrooms [14–17] to develop meaningful interventions. Although the conceptualisation of this support, especially in initial teacher education, is a complex endeavour due to limited access to schools' socio-cultural contexts, it is vital to explore prospective teachers' perspectives and proposed practices through authentic assessments.

In Higher Education, Live Brief assessments (real-world projects) are one possible avenue for providing access to schools' realities. Typically, Live Brief assessments aim to provide authentic tasks, which are within the scope of learning outcomes of modules, and are presented by external organisations to university students. University students collaborate to suggest development ideas and/or solutions to address the task at hand. Subsequently, university tutors and external organisations provide feedback to students' solutions/ideas. Arguably, such authentic assessments may offer enhanced access to the complexities of schools' practices with noteworthy caveats that we will examine in the following sections. Addressing those caveats, Live Brief assessments may provide an opportunity for prospective teachers to influence schools by bridging theory and practice. Within the context of this research, Live Brief assessments are utilised in an undergraduate course focused on subject knowledge in mathematics. Students were tasked with addressing a local school's development idea, titled 'How to Close the Language Gap in Early Years?'

This research addressed the following questions to address the aforementioned gaps:

- What are teaching practices that prospective teachers propose through Live Brief presentations to address language diversity in early years mathematics? (or as the school stated, to address 'the language gap' in early years mathematics).

We the authors of this paper, would like to position ourselves within this research before we outline some key literature on this field. Primarily, we believe that our identities have influenced how we approached this particular research, including the types of questions we asked and how we interpreted the data. Firstly, we possess language diversity ourselves, in the sense that our home language, Turkish, is accompanied by English in our language repertoires. Both of us have experience of teaching mathematics in Turkish and English, in contexts where languages other than those were the dominant languages of instruction. For instance, the first author taught mathematics in a primary school in Finland, while the second author taught mathematics in Denmark. Moreover, we are both passionate about teaching mathematics for social justice and reject the discourses of 'innate ability' and deficit approaches. In contrast, we firmly believe that everybody can and should learn mathematics as a human activity because it holds the power to enable asking the right questions to understand and change the world for the better.

With these reflexive notes in mind, we begin by defining language diversity and scoping the literature on the complex relationship between language diversity and mathematics. We then offer details about the context and design of this research before presenting the findings. We conclude with revisiting the related literature for final remarks and offer implications for teacher education, future research and mathematics education policy.

1.1. Language Diversity and Mathematics

1.1.1. Language Diversity

Considering current world events, including migration and technological advancements, 'mathematics education is always happening in the context of language diversity' [18], p. 4. Drawing from Planas et al. (2018) [5] and Barwell et al. (2016) [18], we understand language diversity as 'the languages of the learners as they interact with mathematics but also to the languages for communication: official languages of instruction, languages of teaching, and languages of thinking and learning' [5], para. 17. The use of the term language diversity is, therefore, not solely connected to the concepts of 'multilingualism' or having 'English as an additional language (EAL)'. Instead, it accounts for a broad range of communication mediums such as dialects, sign languages, diagrams, symbols, etc. In fact, these very concepts can be problematic considering teaching mathematics for social justice.

One reason is that the aforementioned concepts marginalize some groups of students as they are not part of the norm. This may result in deficit approaches in teaching and learning mathematics, such as simplifying content to make it 'more accessible' [19]. Additionally, as Barwell et al. (2016) [18] discussed, the concepts 'multilinguism' and 'EAL' imply static forms of communication and a particular focus on languages, rather than learners. Barwell et al. (2016) [18] also state that it is often difficult to have neat boundaries between languages, hence these concepts are not particularly helpful for designing equitable mathematics teaching practices. García (2017) [20] agrees with this stand, by advocating for 'translanguaging', which involves leveraging all the language repertoires learners possess, transcending traditional language boundaries and shifting the focus from languages to learners. Similarly, Mazzatti (2022) [21] p. 4, defines translanguaging as 'complex ways of using languages to communicate, to understand, and to transform'. Nevertheless, the ways in which these languages are used in mathematics classroom by teachers can be politically and socially constructed under the dominance of monolingual curricular standards [22]. Chronaki et al. (2022) [22] suggest that considering the relational and interactive act of dialogicality in translanguaging is important to prevent the marginalization of some students. Even within the 'monolingual' teaching context, the term 'heteroglossia' is helpful to understand the complexity of learners' language repertoires. Bakhtin's (1981) [23] notion of heteroglossia refers to various forms of speech types, due to, for example, socio-cultural differences. Language diversity includes and goes beyond the concepts of 'multilinguism', 'EAL, 'translanguaging', and 'heteroglossia' and draws attention to 'language as a resource' rather than an obstacle. To account for such variation, while policy rhetoric commonly utilises the term 'English as Additional Language' (EAL–e.g., [24]) in the context of this paper. (While offering an extensive theoretical account on the aforementioned concepts in this section is beyond the scope of our paper, we believe the descriptions provided above serve to conceptually situate our research).

1.1.2. The Nature and Purpose of Mathematics

The notion that mathematics is a universal language and/or a culture-free subject, predominantly emphasizing cognitive aspects of learning, has been challenged. The "social turn" [25] and subsequently "socio-political turn" as termed by Gutiérrez (2013) [26], have been influential in reconsidering the nature and purpose of mathematics education. This change in perspective has led to an increased recognition of the interdependence between mathematics education and the sociocultural contexts in which teaching and learning take place. Particularly, it highlights how this context influences the languages used in mathematics. Concepts such as 'ethnomathematics' [27], 'speaking mathematically' [28], and more recently, the 'situated sociocultural perspective' [4], and the 'culturalist perspective' [29] reflect this shift. Furthermore, Gutierrez's [30,31] four dimensions of equity is another helpful framework to consider the nature and purpose of mathematics. She discusses how teaching mathematics often aims to provide 'access' (e.g., teaching vocabulary in English) and 'achievement' (e.g., high scores in tests), but oversights 'identity' (e.g., how students develop their mathematical identity within language diversity, whether they have opportunities to use their cultural and language resources) and 'power' (e.g., developing sense of agency and consciousness over mathematical learning to understand and change the world). All these perspectives underscore that mathematics is increasingly considered as far from being a language and culture free subject, in fact the opposite holds true.

The research on mathematics education and language has also undergone a significant shift in perspective since its establishment in the 1970s. As such, mathematics teaching and learning in a language-diverse context has attracted much attention, as evidenced by the increase in research in the field (e.g., [3,10,18,30,32–34]). Initially, the focus was on a deficit perspective, which emphasized the challenges and achievement gaps faced in language-diverse contexts (e.g., [32]). However, there has been a transition towards perspectives that recognize the socio-cultural and political dimensions of language and the wide range of language repertoires learners bring to the classroom [20]. Recent changes account for sociocultural aspects of teaching and learning mathematics and view language as a valuable resource in mathematics education (e.g., [3,10,34]).

1.1.3. Addressing Language Diversity through Pedagogy

The role of teachers and pedagogy in mediating language diversity in mathematics teaching has been widely addressed in the literature (e.g., [8,22,35–38]. In line with much research in this field, Schleppegrell (2007) [39] concluded that the role of teachers for communicating mathematically was imperative. Previous research suggested a range of perspectives, concepts and potential support mechanisms to characterise teachers' role and pedagogies. For instance, Lucas et al.'s (2008) [35] concept, *linguistically responsive mathematics teaching,* underscores the importance of three pedagogical practices. These practices are acquiring knowledge of the learners' linguistic backgrounds; identification of potential linguistic challenges/demands that exist in the mathematics tasks; and scaffolding strategies to enable learners to participate and succeed in mathematics as key pedagogical approaches to address language diversity. Scaffolding, as conceptualized by Bruner (1975) [40], involves learning with the support of a 'more knowledgeable other'. Vygotsky's (1978) [41] ideas typically complement discussions on scaffolding, as he posits that learning occurs through social interaction in which language plays a crucial role. In regard to specific scaffolding practices, Zahner and Sterling (2022) [42] suggested note-taking, highlighting mathematical words, elaborating on technical terms, reasoning from context, correcting pronunciation, using home languages, and reading textbooks, which are captured as 'language access strategies'. On the other hand, García (2017) [20] argued that pedagogies should go beyond merely scaffolding and facilitate the transformation of learners as unique subjects in language-diverse classrooms, similar to to Gutierrez's (2007; 2012) [30,31] dimension of identity.

Home languages, as an essential component of one's identity, have been suggested as an indispensable resource for learning mathematics [3,8,43]. In their longitudinal research in Germany, Peter-Koop (2010) [44] found that kindergarten children (age 5) who were identified as migrants, demonstrated significantly better performance when they were offered mathematical tasks in their home language. Moreover, Chronaki et al.'s (2015) [45] found that the use of multiple languages to teach number words to children aged 4 to 6, did not only benefit the students whose home language is different than the language of instruction; it also benefitted others. Such practices can enhance all students' self-confidence while challenging the assumptions around the deficit view of students with diverse language needs. Chronaki et al.'s (2015) [45] research also underlines the importance of collective efforts to challenge such deficit notions by involving not only children, but also parents and teachers. Additionally, Clarkson (2009) [46] suggested a number of effective practices in terms of the ways in which pupils' informal language/home language can be used to progress to a more structured and academic mathematical language. There is a strong agreement in literature that limiting the use of home languages and in fact, 'simplifying' mathematical language in classrooms might inhibit students' mathematical understanding [4,19,47]. Such practices limit pupils' agency [48] and in turn might affect how they develop a positive mathematical identity [49].

Another important theme in the literature is using multimodality as a pedagogical lens to address language diversity in mathematics. Multimodality can also be seen as an important part of translanguaging as it refers to a range of modes to communicate mathematical thinking, including words, body movements, listening, writing, graphing, drawings, manipulatives, and music [18,21]. For example, activities where pupils use their bodies and gestures can enhance collective mathematical meaning-making [50] and open up new spaces for mathematical communication. Multimodality is particularly important in early years contexts, as pupils often develop their own ways of communicating through embodied activities, drawings, and manipulatives, rather than written mathematics [51]. Additionally, Sugimoto [52] employed a Language Demand Tool as a sense-making mechanism for prospective teachers focusing on a range of modes. The tool encompassed different sections for students to observe, including reading, writing, listening, speaking, and representing, alongside language support. The tool proved to be effective in redirecting prospective teachers' attention to the language demands in mathematics learning and also underscores the multimodal nature of mathematics classrooms.

In conclusion, teachers face particular challenges and opportunities in language diverse contexts, where they must make decisions considering the complexities, commonly referred to as "tensions" (e.g., [18] and "teaching dilemmas" [10,53]. Challenges include determining when to prioritise language over content, meaning making over discussion, and how to effectively support the use of multiple languages [10]. In this regard, the literature suggests that teachers might use strategies to only focus on language support and even minimise communication, which then limits how language diversity is utilised in mathematics learning [8]. This is related to teachers' beliefs and dispositions about language diversity in mathematics as some teachers might draw from 'deficit' approaches [54]. Therefore, it is crucial that prospective teachers are provided with opportunities to experience and reflect on such dilemmas or tensions to develop their repertoires for purposeful and socially just practices.

1.2. Context

1.2.1. Research Setting

This paper draws on Author 1′s involvement as a tutor on a module focused on subject knowledge in mathematics for year 1 students. The programme is a 3-year undergraduate degree in primary education studies without the Qualified Teaching Status (QTS), meaning that students can choose different pathways, instead of becoming teachers or follow an additional year of study to gain a QTS degree. If they choose to become teachers, they would be teachers of mathematics for pupils aged 3–12. Although there is a possibility that they might pursue different paths, we refer to them as 'prospective primary teachers' due to the common pursuit of becoming teachers.

The module under consideration aims to provide a foundation in key knowledge and understanding related to pedagogy and practice in early years mathematics teaching in Early Years Foundation Stage (EYFS) (ages 3–5) and Key Stage 1 (ages 5–7). One of the fundamental aims of the module is that students will be able to evaluate and identify good practices in teaching mathematics. The content of the module is mainly based on subject knowledge, but there are some insights about diverse needs in mathematics classrooms and how to address them. Nevertheless, although there are some references to communication and the importance of key vocabulary, language diversity is not explored within the module. Live Brief assessments are used as a formative assessment, which constitutes the main source of data (this will be explained in detail in the following sections).

1.2.2. National Context

In England, the importance of 'spoken language' is underscored, as teaching key mathematical vocabulary is a statutory requirement in the national curriculum of mathematics in England, which is the context of our research [55]. In regard to early years, Early Years Foundation Stage (EYFS) is a national statutory framework that sets the standards for the learning and development of children from birth to 5 years of age [56]. The EYFS framework has undergone a significant change in 2019 to be enacted in 2021, including changes in Early Learning Goals (ELGs) and a greater emphasis on communication and language. Similarly, the national curriculum for mathematics [57] mentions the importance of language in teaching and learning, including a list of key vocabulary for each area as either statutory or non-statutory requirements. (e.g., use the language of equal to, more than, less than (fewer), most, least). Pupils are also expected to reason mathematically using mathematical language; however, the insights from the curriculum seem to draw from a more cognitivist perspective, rather than socio-cultural lenses (e.g., communications to remedy misconceptions). More specifically:

> The national curriculum for mathematics reflects the importance of spoken language in pupils' development across the whole curriculum–cognitively, socially, and linguistically. The quality and variety of language that pupils hear and speak

> are key factors in developing their mathematical vocabulary and presenting a mathematical justification, argument or proof. They must be assisted in making their thinking clear to themselves as well as others and teachers should ensure that pupils build secure foundations by using discussion to probe and remedy their misconceptions [57], p. 4.

As for some statistics to set the broader context, 19.5% of pupils were recorded as having English as second language, which increases to 29.1% at the nursery level [58] in England. This suggests that the assumption of teaching in classes without language diversity should be challenged in teacher education programmes, where prospective teachers are expected to be more equipped to address language diversity through critical, purposeful, and socio-cultural lenses in teaching mathematics. With specific reference to the early years context, research suggests that although the use of language rich mathematics activities is correlated with pupils' broader mathematics skills, early years practitioners reported low levels of confidence in teaching mathematics in general and also a lack of opportunities to develop their pedagogy in mathematics [59].

2. Theoretical and Analytical Framework

We used Moschkovich's (2002) [3] three perspectives as a theoretical and analytical framework on the relation between language and learning mathematics in this study (Figure 1). These perspectives are lexicon, register and situated-sociocultural perspectives, which are powerful lenses to understand and improve teaching practices to enhance communicating mathematically, especially within diverse language contexts. Moschkovich proposed these perspectives to describe mathematics learning with particular attention paid to their relation to language. Each perspective emphasises particular aspects and practices of teaching and learning mathematics. She perceives these perspectives as relational, hence they are not mutually exclusive. More specifically, these three perspectives are nested and reflected into instructional practices with a dynamic relation to each other.

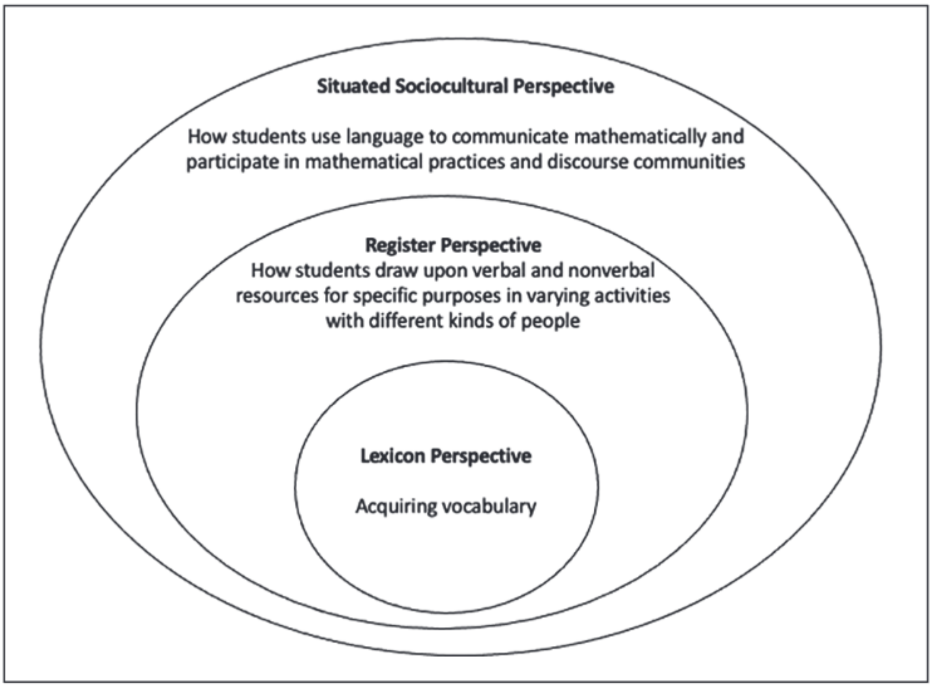

Figure 1. Moschkovich's perspectives on the relationship between language and mathematics [52] p. 179.

Lexicon perspective underscores the importance of explicit vocabulary teaching [60], which differs from a situational use of mathematical terms. An example of this could be teaching the word 'odd' as referring to numbers that are not divisible by 2. Moschkovich (2002) [3] argues that if teaching draws solely from a lexicon perspective, it will reflect a narrow view of language and subsequently limit how teachers may assess pupils' mathematical proficiency. This limitation arises because pupils may use various resources beyond verbal and written communication in the official language of instruction to illustrate their mathematical thinking. Additionally, merely having the knowledge of a set of key vocabulary may not be sufficient to participate in mathematical practices.

Register perspective refers to a language in which multiple meanings can be associated with certain terms [39]. For example, the word 'odd' may denote peculiarity, in addition to its meaning in mathematics. These multiple meanings can be confusing for some students in accessing mathematical knowledge and differentiating it from everyday language. However, Moschkovich (2002) [3] suggests that, in fact, the opposite might as well be true, that is students' using two different registers to communicate mathematically and assisting their mathematical sense-making. Nevertheless, how these boundaries are defined by teachers is open to debate. For example, Zahner and Sterling [42] proposed that Bunch's [61] pedagogical language knowledge framework with language access strategies, referring to pedagogical practices that aim to support accessing discipline-specific terminology, would be helpful. These strategies could be utilised to examine how teachers would draw such boundaries and teach everyday language with discipline-specific language.

Moschkovich's (2002, 2012) [3,4] third perspective, situated socio-cultural perspective, however, views mathematics learning as more than acquiring vocabulary. In Moschovich's [3] p. 197 words, 'A situated-sociocultural perspective can be used to describe the details and complexities of how students, rather than struggling with the differences between the everyday and mathematical registers or between two languages, use resources from both registers and languages to communicate mathematically'. For instance, if the word 'odd' was mentioned in two different social contexts, pupils had a better chance of deriving the meaning from those contexts and perhaps through using a range of resources including gestures, objects, diagrams and their home languages. This perspective suggests that students develop their own understanding mostly drawing from their sociocultural background and are engaged with multiple ways of understanding and mathematical conversation. It also acknowledges the complexities of teaching and learning, as well as its interdependency with the context in which students engage in mathematical communication. In other words, mathematical communication viewed as intercultural communication [29], using social, linguistic, and material resources to actively engage in mathematical practices [3]. As such, it goes beyond the mere substitution of words like 'tortilla' instead of 'bread' in mathematical exercises to engage Latina/o students [31]. These different perspectives imply that teachers would require a set of knowledge and skills, and perhaps employ complex, meaningful and nuanced perspectives to address complex challenges in accommodating the diverse language needs of their students.

3. Methods

3.1. Live Brief Task: Addressing the Language Gap in Early Years Mathematics

Live Brief is an authentic assessment method where university students work together to solve a problem or offer a development idea for an organisation. Live Brief assessments have been used in Higher Education to enhance collaborations between different organisations and to increase students' communication and teamwork skills through tackling real-life problems as a group [62]. Organisations, such as schools, communicate a problem or a development idea, which aligns with the specific learning outcomes of the module(s), to students to offer solutions and suggestions.

As part of the module under consideration, Live Brief assessment was utilised as a formative assessment opportunity for students to respond to a local school's development idea. Fundamentally, the module aims that students will develop subject knowledge of mathematical concepts, to identify and evaluate good practice, and to work effectively as part of a team to discuss theory and practice. In relation to these learning outcomes, Live Brief assessment offered a context for students to work as a group and identify good practices to address local school's development idea, which was about closing the language gap in mathematics. While the module did not cover this topic specifically, students had a chance to engage with various self-selected resources and readings. Due to structural limitations (e.g., time), students were asked to outline their suggested practices in a group PowerPoint presentation in English (the language of instruction).

More specifically, as part of the Live Brief task, the students were required to explain the role of language in teaching and learning mathematics, offer an action plan for the school and also suggest a whole-class, small group and a one–to-one activity. The school to which the students offered their ideas and solutions was in a socio-culturally deprived area where one-third of the students' home languages were different than the language of instruction, English. Table 1 presents information that was sent to students to address in their Live Brief presentation:

Table 1. Live Brief assessment information.

The context: The local school is a relatively small primary school with around 200 students and located in a socially and economically deprived area. One-third of the pupils speak an additional language, besides English. The largest multilingual groups are from Indian Heritage and Poland. According to the school's base line assessments, most pupils arrive at school with a vocabulary deficit and the school put vocabulary teaching at the heart of their EYFS curriculum. Vocabulary is taught in context and repeated in daily life. There are targeted speaking times devoted to developing pupils' vocabulary.
Tasks to complete: • A brief summary explaining the importance of language in mathematics • A roadmap/action plan aiming to close the language gap in mathematics • Three sample activities to go with this plan (one whole class, one small group and one one-to-one) **These activities should:** • Include suggestions to improve language rich environments • Suggest links to mathematics in those targeted speaking times • Consider students with different needs and backgrounds

3.2. Participants

The subject knowledge for teaching mathematics modules included 118 year 1 undergraduate students, and all of them participated in the Live Brief group presentation. In total, there were 19 presentations from three different groups/classes of students. Presentations were prepared in groups, so the data presented here illustrate collective proposed practices to address language diversity in early years mathematics. Author 1 acted as a tutor in the module and also took part in the formative assessment process for all presentations. Participants were not introduced to literature on the role of language in mathematics as one of their tasks was to research this area to be able to offer evidence-informed practices. The module was the students' first mathematics related module in their programme; they had previously attended modules that covered primary education, the development of children, primary pedagogy and subject knowledge in English and science and technology.

3.3. Data Generation and Analysis

Data were collected through the formative assignment submissions, students' group Live Brief presentations, for the module. In groups of 5–7, students were required to prepare a 10 min presentation, addressing the problem/development area that a local school presented for the Live Brief task. We have analysed all 19 presentations and present extracts from the ones we have permission to share.

We employed a reflexive thematic analysis [63] following the six stages below and illustrated our theme construction process in Table 2:

1. **Familiarization:** Author 1 had familiarity with the presentations through the students' live presentations. Nevertheless, we both read all the presentations independently and looked at one from each group together, thinking with Moschkovich's (2002) [3] three perspectives and related literature on the role of language in teaching and learning mathematics. This stage helped us to make meaning of data in light of the literature we have been engaging with. We made some preliminary notes for each presentation depending on our first interpretation of data and included them as 'group summaries' to inform our next stages of data analysis.
2. **Generating codes:** We chose 2 presentations from each group and started to draw links between Moschkovich's perspectives and related concepts independently with students' proposed practices. We also identified any hybrid perspectives engrained within some activities that could not be categorised into one perspective (i.e., occurrences of at least two different perspectives). We created a table (Table 3) where the occurrences of each perspective were recorded. We utilised some sensitizing concepts [64], in other words interpretive devices, that are derived from the literature (e.g., [38,42]) in generating codes. These concepts included lexicon perspective (e.g., explicit vocabulary teaching, pupils' writing their own definition); register perspective (e.g., multiple meanings in everyday life and mathematics, more focus on multiple registers instead of students' using such registers to communicate); situated-sociocultural perspective (e.g., participating, communicating, reasoning, making sense in mathematical practices using every day and mathematical discourses, language as resource). We had frequent meetings to discuss our initial codes and potential categories in light of the sensitizing concepts and our research question.
3. **Constructing themes:** Upon completion of coding all presentations and creating a summary of the occurrence of each perspective within the proposed practices, we started to think about possible ways of collating codes, categories, and practices to form themes (see Table 2). We dwelled on underlying factors that might have produced the proposed practices and some higher order concepts to capture the essence of data, addressing our research question.
4. **Reviewing themes:** We reviewed the themes, cross-checking the codes, categories, and the content of presentations to capture the dataset meaningfully and coherently.
5. **Defining and naming themes:** Three themes, explicit vocabulary teaching, scaffolding and the use of multi-sensory approaches were selected to account for the students' proposed practices in their Live Brief presentations. These themes are selected as they had the most explanatory power to capture the essence of the data and helpfully address our research question. Data extracts are chosen to illustrate each theme effectively.
6. **Writing up:** The final report has been produced collectively and reflexively, that included cross-checking the writing with the codes, themes and data set separately and engaging with discussions on the logical order of the themes and extracts from the dataset. In order to make data organisation and classification more manageable, we numbered the group presentations (e.g., G1), although we focussed on the tasks individually. We agreed that the most common practice, explicit vocabulary teaching should be the first one to portray the dataset.

3.4. Ethical Considerations

This research was granted ethical approval from the ethics committee at the university and complied with the British Educational Research Association's (2018) [65] guidelines. Students were provided with participant information sheets and asked to give their consent in an online form. Although the Live Brief presentation was formatively assessed, hence no summative grades were given, students' consent was sought at the end of the teaching period and after grades were released, to prevent any potential conflict of interest. All identifiable information (e.g., students' numbers, names) was removed from the presentations as Author 2 is external to the university.

Table 2. An illustration of theme construction.

Illustrative excerpt		
Singing number related songs: At the beginning of our lesson the whole class activity will be using songs this is a good way to close the language gap in mathematics in the EYFS this is because using music is good for active engagement with the class, it's also been shown that using songs and music within the classroom can have an impact on the way children's brains process information and enhancing their language skills and speech. In the class we will be singing the "five little ducks" alongside singing this song we will have puppets this is so we can give children a visual representation this will be especially useful for those children with additional language and needs. As we are singing the song as the whole class using puppets, we will have a video of the song to help children's cognitive recognition. Around the room we will have numbers on the walls to make it clear for the children if they need further help and guidance. This will then help to close the gap on mathematical language as it helps to explain the concept of 'one more' and 'one less'. *G9*		
Codes	**Categories**	**Themes**
• Using visual aids to scaffold • Using music for cognitive and emotional engagement • Repetition of counting • Using concrete materials (i.e., puppets) to scaffold	• Lexicon perspective (teaching counting using songs, visual aids, and puppets–providing opportunities to learn key vocabulary) • Register perspective (providing opportunities for sentence frames from daily life)	• Explicit vocabulary teaching (e.g., repetition of numbers, the numbers on the walls, the concepts of 'one more' and 'one less') • Scaffolding (e.g., the use of puppets) • Using multi-sensory approaches (e.g., the use of song and video)

Table 3. The number of occurrences of Moschkovich's perspectives in the proposed activities.

	Moschkovich's Perspectives		
Activities	**Lexicon Perspective**	**Register Perspective**	**Situated Sociocultural Perspective**
One-to-one activity	14	13	8
Small group activity	17	11	3
Whole class activity	19	11	3
Total occurrences [1]	50	35	14

[1] The reason why the total numbers do not add up to 57 (19 activities × 3 types of activities) is that some perspectives were evident as a hybrid form. We counted the occurrences of such cases for both perspectives.

4. Findings

In the following, we present an overview summary of the occurrences of the three perspectives in the activities proposed by the students. Subsequently, we illustrate a range of pedagogical approaches from the students' Live Brief presentations; namely, explicit vocabulary teaching, scaffolding, and the use of multi-sensory approaches.

4.1. Summary of the Occurrences of Moschkovich's Perspectives in the Proposed Practices

This brief section outlines a summary of the occurrences of Moschkovichs's perspectives in one-to-one, small group and whole class activities. While the table presents numerical data, we are not particularly interested in the frequencies solely. What we would like to achieve here is to illustrate a distribution of occurrences within each type of activity (i.e., one-to-one, small group, and whole class) to offer a potential starting point for future research and practice regarding addressing language diversity through pedagogy.

Table 3 demonstrates occurrences of Moschkovich's three perspectives within 57 proposed activities, that include one-to-one, small group and whole class activities (19 each). It appears that the majority of groups approached the role of language in mathematics mainly from a lexicon perspective and register perspective, although this was less prominent. Furthermore, a situated socio-cultural perspective was less significant in these practices. While this is not surprising on its own, findings suggest that although each type of activity manifested the three perspectives, a situated socio-cultural perspective was more evident in one-to-one activities compared to others. Considering the social and discursive characteristics of this perspective, we would expect it to be more prominent in small group and whole class activities. We will delve into potential reasons for this in the discussion, after examining the details of the proposed practices in the following sections.

4.2. Proposed Practices to Address Language Diversity

This section illustrates three themes to capture a range of pedagogical approaches that are proposed by prospective teachers. The first theme is about *explicit vocabulary teaching*, which captures a range of practices including offering child-friendly definitions, creating word walls for key terminology, and using repetition to expose pupils to the terminology. Secondly, we will capture practices that fall into the *scaffolding* theme, for example, teacher modelling and creating small groups to offer language support. Finally, we will present a range of *multi-sensory approaches*, such as the use of songs and concrete materials. In each theme, we will map Moschkovich's three perspectives and provide example activities from student presentations. These example activities aim to illustrate the theme under exploration and also how these activities diverge or converge with others.

Explicit Vocabulary Teaching

Teaching key mathematical terms explicitly emerged as a common practice in the students' presentations. They shared a common rationale for teaching vocabulary, aiming to address the 'language gap' in mathematics mostly because acquiring vocabulary was perceived as the central problem that pupils had, echoing national curriculum documents and policy rhetoric. G10, for example, underlined the significance of vocabulary development in fostering mathematical proficiency. Similarly, most groups put an emphasis on how the National Curriculum for Mathematics stated the importance of mathematical vocabulary for mathematical justification, argument, or proof [57]. While there was focus on the explicit vocabulary teaching as an activity mostly distinct from everyday life contexts, there were some instances where the groups alluded to key vocabulary as something to be utilised in real life. For example, G2 stated that 'By regularly being exposed to mathematical language, the students are more likely to understand and incorporate what they have learnt into their everyday dialogue.' As for how this 'exposing' is done, different approaches were evident, including offering child friendly definitions, creating word walls so that pupils can see key terms frequently and focusing on repetition for memorisation, as stated by G1:

> Teacher addresses the important key words for the lesson, whilst the children are gathered during 'carpet time'; ensuring the mathematical terms have been repeated and rehearsed collectively by the students multiple times to develop their memory and familiarisation.

The suggested activities typically involved teachers starting the lesson by teaching the definitions of words and subsequently referring to them, while questioning pupils' understanding of those words later. Mostly, the expectation from teachers was to lead vocabulary acquisition by creating opportunities for students. The following example illustrates this common practice (Figure 2).

The above one–to-one activity mainly draws from a lexicon perspective as it pays attention to creating opportunities to see, hear and say key terminology. However, it remains unclear how language diversity is supported. Arguably, incorporating visuals might have been considered as a support to learn key vocabulary. However, such approaches may lead to rote memorization rather than supporting students' active meaning-making processes. Consequently, connecting mathematical language to home languages and learning key vocabulary in context to communicate mathematical reasoning remained unaddressed.

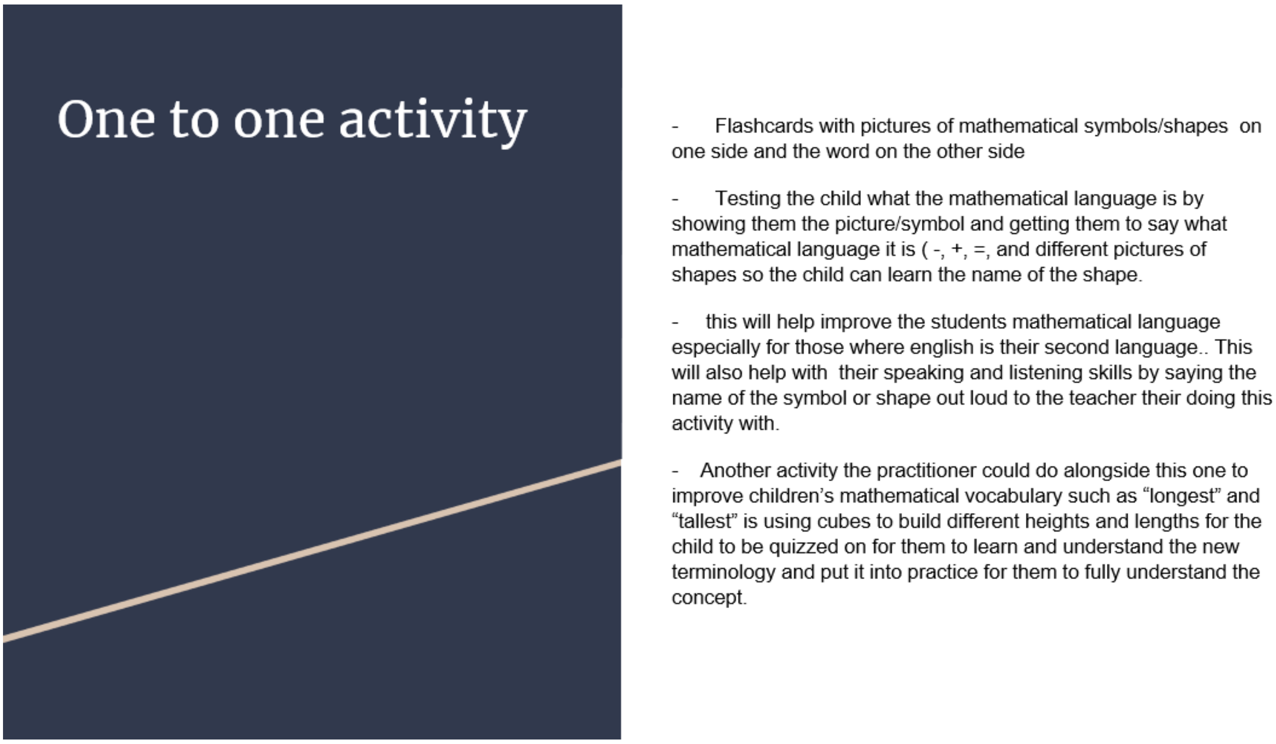

Figure 2. The use of flashcards to teach vocabulary.

We observed some variations in terms of how key vocabulary was proposed to be taught in the activities where a register perspective was manifested, including making connections to real life and referring to multiple meanings that some key words might have. For example, G2 commented on how confusing the word 'take away' might be, if it is used to mean 'subtract', as it can have other connotations (e.g., take away food). As presented by G19, the following whole-class activity offers a potential to teach vocabulary through storytelling, while making connections to everyday life concepts and facilitating students' own meaning making processes through mathematical communication (Figure 3). The activity below also creates opportunities and tools for pupils to illustrate their learning, mainly referencing a register perspective while alluding to a situated socio-cultural perspective, through providing opportunities for participation and social interaction by using a range of objects (e.g., 'porridge' bowls). This activity diverges from other whole class activities by at least attempting to include a situated-socio-cultural perspective. Nevertheless, it is not a strong example where a situated socio-cultural perspective is evident. One reason is the lack of involvement and consideration of pupils' socio-cultural backgrounds including their language diversity. For instance, it would be questionable how the particular book (i.e., Goldilocks and the Three Bears) and the choice of 'porridge' are relatable to some students. It is also important to note the lack of creativity here, as the practice refers to a common mainstream early childhood activity with minimal room for language diversity.

There were a few examples where groups suggested using translators to facilitate vocabulary acquisition of pupils with 'EAL' or, in fact, making connections to students' homes to foster vocabulary learning, as illustrated by G12:

> [Repetition of mathematical language at home] is a good way to help the children of Indian and Polish descents if English is not their first language as it gives their parents opportunities to communicate and translate with their children.

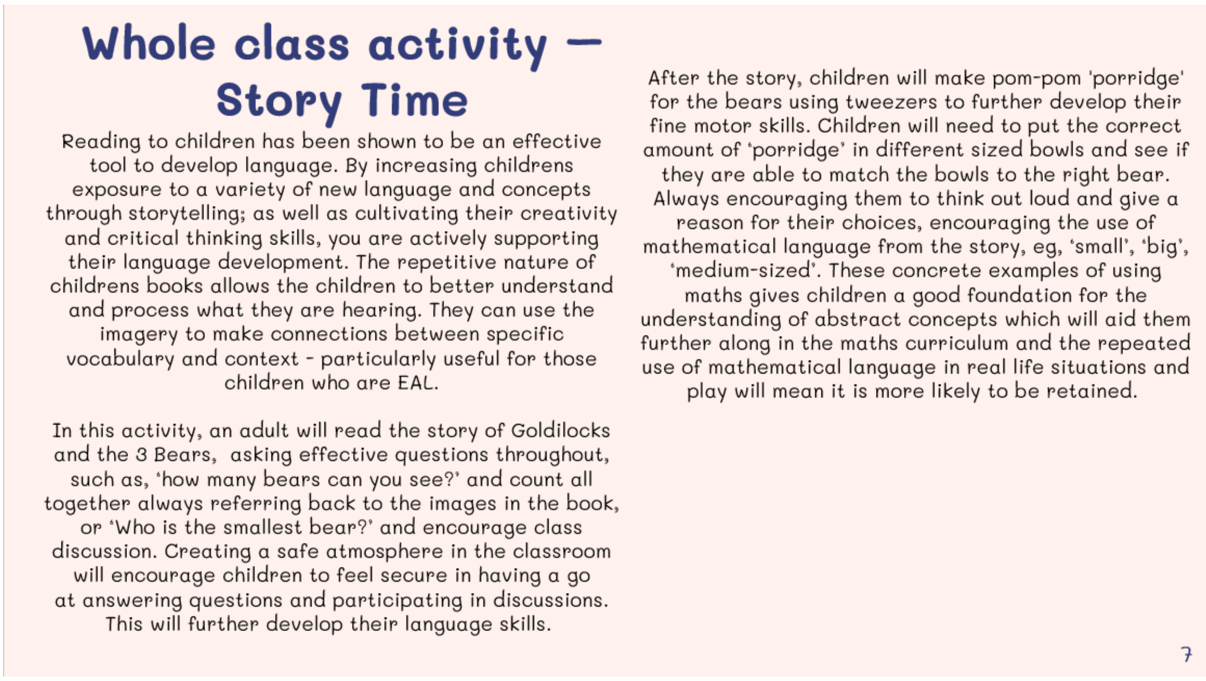

Figure 3. The use of storytelling to teach vocabulary.

The statement above illustrates good intentions to foster vocabulary acquisition through parental involvement; however, it does not seem to consider potential dynamics of home environment (e.g., parents' education level, languages, their work commitments, etc.) and seems to divert the teaching responsibilities to parents due to language diversity. This subsequently limits the ways in which teachers can be agentic in their practice, mediating language diversity within the classroom through meaningful and constructive relationships with parents. In fact, some groups highlighted the importance of incorporating pupils' home languages within teaching; however, it too stayed limited:

> Our Action plan to close the language gap in mathematics within the EYFS includes having labels in English, Polish and Indian as this will then incorporate the children's additional languages. By having labels, the children will then have a visual aid to help the students to understand mathematical concepts. (G9)

Although including visuals with words from pupils' home languages might be a constructive initial step, the ways they are utilised, whether following a lexicon perspective (i.e., simply teaching key words in both languages) or register perspective (i.e., focusing meaning making through communication) or situated socio-cultural perspective (i.e., involving mathematical discourse through social interactions) remains crucial to explore further.

5. Scaffolding

One of the common reasons why the groups suggested scaffolding activities was the importance of additional support from peers, teachers, and sometimes from additional resources, particularly in small group and one-to-one activities, for addressing language diversity. This support included teachers' modelling, differentiation based on students' perceived academic achievement, pairing students who speak the dominant language (English) better (as perceived by teachers) and offering a range of representations to scaffold students' learning. In contrast to the previous theme of explicit vocabulary teaching, we observed evidence of all three perspectives (lexicon, register, situated socio-cultural), often in combination and in varying degrees. This suggests that scaffolding, if designed meaningfully by prospective teachers, has the potential to address language diversity in mathematics classes by creating spaces where different communication resources might interact. There were only three small group tasks out of nineteen that referenced a situated-socio-cultural perspective, and one of them is presented in Figure 4. The activity reflects aspects of a situated-sociocultural perspective while also incorporating lexicon and register perspectives through its focus on vocabulary learning and encouraging pupils to use a mathematics register (Figure 4).

Figure 4. The use of scaffolding to teach about numbers and shapes.

Similarly, G14′s incorporation of the three perspectives is presented below (Figure 5). This is another small group activity that diverges from the rest of the small group activities where a few sentence frames are included (e.g., 'You need one more counter to make five.'), following a register perspective. The word of the day component aligns with a lexicon perspective, while providing a range of communication channels for pupils to demonstrate their mathematical reasoning can be related to a situated-sociocultural perspective. Nevertheless, home languages are still not considered within these practices.

Mainly, groups focused on the 'help' aspect of scaffolding, which was often directed to students who have diverse language backgrounds and needs. This help would sometimes come from teaching assistants as well as peers and teachers. In some cases, such help was perceived similarly to the help for students with special needs, indicating a potential deficit approach to language diversity in teaching and learning mathematics.

> To support children with English as an additional language/speech difficulty, a speech therapist will attend our activity and provide us feedback for those who may need extra support. (G4)

It is important to note that Bruner's (1975) [41] concept of scaffolding was envisaged to be about social interactions, reciprocal and active processes. For example, there was not any convincing evidence in the dataset in which pupils' diverse language backgrounds would be used as resources to scaffold mathematics learning within the classroom. In fact, the most common strategy for scaffolding was a whole-class question–answer strategy, which was led by teachers to create opportunities for engagement. We also noted that scaffolding in whole-school activities was mainly through additional resources that teachers would bring into the classroom, such as concrete materials, flashcards, labels including translated words, word walls to assist students' memory and retention. These resources offer a space and opportunity to communicate mathematically in different ways; however, how they are utilised remains to be seen.

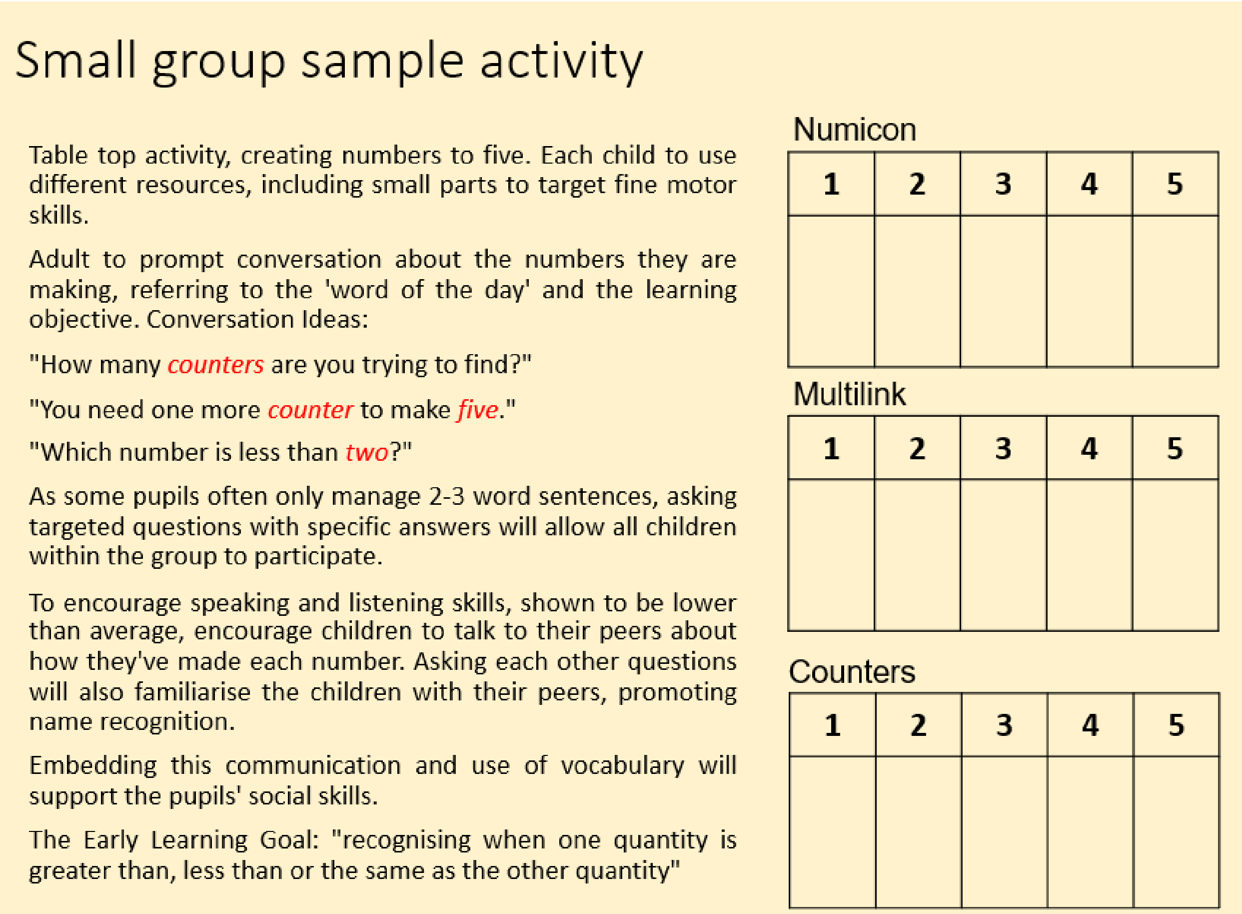

Figure 5. The use of three perspectives to teach about numbers.

6. The Use of Multisensory Approaches

Most students perceived the use of multi-sensory approaches, such as incorporating songs, the use of various manipulatives and representations including concrete materials (e.g., Numicons, Unifix cubes) and visuals, the use of play, especially in outdoor learning environments and cooking. Repeated rationales of those practices include making real-life connections, encouraging communication, and also addressing language diversity. However, there were cases where some groups attempted to use such approaches to minimize language-related demands to make the content 'accessible' for everyone. This is also a reflection of an approach that sees 'language as a barrier', and subsequently some groups proposed their solution as using language less. For example, G11 attempted to use visuals, potentially gestures, and body movements to create opportunities for addressing language diversity in their small group activity (Figure 6). This resonated with other small group activities in the cohort and resembled another mainstream activity that can easily be found online. Their suggested practice remained limited, and in fact, problematic, as the main aim appeared to be minimizing language exchanges. This was particularly evident in the following quotation: 'This helps with language barriers as the children are using their spatial skills rather than a language they don't understand'. Although embodied activities have the potential to address language diversity [50], it is imperative to explore prospective teachers' rationale and enactment of proposed practices in real life.

Small group activity

Lady-bug sheet- One side will be filled out by each student, they then pass it to the next student and must make it equal on the other side, this will help them with basic counting. As it is basic symmetry it requires less use of the English language, helping to support any students with a language barrier, it is visual learning, which also supports their fine motor skills. The children could also use peer support - (Vygotsky MKO) - as the more able students could help the lesser ability students in understanding and completing the task.

Giving out numbers to the children in groups of 5 (Numbers between 1 and 10), you then ask them to do a number of tasks to help develop their knowledge. The tasks should increase in difficulty, for example: Task 1 - Put themselves in order. Task 2 - Find the sum of their numbers. Task 3 - Separate the even from the odd etc. This helps with language barriers as the children are using their spatial skills rather than a language they don't understand.

Figure 6. The use of multisensory approaches to teach counting.

Nevertheless, there were other instances where the groups focused on the 'participation' element of using a range of multi-sensory approaches. For example, G15 suggested a play-based activity with large trays filled with coloured water and different sized, clear containers to teach about measurement. The participatory element included tasks such as interacting with those resources through independent play to a more structured play with guided questions, estimation (e.g., 'ask them to guess how many scoops do you think will fill this container?), and communicating their mathematical reasoning (e.g., how do you know which one is biggest?). While these practices were mainly small group tasks, there were whole class examples too. For example, G14 suggested that the class would sing the 'five little ducks' song while acting out like the ducks and answer questions such as 'how many ducks have gone away', 'if there is one less, how many will we have? Are there more ducks with mummy or less ducks?' This practice aimed to teach vocabulary, such as 'more than' and 'less than' through the song and role playing as a whole group. Those proposed activities, which draw mainly from a register perspective while tapping into a situated socio-cultural perspective (through offering situations where pupils can communicate mathematically through their bodies, gestures, for example), are essential to address language diversity in mathematics. This is mainly because the multimodal nature of these tasks enables different language repertoires to be activated, hence the increased engagement in mathematical communication. Nevertheless, home languages are still ignored to a great extent within these activities.

Following a multimodality trend, most of the activities were suggested to be outdoors so as to relate to different senses, such as touching, seeing, smelling, hearing, etc. There was an agreement among the groups that outdoor play would put key vocabulary in context, provide enhanced opportunities for communication and facilitate cognitive and emotional engagement. Another example of a multi-sensory approach was cooking and G17′s proposed practice below is a good example that captures the content of similar activities (Figure 7). In this small group activity, students were encouraged to communicate mathematically in order to prepare a fruit salad. Language diversity appeared to be addressed through pictorial cues alongside written instructions and also offering opportunities to illustrate mathematical thinking (e.g., sharing the blueberries). If home languages were incorporated within these activities (e.g., in the pictorial cues), there would be a greater chance to address language diversity.

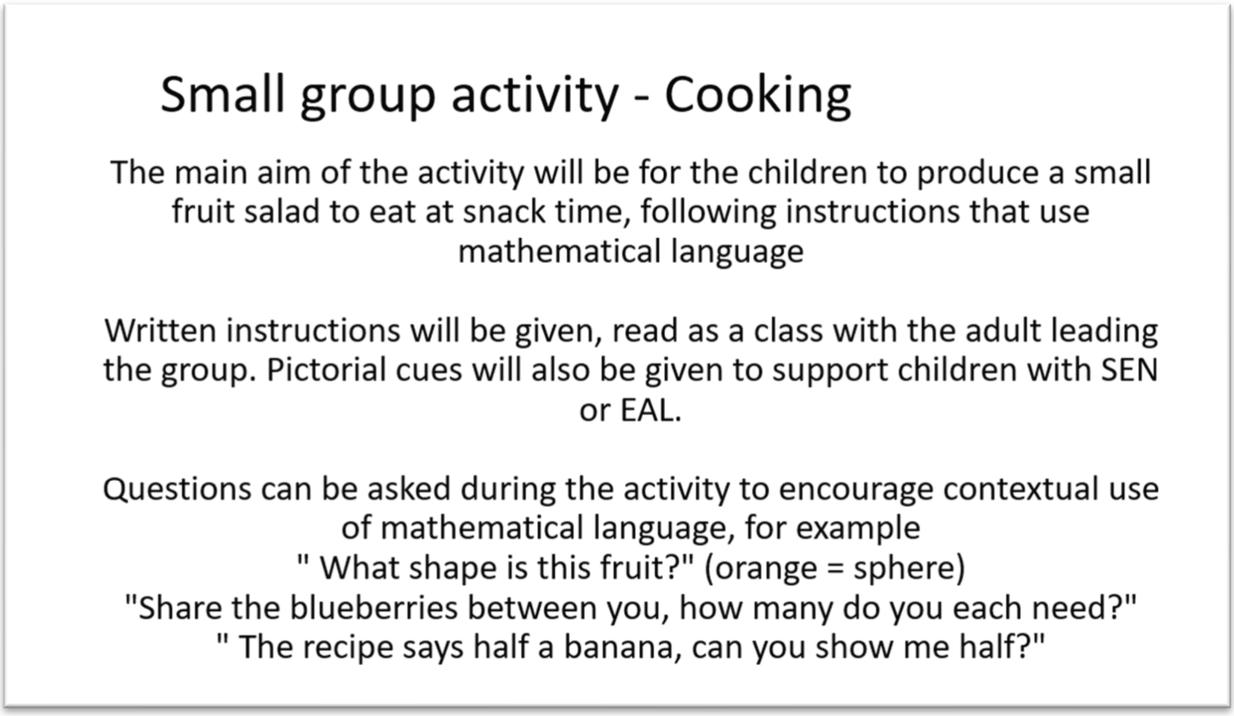

Figure 7. The use of cooking to teach about shapes and numbers.

7. Discussion and Implications

Drawing from our findings, we organise our discussion section focusing on two areas: how language diversity is seen and operationalised in the activities that are proposed by prospective teachers and how the nature of mathematics as a subject might be perceived by them. These two areas, we believe, are two strong starting points to zoom-out from our data and compare our findings with literature, to offer implications to teacher education, future research, and policies.

8. Language Diversity: A 'Problem', Resource, or a Neglected Aspect?

While some groups considered language diversity in the proposed activities, the majority either did not acknowledge it in their presentations or appeared to view such diversity as a problem to be resolved. This finding concurs with related literature that teacher education programmes are struggling to prepare prospective teachers with adequate knowledge and skills to address language diversity in teaching and learning mathematics [8,14–16]. After critically reflecting on our research context, it became evident that the module with which Live Brief assessments are associated includes limited content about addressing language diversity in teaching and learning mathematics. More specifically, the content of the module is mostly filtered through the dominant policy rhetoric (i.e., EAL), possibly leading students to see language diversity as a special need that is often classified in the same group with dyslexia and dyscalculia, for example. This might indicate that some Initial Teacher Education curricula may not be utilising research-informed practices effectively to address diversity [66] or may include very limited, if any, content to prepare prospective teachers in this regard [14,67]. Furthermore, while university tutors have no control over the specific content of the Live Brief assessment, it would be valuable to dedicate some time to explore the topic once it has been finalized by local schools. Reflecting on this, introducing current debates regarding language diversity in mathematics within the specific school context and also encouraging students to take risks, be creative and design their own practices (rather than mimicking mainstream practices) could provide a more effective starting point for students. Moreover, despite students being provided with contextual information about the school, they lacked information about the pupils themselves. If there were opportunities for our students to pose questions about the pupils, they could potentially design more meaningful activities to address language diversity. Without taking such steps and providing support to prospective teachers, relying solely on the implementation of Live Brief assessments as a means to address these issues by offering authentic real-life contexts may not fully achieve their intended purposes. Therefore, providing opportunities for students to practice, even on a small scale, appears to be essential.

The lack of professional support could also be exacerbated by limited guidance and direction through the nationally produced curriculum documents [8,17]. Findings suggested that the national curriculum for mathematics documents in England appeared to be students' first sense-making tool. Although there is a separate document outlining how to support pupils who have 'English as an additional language' [24] and there are some references to the role of language in the teaching and learning of mathematics, there are not any specific formal guidelines available for addressing language diversity in mathematics [57]. This opens questions around how the politics of 'diversity' discourses and practices are perceived by the government and how these perspectives might be translated into a range of curriculum making practices, including the production of guidelines. Prospective teachers should be encouraged to pose similar questions in their teacher education programmes to better understand how mathematics education is strongly connected to politics.

A range of interventions were evident including extra tuition by teachers, strengthening home–school connections, one–one activities to teach mathematical terminology in English, and having visual aids in students' home language, echoing the literature in this area [5,42]. Although some of the interventions have the potential to tap into more sociocultural aspects of teaching and learning mathematics (e.g., strengthening home–school connections, and incorporating students' languages within teaching), these perspectives often lacked criticality and remained superficial. This was particularly evident when students proposed diverting the responsibility of involving home-languages to parents, solely through parents' involvement in pupils' learning at home. Additionally, there were other groups attempting to make connections to pupils' home languages by using web-based translators during teaching or investing in flash cards where key vocabulary appears to be in different languages. This aligns with research indicating that early career teachers prioritize vocabulary in mathematics teaching practices, but are less likely to incorporate mathematical communication and discourse [38]. Although these steps are valuable and illustrate an awareness of language diversity, Gutierrez (2002) [68] argues that it is not sufficient to solely teach key vocabulary in home languages. Instead, teachers should honour pupils' diverse experiences, come to know their students through informal dialogues, avoid applying deficit approaches and provide rich opportunities for discussions in mathematics classrooms. For example, creating translanguaging spaces and challenging monolingual curriculum standards [22] through encouraging students to use home languages while solving mathematical tasks and discussing with peers, using their funds of knowledge, and avoiding deficit discourses are key in addressing language diversity. As such, we reiterate that Live Brief assessments might be limited without nuanced contextual information to outline such practices or a space for prospective teachers to imagine what translanguaging might look like in a unique context. It was striking, but not surprising (considering most of the current policy guidance), to see that the majority of presentations mentioned having English as a second language in a similar vein with students having special needs, such as dyslexia and dyscalculia. This implies that in such perspectives a deficit approach might be evident, as reported elsewhere [36,54]. It is, therefore, essential to explore prospective teachers' perspectives on and attitudes towards language diversity as these will be the building blocks of their future practices.

The proposed practices suggested that students tended to address language diversity more in the small group and one–one activities with an emphasis of scaffolding by using diverse teaching materials. The most common practice addressing the role of language was teaching vocabulary explicitly at the beginning of the lesson to a whole class. As aforementioned, this would have serious consequences in the way pupils are supported and assessed in terms of their mathematics competence (e.g., a limited view of language, not acknowledging and/or valuing other resources pupils might use). Moreover, while groups showed flexibility to adopt multisensory approaches for all types of activities, the integration of different senses lacked meaningful connections to mathematical communication and discourse. Although these activities (mostly from very typical early childhood practices that can be found online) were often presented as being relevant to real-life contexts, their actual relevance to students' lives remained uncertain. Therefore, it is suggested that prospective teachers should be provided with rich opportunities to develop their pedagogical repertoires and instances to interrupt their thinking about the role of language in teaching and learning mathematics. Nevertheless, some research argues that teachers might face dilemmas (e.g., [10] and tensions (e.g., [18]) to balance and address such a range of diversity in the classroom, hence, continuous professional development and willingness to improve practice for promoting social justice for everyone seem to be the key.

9. Mathematics: A Language Free Subject or a Communication Tool?

The nature and purpose of mathematics as a school subject has attracted much attention [69], especially in recent decades from a socio-cultural lens [26]. Although some teachers often perceive mathematics as a language-free subject [52], recent theoretical and empirical contributions in this area strongly disputed such long-standing beliefs [4,18,36,70]. Nevertheless, it appears from the groups' presentations that there are still some traces of such beliefs into the proposed practices. For example, there is an indication that teaching key vocabulary and symbols would be sufficient to address the 'language gap'. Furthermore, some tasks aimed to minimise verbal communication, most likely with good intentions that pupils with language diversity would be less challenged in terms of language and could divert their attention to mathematics content. However, the literature suggests the opposite, maintaining that mathematics teaching should be language rich, actively involve students' socio-cultural and language backgrounds meaningfully and focus more on students' mathematical reasoning, problem solving and thinking processes [4,35,70].

Furthermore, a situated socio-cultural perspective was evident more within one–one tasks, while we would expect to observe more occurrences in small group and whole group tasks considering the social and discursive nature of this perspective [4]. Prospective teachers might find addressing language diversity more manageable in their one–one interactions, potentially due to a lack of pedagogical repertoire of inclusive differentiation in whole-class activities and a lack of awareness of how to facilitate meaningful mathematical communication between peers. Additionally, students might approach language diversity from deficit perspectives, resulting in individualized interventions, rather than using language as a resource within small group and whole class discursive activities.

The aforementioned observations in the dataset can be a result of a lack of critical engagement with teaching mathematics, a lack of creativity and perhaps a lack of awareness of sociocultural aspects of teaching and learning mathematics. Additionally, the dominance of cognitive perspectives in teaching and learning, in general, might inhibit prospective teachers' noticing other aspects, including social, cultural, linguistic, historical, and economic [52], especially in a subject like mathematics, where most people think it is isolated or universal [71]. Consequently, this often leads to practices that minimise the use of a range of language repertoires students bring to the classrooms, with the belief that numbers and symbols can solely convey mathematical concepts without rich discursive opportunities. Hence, we were left with the question of whether the groups would propose different kinds of practices if the subject was different, for instance, English or Social Sciences, with the same purpose, closing the 'language gap'. Future research can investigate such differences or similarities to examine the influence of prospective teachers' perspectives and beliefs on the nature of the subject and the subsequent impact on the design of teaching practices to address language diversity.

10. Final Remarks

We would like to end this paper by offering future-oriented discussion points and questions, to be considered in research, practice, and policy. First and foremost, the students' proposed practices were limited in terms of addressing language diversity and lacked creativity and criticality. This issue should be further explored with a particular attention to students' long-standing beliefs about the nature and purpose of mathematics as a school subject and critical perspectives on addressing language diversity in the teaching and learning of mathematics. Additionally, this was a strong sign for us, especially the first author, who taught the module under exploration, to revise the curriculum with a particular attention to language diversity. There needs to be opportunities for students to interrupt their current thinking so that they can critically reflect on how they can design their practices in consideration to socio-cultural aspects and a range of resources pupils might use (including gestures, home languages, artifacts, diagrams, objects, etc.), apart from symbols and numbers. We are convinced that, as Moschkovich (2002) [3] p. 203 rightly stated, 'a situated socio-cultural perspective opens the way for seeing complexity and competence' in teaching and learning mathematics. Second, our research drew from the proposed practices, hence we did not have a chance to observe how these practices would be enacted in classrooms. Perhaps there would be a range of opportunities where our students would notice various dynamics, which subsequently would (or not) influence their actual practices. Therefore, it is essential to create opportunities for prospective teachers to move beyond the Live Brief assessment as a presentation, but in fact, obtain a chance to enact their proposed solutions in context so that pupils' voices and identities can also be taken into account. Finally, considering the influence of curriculum policies, including statutory requirements in the curriculum documents, it is crucial that the discussions around language diversity and how to address it through socially just perspectives should be at the heart of both policy discourse and practice.

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Data Availability Statement: The data that support the findings of this study are not publicly available for confidentiality reasons, as they include information that may disclose participants' identity. The parts of the data that do not include personal information may be available from the corresponding author upon request.

Conflicts of Interest: The authors declare no conflict of interest.

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