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THE ALIGNMENT BETWEEN TEACHERS' BELIEFS AND ATTITUDES TOWARDS TRANSLANGUAGING AND THEIR CLASSROOM PRACTICES IN MATHEMATICS MULTILINGUAL CLASSROOMS IN LEBANON

by
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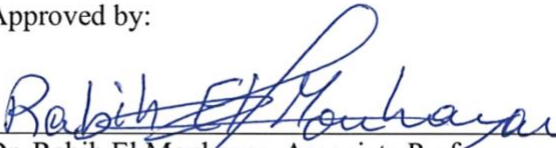at the American University of Beirut

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ABSTRACT
OF THE THESIS OF

Rana Ziad Bassaj   for   Master of Arts
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Title: The Alignment between Teachers' Beliefs and Attitudes towards Translanguaging and their Classroom Practices in Mathematics Multilingual Classrooms in Lebanon

Mathematics education in Lebanon is conducted in various multilingual contexts. When mathematics is taught in a second language, translanguaging – the use of the full linguistic resources – has become a matter of concern that teachers are expected to understand and address in multilingual mathematics classrooms. This study investigates intermediate mathematics teachers' beliefs and attitudes towards the functional role of translanguaging and their actual classroom practices in Lebanon. The study follows a mixed research design: qualitative and quantitative. The participants were 54 mathematics teachers at the intermediate level from different private schools in Lebanon. Data were collected using a questionnaire, semi-structured interviews, and classroom observations. Fifty-four teachers filled the questionnaire, 11 of those teachers were later selected for the interview based on the analysis of the questionnaire, and then 3 of those teachers were selected for classroom observations. Results showed that the 54 teachers were distributed over six different beliefs and attitudes towards the functional role of translanguaging practices in mathematics classrooms. Most teachers do not use Arabic (virtual beliefs) and they do not value it (negative attitudes) (27.8%) and others are flexible in their usage of Arabic (maximal beliefs) as they value it (positive attitudes) (27.8%). The remaining teachers were distributed as follows: maximal beliefs with negative attitudes (18.5%); virtual beliefs with positive attitudes (13%); optimal beliefs with negative attitudes (1.9%); and optimal beliefs with positive attitudes (11%). Results showed that the teachers with virtual beliefs (whether negative or positive attitudes) shared a common understanding regarding the limitations in using home language to teach mathematics. Moreover, they believed that adhering to the school policy regarding the use of English as language of instruction enhanced students' language acquisition and contributed to their success in the future. Further analysis showed that teachers with maximal beliefs (whether negative or positive attitudes) acknowledged that using English only as language of instruction to teach mathematics was not applicable in their classrooms. Sometimes they must use home language in order to proceed with their teaching. Despite the differences, teachers with optimal beliefs (whether negative or positive attitudes) acknowledged that their students had the right to use home language. Additional analysis provided the frequency and corresponding percentages of each translanguaging function (management, content, and social) employed in the three observed mathematics classrooms. Teacher with virtual beliefs and negative attitudes used Arabic for management purposes (89.5%), while the teacher with maximal beliefs and positive attitudes, used Arabic for management (55.1%) and content (33.3%) purposes. Last, the teacher with optimal beliefs and positive attitudes used Arabic 52.8% for content purposes and 34.3% for management purposes. In terms of the alignment between the teachers' beliefs and attitudes with their classroom practices, we can say that they align generally. However, the teacher holding virtual

beliefs and negative attitudes used Arabic for 15.3% despite the fact that she reported not using Arabic in her mathematics classes. But these 15.3% were distributed mainly into management purposes and the teacher might have treated those as insignificant.

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CHAPTER 1

INTRODUCTION

Background

Mathematics education researchers (e.g. Golden, 2002a; McLeod, 1992; Thompson 1992) have expressed their concern that research in mathematics education has focused more on cognition than on teachers' beliefs and attitudes. Their concern is justified because research shows that studying mathematics teachers' beliefs and attitudes makes explicit to the teachers' themselves and to others the perspectives they hold about teaching and learning mathematics. These perspectives are of great importance since they influence the teachers' behaviors and decisions about teaching practices (Clark & Peterson, 1986; Kagan, 1992; Pajares, 1992). Consequently, research in mathematics education has been concerned with individuals' attitudes and beliefs; all of which together refer to affect; about the mathematical thinking, the curriculum, and the technology in mathematics classrooms (Philipp, 2007). Affect is "a disposition or tendency or an emotion or feeling attached to an idea or object. It is comprised of emotions, attitudes, and beliefs" (Philipp, 2007, p.259). Focusing research on the affective dimension in mathematics education has been important because it influences the teachers' experiences and the students' achievement (Thompson, 1992; Philipp, 2007). As a result, mathematics education researchers started studying students' and teachers' affect about various issues in teaching and learning.

McLeod (1992) provides a comprehensive definition of affect, which includes beliefs, attitudes, and emotions. He describes how these components differ in terms of their stability, intensity, and cognitive aspects. Specifically, McLeod notes that beliefs

are relatively stable and cognitive in nature, while attitudes are characterized by greater intensity and emotional component. Meanwhile, emotions are typically the most intense of the three components and are less cognitive in nature compared to beliefs and attitudes. By distinguishing between these components of affect, Philipp (2007) refines McLeod' (1992) definition to consider emotions as part of the attitudes since they are prone to change rapidly, and eventually a repetitive emotion can develop an attitude towards the subject at hand. Consistent with Philipp's (2007) perspective, the present study defines affect as encompassing both beliefs and attitudes. Attitudes, as defined by Philipp (2007, p. 257), refer to the ways in which individuals act, feel, or think, which reveal their inclinations or opinions. Beliefs, on the other hand, serve as "lenses" through which individuals perceive and interpret the world around them (Philipp, 2007, p. 257). Specifically, attitudes denote a need for action that reflects one's stance on a given subject, thus underscoring the link between attitudes and emotions (Philipp, 2007; Zumbrun, 2015). Conversely, beliefs may persist without any immediate action or exertion, acting as a perceptual filter for the world (Ambrose, 2004; Philipp, 2007). Moreover, beliefs become more resilient with time (Ambrose, 2004; Philipp, 2007; Thompson, 1992).

One of the areas of focus on affect in mathematics education is concerned with teachers' affect and its relationship with their teaching practices, which in turn influences the students' achievement (Philipp, 2007). Teachers' practices include "everything that the teacher does that contributes to his or her teaching, including planning, assessing, or interacting with students" (Simon & Tzur, 1999, as cited by Philipp, 2007, p. 305). Throughout their various experiences, teachers develop specific attitudes and beliefs regarding the different practices that they engage in or are exposed

to. One of the practices in mathematics education that gets different perspectives is translanguaging. Translanguaging "refers to the practice of using one's full linguistic repertoire to gain knowledge, to make sense, to articulate one's thoughts and to communicate about using language" (Wei, 2011, p. 1223). Translanguaging in mathematics classrooms involves teaching and learning mathematics using the language of instruction along with home language. While some teachers totally disagree with the practice of mixing between the language of instruction and the home language, others support this practice as it facilitates students' understanding and learning (e.g. Alhasnawi, 2021; Amin & Badreddine, 2020; Salloum & BouJaoude, 2020; Setati, 2008).

In Lebanon, although the Arabic Lebanese dialect is the primary language spoken at home, the school policy mandates teaching mathematics in a second language, specifically either English or French (Shaaban & Ghaith, 1999). The use of a second language for mathematics instruction is largely due to a range of historical, political, social, economic, and educational factors, which are further explored in Shaaban & Ghaith's (1999) work. As a result, classrooms where multiple languages are utilized by both students and teachers are commonly referred to as multilingual classrooms. In Lebanese mathematics education, these multilingual classrooms involve students and/or teachers whose home language is the Arabic Lebanese dialect, yet instruction and learning of mathematics occur in either English or French, their second language.

In the situation of mathematics multilingual classrooms, translanguaging practices are a matter of concern, and mathematics teachers need to be aware of how to deal with it. Chai and Merry (2006) point out that increasing teachers' understanding of

concerns regarding linguistic diversity improves students' educational outcomes. The authors recommend that raising awareness has to align with teachers' beliefs and attitudes towards translanguaging practice. In studies about teachers' affect towards translanguaging, researchers have typically focused on either examining teachers' beliefs in isolation or studying their attitudes separately towards translanguaging practices.

Recent studies (e.g Fang & Liu, 2020; Nambisan, 2014; Pinto, 2020) have revealed that the majority of teachers hold a positive attitude towards translanguaging, perceiving it as a beneficial practice. However, some teachers view it as detracting from the intended learning objectives and thus hold a negative attitude. Studies that examine teachers' beliefs towards translanguaging practices (e.g Alhasnawi, 2021; Doiz & Lasagabaster, 2020) have shown that some teachers believe their role is to create an environment that mirrors the language of instruction to ensure student success, while others believe in the benefits of flexibility in translanguaging practices. As such, it is clear that different individuals hold different beliefs and attitudes towards translanguaging, highlighting the need to align awareness-raising efforts with teachers' existing perspectives.

Several studies have investigated the relationship between teachers' beliefs or attitudes and their classroom practices, and the results indicate a strong association between the two (Alhasnawi, 2021; Haukus, 2016; Khader, 2012; Nambisan, 2014; Zainil & Arsyad, 2021). Teachers who have positive attitudes and beliefs towards translanguaging tend to incorporate translingual resources, including the home language and the language of instruction, in their classroom practices. In contrast, those who hold

negative attitudes and beliefs against translanguaging tend to restrict the use of home language and maximize the use of the language of instruction.

The present study identifies different teachers' attitudes and beliefs towards the functional role of translanguaging practices in mathematics multilingual classrooms in private schools in Lebanon. Also, the study uncovers why the teachers' hold such beliefs and attitudes towards the functional role of translanguaging practices. Finally, the study examines the functions of translanguaging practices as observed inside the mathematics classrooms.

Purpose of the study

The purpose of this study is to (a) identify and describe intermediate mathematics teachers' beliefs and attitudes towards the functional role of translanguaging practices in mathematics classrooms, (b) analyze teachers' beliefs and attitudes towards the functional role of translanguaging practices in mathematics classrooms, and (c) explore the functions of translanguaging practices as observed in their mathematics classrooms.

Research Questions

(1) What are teachers' beliefs and attitudes towards the functional role of translanguaging practices in mathematics multilingual classrooms in private schools in Lebanon?

(2) How do teachers rationalize their beliefs and attitudes towards the functional role of translanguaging practices in mathematics multilingual classrooms in private schools in Lebanon?

(3) What are the patterns of functions of teachers' translanguaging practices in mathematics multilingual classrooms in private schools in Lebanon?

Rationale

In this section, I provide rationalizations for this study. First, I refer to the fact that, according to the researcher knowledge, none of the studies combined the two constructs (beliefs and attitudes) in one study. Second, I refer to the importance of language in mathematics classrooms. Third, I refer to the Lebanese context.

Focusing on teachers' affect

In studies about teachers' affect towards translanguaging practice, researchers mostly targeted language classrooms. Some studies address English as a foreign language at the university level (e.g. Doiz & Lasabagaster, 2016; Fang & Liu, 2020) whereas other studies focused on language classroom at the school level (e.g. Guzman-Alcon, 2019; Haukus, 2016; Pinto, 2020; Wang, 2019; Zainil & Arsyad, 2021). Little research has been done to examine teachers' affect towards the functions of translanguaging practices in the context of the mathematics classrooms which makes our study of outmost importance. Only Alhasnawi (2021) targeted teachers' beliefs towards translanguaging practice in English medium instruction in university mathematics, which is different than the current study since it examines not only teachers' beliefs, but also their attitudes towards the functions of translanguaging practices in intermediate school level mathematics.

Focusing on the language in mathematics classrooms

Research shows that using strategic translanguaging in multilingual mathematics classrooms can enhance teaching and learning, in which teachers and learners draw from their full linguistic repertoire to facilitate comprehension and communication (Palmer, Mateus, Martinez, & Henderson, 2014). Yet, no studies attempt to identify and describe both teachers' beliefs and teachers' attitudes towards translanguaging practices

in mathematics classrooms. Therefore, this study attempts to identify and describe the teachers' beliefs and attitudes towards the functional role of translanguaging practices and explore the functions of their translanguaging practices in the mathematics classroom instruction.

Focusing on the Lebanese context

Research on teachers' affect towards translanguaging practice were conducted in several countries such as Vietnam (Thi to Khuyen et al., 2020), China (Fang & Liu, 2020; Pinto, 2020; Wang, 2019), UAE (Al Bataineh & Gallagher, 2021), Iraq (Alhasnawi, 2021), Indonesia (Khairunnisa & Iwa Lukmana, 2020; Zainil & Arsyad, 2021), Spain (Doiz & Lasagabaster, 2016; Gorter & Arocena, 2020), and United States (Fernandes & Kahn, 2021). However, there are no studies about teachers' beliefs and attitudes towards translanguaging practices in mathematics classrooms in Lebanon. There have been few studies (e.g. Amin & Badreddine, 2020; Salloum & BouJaoude, 2020) that focused on the interaction in multilingual classrooms in Lebanon, particularly in the context of science education, and discussed the teachers' views and perspectives towards translanguaging. However, these studies did not specifically investigate teachers' beliefs and attitudes towards translanguaging practices, unlike the focus of the current study which is on the mathematics classroom. Although recent studies (El Mouhayar 2020, 2021a, 2021b, 2022) have explored classroom talk in multilingual classroom environments, he did not examine teachers' beliefs and attitudes. Therefore, the findings of this research influence the professional development workshops that address issues related to teachers' beliefs and attitudes towards translanguaging in mathematics classrooms in Lebanon.

In addition, the teachers participating in some studies (e.g Alhasnawi, 2021; Khairunnisa & Iwa Lukmana, 2020; Nambisan, 2014; Thi to Khuyen et al., 2020) are teaching English language learners or immigrant students in monolingual societies. For this reason, most of the teachers report that it is their goal to help students acquire the English language.

On the contrary, in this study, most teachers and/or students have been exposed to the language of instruction (English or French) through social media, TV shows, etc. which makes it interesting to investigate the functions of translanguaging practices inside the mathematics classrooms.

Significance

This study is of significance (1) for research about teachers, (2) for teacher educators and policy makers, and (3) for teachers. The main significance is that this study may raise awareness for teachers, policy makers, and schools on the alignment between teachers' beliefs about their own practices and attitudes towards translanguaging practices and their actual classroom practices inside the mathematics classrooms in Lebanon.

Implications for research

The study contributes to the literature findings by establishing whether teachers embrace translanguaging practices inside mathematics multilingual classrooms or not. Moreover, it reveals the alignment or discrepancy between teachers' beliefs and attitudes towards translanguaging practice and their actual translanguaging practices in classroom multilingual environments.

Implications for teacher educators and policymakers

The study alerts teachers' educators to expose the teachers on the benefits of translanguaging practice and how we can use it strategically as a pedagogical resource without hindering the students' ability to capture the language of instruction. To effectively encourage the use of translanguaging as a pedagogical practice in professional development, it is crucial to first understand teachers' beliefs and attitudes towards this practice. In addition, this study provides insights for policymakers in Lebanon to consider dynamic language policies in response to the diversified repertoires of students and teachers across academic disciplines.

Implications for practice

The results of this study identify and describe the teachers' attitudes and beliefs towards translanguaging practices. By revealing teachers' beliefs about practices and their attitudes towards it, these might not correspond to the optimal learning conditions. For this reason, this study identifies beliefs and attitudes that may be challenged and revised. Accordingly, raising awareness becomes a need in mathematics classrooms to uncover the benefits of translanguaging practice. In this way, translanguaging practice can be used as a pedagogical resource to encourage classroom discussions and participation.

CHAPTER 2

LITERATURE REVIEW

An individual's beliefs and attitudes have a significant impact on his/her practices. For instance, Kubanyiova (2014) points out that "teachers' practices are closely related to how they believe teaching should be carried out and to the teaching methods they have internalized throughout their careers" (as cited in Doiz & Lasagabaster, 2016, p.7). This being said, examining teachers' beliefs and attitudes towards translanguaging practice will help us understand their rationale towards using translanguaging inside their classrooms. Even though this is an important topic in mathematics teaching and learning, there is a gap in the literature regarding beliefs and attitudes that teachers hold concerning translanguaging practice. Recent studies have examined the role that translanguaging play inside the classroom and its benefits to students' learning (e.g. Cummins, 2008; Moschkovich, 2012; Salehmohamed & Rowland, 2014; Setati, 2008; Setati & Adler, 2000). The findings of these studies report that translanguaging can help in building the conceptual understanding and can allow the expression of oneself. However, research highlights that teachers have to be cautious while adopting translanguaging practices since it should be strategic and not used excessively.

In the first part of this chapter, we present the theoretical framework that delineates the concept of translanguaging, and we review literature on translanguaging in the context of mathematics teaching and learning. Furthermore, we elaborate on the functions and benefits of using translanguaging in multilingual classrooms. In the second part of this chapter, we delve into the definition and characteristics of affect.

Lastly, we examine the literature on teachers' beliefs and/or attitudes towards translanguaging practices and the connection between their beliefs/attitudes and their classroom practices.

Translanguaging

Translanguaging is firstly seen as a process that bilinguals draw upon depending on the need of the moment. It is characterized as "a process in which bilinguals draw on their full linguistic toolkits in order to process information, make meaning, and convey it to others" (Orellana and Garcia, 2014; p.386). In line with this, translanguaging is seen as a natural phenomenon through which bilinguals engage with their bilingual worlds (Garcia, 2009).

In educational settings, Garcia's key focus is accepting translanguaging as a pedagogical practice. Her argument is that translanguaging can help in liberating the voices of bilinguals even in the education setting. She draws on Baker's (2011) who defines translanguaging as "the practice of meaning-making, shaping experiences, gaining understanding and knowledge through the use of two languages" (p. 288). Garcia further proposes that translanguaging is transformative, it has a potential of removing the hierarchy of languaging practices that makes some languages more valuable than others. Wei (2011) makes a similar argument, that translanguaging is "transformative in nature, it creates a social space for the multilingual language user by bringing together different dimensions of their personal history, experience, attitudes and beliefs into one meaningful practice" (p.1123).

In light of his argument, Wei (2011) refers to translanguaging as "the practice of using one's full linguistic repertoire to gain knowledge, to make sense, and to articulate one's thoughts and to communicate about using language" (p. 1223). This linguistic

repertoire constitutes of all the resources available to a person at their disposal, including linguistic, semiotic, and sociocultural resources used in communication (Blommaert, 2013). In essence, a linguistic repertoire or sometimes referred to as a communicative repertoire is a collection of ways in which individuals use languages to function effectively in their social interactions (Blackledge & Creese, 2010; Rymes, 2014).

Recent literature on sociocultural perspective in education has consistently advocated for the integration of translanguaging as a pedagogical practice due to its ability to enhance both content education and language proficiency (Aguiar, Mortimer & Scott, 2010; Blackledge & Creese, 2010; Garcia, 2009; Garcia & Wei, 2014; Otheguy et al., 2015; Wei, 2011). Furthermore, research suggests that the use of strategic translanguaging in multilingual mathematics classrooms can enhance teaching and learning, in which teachers and learners draw from their full linguistic repertoire to facilitate comprehension and communication (Palmer, Mateus, Martinez, & Henderson, 2014; Sanchez, Garcia & Solaria, 2018).

Translanguaging as a pedagogical practice in mathematics teaching and learning

In developing our understanding of language in use, we will attend to the notion of resource and source in mathematics education literature. Since translanguaging is the practice of using one's full linguistic repertoire, the language(s) inside this repertoire act as a semiotic resource to make meaning (Blackledge & Creese, 2017). In many multilingual societies, students are learning mathematics in a second language that does not correspond to their home language, which can cause loss of resources. Many instructional approaches have been posed in an attempt to build on home language as a

resource in mathematics learning and teaching (Adler, 2001; Barwell, 2009; Setati, 2005; Uribe & Prediger, 2021).

A home language, according to Halai and Clarkson (2016), is the language(s) that a person grows up using. The home language (or native language) of a person, can be the language s/he is born with, and s/he first spoke. To be more precise, UNESCO (1953) defines home or native language to be the "language which a person acquires in early years, and which normally becomes his/her natural instrument of thought and communication" (p.46). But a second language is defined as "the language acquired by a person in addition to his/her home language" (UNESCO, 1953, p. 46).

Many studies (e.g Barwell et al., 2016; Barwell, 2018; Planas, 2018; Uribe & Prediger, 2021) identified some benefits of using home language as a resource in mathematics learning and teaching. These benefits include: (1) higher engagement in classroom participations, (2) better connection to students' daily live experiences, (3) enhance literacy, and (4) strengthen sources for meaning making for mathematical concepts.

The last benefit (sources for meaning making) is mentioned by Barwell (2018) in his research on mathematics teaching and learning and is the adopted focus of the current research. He argues that "instead of thinking of students as working with resources as nouns, we can think of them as languaging: as using a repertoire of language practices that draws on students' varied experiences of communication in multiple contexts to make meaning in mathematics" (p. 160). In other words, home language as a source for meaning making does not only refer to the communicative role of the home language, rather it refers to the functional role of language as a tool for thinking and knowledge construction that facilitates the meaning making (Barwell,

2018; Planas, 2018; Uribe & Prediger, 2021). These multiple sources of meaning can be organized around three dimensions of heteroglossia: languages, discourses, and voices (Busch, 2014). Students and teachers can rely on the classroom language and any second language known to be involved in the mathematical discourse to make their voices sound and make meaning.

The oral discourse practices in mathematics education are the main focus of this study. These practices are defined as "multi-unit turns that are interactively co-constructed, contextualized, and functionally oriented towards particular genres such as narration, explanation, or argumentation (Bergmann & Luckmann, 1995)" (as cited in Erath et al., 2018, p.164). For instance, explanations are practices "to solve the communication-related problem of conveying and constructing knowledge" (Erath et. al, 2018, p.164). Argumentations are practices for "negotiating divergent validity claims" (Erath et al., 2018, p.164). Finally, narration can be either re-telling an event or experience, or presenting a mathematical concept in the context of a story (Marks & Mousley, 1990).

In light of the above discussion, the present study is centered on the use of translanguaging as a pedagogical practice in mathematics multilingual classrooms, wherein individuals can utilize their complete linguistic repertoire as a source for meaning making in mathematics multilingual classrooms. In the following section, we explore the various functions of translanguaging practices in such classrooms.

Functions of translanguaging practices

Research have been focusing on the functions of translanguaging practices in facilitating classroom interaction and helping students in understanding the content (e.g. Baker, 2011; Cahyani et al., 2018; Ferguson, 2003, 2009; Lo, 2015; Turnbull & Dailey-

O'Cain, 2009; Zainil & Arsyad, 2021). For example, translanguaging is used to promote deeper understanding of the subject matter, to develop the weaker language, and to facilitate participation (Baker, 2011). The pedagogical function of translanguaging signifies that it can "help in the effective communication of the lesson content and language skills, which have been specified in the curriculum" (Canagarajah, 1995, p.179). While the affective/social functions refer to "the functions that serve for expression of emotions" (Sert, 2005, p.3).

Lo (2015) refined Ferguson (2009) taxonomy for the functions of classroom translanguaging (Table 1) based on a meta-analysis of a wide range of research. The first major category in Table 1 defines pedagogical functions of translanguaging for classroom management. Within this function category, Lo (2015) classifies switching between languages for signaling a shift in the topic or signaling a new position/relationship. This occurs by giving instructions or encouraging classroom participation, managing pupils' behavior such as motivating, disciplining, and praising them. The second major category involves the use of translanguaging for content transmission. Lo (2015) classifies switching between languages to construct and convey knowledge, or to annotate key technical terms in the second language, or to provide examples that explain unfamiliar concepts to students. The third category pertains to social or affective functions. This function might include working in groups, giving an example of a social value, or building a friendly atmosphere in the classroom.

Table 1

Functions of translanguaging practices

Major Categories	Sub-categories
Pedagogical functions: classroom management	1. Managing discipline 2. Comments on students' behaviors 3. Giving instructions or commands 4. Encouraging class participation 5. Arousing students' attention or focus
Pedagogical functions: Content transmission	1. Explanation of difficult concepts 2. Parallel translation (i.e. providing the home language equivalents for a word in the language of instruction) 3. Providing examples in students' daily life to explain an unfamiliar topic or concept to students
Social or affective functions	1. Referring to a social value 2. Building up friendlier atmosphere 3. Working in groups

Note. Adapted from Lo, 2015 (p.279)

Previous studies (e.g. Cahyani et al., 2018; Canagarajah, 1995; Ferguson, 2003, 2009; Lin, 2006; Lo, 2015; Zainil & Arsyad, 2021) on translanguaging use Lo (2015) taxonomy of functions in different contexts inside classrooms in order to examine why and how teachers switch between languages inside the classroom. The findings report that all functions are evident in the classroom, yet more translanguaging is happening for content purposes.

For example, Cahyani et al. (2018) conduct a study in tertiary bilingual classrooms in Indonesia. Their reported results and analysis show that teachers' switching between languages fall into the following functional categories: (1) the pedagogical function: "including conceptual reinforcement, annotation of key second language technical terms, and review of a topic" (p.470); (2) the sociocultural function: "including management of pupil behavior such as developing self-awareness, gaining

attention, negotiating sociocultural identities, giving praise" (p.470); and the third

function is personal or affective function: "including teacher's personal experiences and

feelings" (p.470). Zainil and Arsyad's (2021) results reveal the pedagogical and social

functions of teacher's switching between languages in English as a foreign language

classes in four high schools. The pedagogical function includes introducing a new

vocabulary, explaining grammar rules, comprehension check, concept checking,

explaining lesson goal, and giving instruction. While the social function includes

accommodating the limited English proficiency of their students, saving time, giving

feedback, and maintaining the flow of the lesson. Lo (2015) examines the extent to

which Hong Kong teachers use L1 (first language) to achieve the dual goal of CLIL

(Content and Language Integrated Learning). His analysis shows that "60-70% of

teachers' switching between languages was content-related, and around 30% of the

switching were used for classroom management to facilitate teaching and learning. Very

few served social or affective functions (e.g. telling a joke)" (p.278).

Benefits of translanguaging practice

Translanguaging can be used as a source for meaning making since the students

can use their home language to help them construct meaning and communicate. This

idea is supported by Cummins (2008) who claims that "unlike the two solitudes

approach, in which it is argued that both languages should be kept rigidly separate,

translanguaging allows students to use their home language as a tool to help them excel

in their target language" (p.65). Essentially, Cummins argument falls under the fact that

for the students to develop their second language, their home language must be well

developed as well. In other words, developing the home language would strengthen the

base for the second language and would improve the literacy skills in their home

language (Cummins, 2008). In brief, translanguaging can allow students to choose how to express themselves using all their linguistic repertoire available to them (this could be the language of instruction or their home language).

Teaching mathematics in a second language might imply that students are learning mathematics simultaneously with learning the language of instruction. Due to this, careful, explicit, and deliberate linguistic support is needed. In view of this, Salehmohamed and Rowland (2014) encourage the use of translanguaging (they named it the "informal use of students' home language") which in turn, will lead to the formal mathematical talk in the language of instruction. Such encouragement has been proven to have a positive effect on students' conceptual understanding (Moschkovich, 2007, 2012; Setati & Adler, 2000; Webb & Webb, 2008). In this sense, Moschkovich (2012) argues that the focus should be on the mathematical content that students are discussing and not the error in the language they are using. She argues that everyday language and experience should be treated as resources and not obstacles. Eventually, after students spend some time engaging in mathematical practices orally and written, they will develop the mathematical talk in the language of instruction. In addition, one should consider the interaction of the semiotic resources involved (translanguaging, mathematical symbols, and visual displays) to engage in the multi-semiotic mathematics activity. Once we consider this interaction, meaning making is facilitated (Moschkovich, 2012).

Through translanguaging, a learning environment that values both languages equally (in this instance, English and Arabic Lebanese dialect) is created and supported by the teacher. In this sense, students would claim an active role in their own education

through acquiring both the literacy of the language and the mathematical conceptual understanding.

Affect

Changes in psychological theories have influenced how affect is addressed in mathematics education research. To elaborate more, back in the 50s, behaviorism had little interest in affect and rather focused on stimulus and response in learning. In the 80s, researchers in cognitive science and artificial intelligence had also excluded the affective factors from their consideration claiming that the task is easier if these factors are avoided. However, Norman and Rumelhart (1981) recommended focusing not only on cognition on its own but rather on affective and cultural factors. Therefore, researchers in psychology started to take into consideration the notion of affect due to its importance in the learning process.

How does research in mathematics education define affect?

Different conceptualizations of what constitutes affect in mathematics education research exist. Some studies conceptualize affect as a construct formed of motivation (Hannula, 2002; Holinger, 2008); or disposition (Larsen, 2009). Additional terms associated with affect are feelings (Kunzmann, Stange, & Jordan, 2005). Anderson and Bourke (2000) define affect as composed of the sub-components: anxiety, aspiration, attitude, interest, locus of control, self-efficacy, self-esteem, and value.

Other studies view affect as a combination of attitudes, emotions, and beliefs (McLeod, 1992). McLeod (1992) distinguished between emotions, attitudes, and beliefs in terms of their stability, intensity, and cognition. Emotions can be seen as the most intense and least stable among the three constructs. Emotions are prone to change rapidly and thus they are less reliable when measured (Mcleod, 1992). McLeod (1992)

views emotions as feelings embedded in context and they are highly dependent on the environment. For example, the feeling of frustration when you are not able to solve a problem; or the feeling of satisfaction represented by the "Aha!" when you find the solution. In contrast, beliefs and attitudes are less intense and more stable and cognitive than emotions. McLeod (1992) views attitudes as "affective responses that involve positive or negative feelings of moderate intensity" (p.581). For example, a repeated negative feeling with mathematical geometric proofs, will result, over time, with a negative attitude towards geometry. McLeod (1992) perceives beliefs as a cognitive component of affect and that cultural factors play a role in the beliefs' gradual development.

It is unlikely that researchers will ever be able to establish a single theory of affect in mathematics education that encompasses all related constructs of affect. This relates to the fact that "the tendency to develop new conceptual frameworks seems strong in the area of research on affect in mathematics education; each study seems to introduce a new theory about affect" (Philipp, 2007, p.303). For this reason, the present study will adopt Philipp's (2007) refined definition of affect to include the following: beliefs and attitudes. He defined affect as "a disposition or tendency or an emotion or feeling attached to an idea or object. It is comprised of attitudes and beliefs" (Philipp, 2007, p.259). He argues that an initial emotional feeling becomes more spontaneous and less physiologically arousing over time, gradually leading to the formation of a more stable response, an attitude (Philipp, 2007). Thus, in the current study, emotions are seen as part of attitudes (Philipp, 2007). According to Philipp (2007), attitudes are "manners of acting, feeling, or thinking that show one's disposition or opinion" (p.259). Attitudes may involve positive or negative feelings, "they are more intense than beliefs,

but less cognitive" (p.259). Attitudes imply "a need for action that expresses the holder's outlook on a particular subject; this points to the connection between emotions and attitudes" (Zumbrun, 2015, p. 31). On the other hand, beliefs are "psychologically held understandings, premises, or propositions about the world that are thought to be true. Beliefs might be thought of as lenses that influence one's view of some aspect of the world or as dispositions toward action" (Philipp; 2007, p.259). Consequently, beliefs act as a filtering system for the world (Ambrose, 2004), and become more resilient with time (Ambrose, 2004; Philipp, 2007; Thompson, 1992). By referring to affect, in this study, indicates that I am referring to beliefs and attitudes.

Teachers' affect towards translanguaging practices

Teachers' affect towards translanguaging practices has not been studied comprehensively in the literature. Researchers have focused on one of the components of affect each at once. Some studies examined teachers' attitudes towards translanguaging practices while other studies focused on teachers' beliefs towards translanguaging practices.

Theoretical distinction between beliefs and attitudes. According to Philipp (2007), attitudes are more intense than beliefs, as they include emotions, while beliefs are more cognitive and stable and become more resistant to change over time. Therefore, attitudes imply a need for action, reflect the importance and values of the subject at hand, which in turn lead to an action based on those feelings (Philipp, 2007).

On the contrary, beliefs are the most cognitive of the three constituents of affect (Philipp, 2007). The level of cognition within the beliefs construct is what set it apart from attitudes. In fact, this connection is strong to the extent that some researchers view beliefs as part of cognition (Thompson, 1992). Thompson (1992) views beliefs as

knowledge. Others view beliefs as knowledge plus personal values (Philipp, 2007). Personal values "is distinct from the notion of values (as a measure of significance), which is a subset of attitudes" (Zumbrun, 2015, p. 31). For example, the personal values refer to "moral views on ethical items" while the values as a measure of significance pertains to "the importance that one places on a particular subject area or item" (Zumbrun, 2015, p. 31). Thus, beliefs can be held without any direct action to the subject at hand, they are one's personal truth of his/her own ability relative to a particular context (Philipp, 2007).

In summary, beliefs about translanguaging practices are associated with cognitive features (Philipp, 2007) and they mainly reflect the teachers' positions regarding translanguaging practices. Attitudes are more intense than beliefs (Philipp, 2007), and they reflect more the teachers' perception towards the value (significance and importance) of translanguaging and their emotions of their use of translanguaging. An example of a belief: "I found mathematics to be difficult" (Zumbrun, 2015, p.45); while an attitude would be "I am scared of mathematics" (p.45).

Teachers' attitudes towards translanguaging practices. Previous studies (e.g. Nambisan, 2014; Khairunnisa & Iwa Lukmana, 2020; Sarikaya et al., 2018; Pinto, 2020; Fang & Liu, 2020) report that teachers tend to have positive attitude towards the use of translanguaging inside the classrooms. Positive attitude means that teachers embrace the benefits of translanguaging and view it as an important practice to be used to help students in their learning of mathematics (Nambisan, 2014).

Nambisan (2014) elicits the self-reported data about the teachers' preferences and behaviors regarding translanguaging. In Nambisan's study, the teachers select "somewhat often" and "often" to questions asking if the teacher encourages the use of

translanguaging involving discussing content in class or student participation. In addition, in the written part of the survey, these teachers wrote statements such as "it is beneficial to use the students' native language when it contributes to understanding of the activity and does not take away from the learning objectives" (p.63). Similarly, Khairunnisa and Iwa Lukmana (2020) examine teachers' attitudes regarding translanguaging inside the classroom. Findings report that the majority of the teachers chose Indonesian and the local language to be used in the English classroom, since they feel that both languages would help students in their learning. On the contrary, the rest of the teachers feel they have to maximize the use of English only. Pinto (2020) reflects the same results when the participants had the opportunity to express their feelings towards translanguaging; several teachers replied, "it is very important to take advantage of students' home language" (p.26).

Other studies (e.g. Al-Bataineh & Gallagher, 2018; Guzman-Alcon, 2019; Wang, 2019) report ambivalent attitudes towards the use of translanguaging. While some teachers embrace the practice of translanguaging, others find it difficult to do so due to various factors such as risking the acquisition of the second language, school language policy, ideology behind prestigious languages, and so on. Teachers who are concerned about the acquisition of the second language may fear that allowing students to use their home language in the classroom may negatively impact their proficiency in the second language. For example, Guzman-Alcon (2019) report that "each school encourages monolingual education in line with its language model" (p.111). For instance, some teachers said: "I mainly use English because my Spanish is not good", or "… it is what we want in our schools" (p.111). In addition, Pinto's (2020) results show

that some teachers have different attitudes according to grade levels: "at the elementary level, it is beneficial to use it, but at advanced levels it becomes detrimental" (p.26).

In light of the preceding discussion, it can be observed that some teachers have a positive attitude towards translanguaging, recognizing it as an essential practice that can facilitate students' learning of mathematics. Conversely, other teachers hold negative attitudes towards translanguaging, as they fear that it could hinder the acquisition of the second language, affecting students' fluency and literacy. Negative attitudes imply that teachers focus more on the drawbacks of translanguaging, perceiving it as an unproductive practice.

In the next section, we investigate studies that report on the teachers' beliefs towards the practice of translanguaging.

Teachers' beliefs towards translanguaging practices. Recent studies on teachers' beliefs towards the practice of translanguaging (e.g. Alhasnawi, 2021; Doiz & Lasagabaster, 2020; Macaro, 2009, 2014) show that teachers' beliefs fall into two categories regarding translanguaging. The findings report that there are teachers who hold beliefs that encourage the use of translanguaging, while others hold beliefs that inhibit the use of translanguaging. Macaro (2009) distinguishes between three teachers' belief positions:

1. "The virtual position: this position is represented by teachers who believe they have to use only the language of instruction in their classes.

2. The maximal position: this encompasses teachers who believe that exclusive use of the second language is not attainable all the time as the perfect conditions do not exist, and therefore, these teachers are flexible about using some home language, while feeling a little bit of guilt.

3. The optimal position: some teachers believe that at certain moments the strategic use of translanguaging can enhance learning more than if they stick to the language of instruction. The use of the students' whole linguistic repertoire paves the way for translanguaging, and teachers who support the optimal position will be willing to embrace translanguaging." (Macaro, 2009, p.35-36)

The findings of the studies that investigated teachers' beliefs (e.g Doiz & Lasagabster, 2020; Macaro, 2014) towards the use of translanguaging report that teachers who hold an optimal position and who embrace translanguaging as a pedagogical practice are in the minority. This is due to the English-only language policy that adds the pressure on teachers who teach subjects through the medium of English.

Doiz and Lasagabaster (2020) adopt Macaro's framework to examine 13 teachers' beliefs regarding the use of home language in English medium instructions. Their results show that the majority of teachers are on Macaro's virtual position since they believe that "their role is to mirror the environment of the students' home language in English by the creation of an only-English context" (p.15). The teachers argue that "they fear the eventual replacement of the second language by the home language if the use of the home language is encouraged" (p.15). On the other hand, only two teachers hold the optimal position. "These two teachers believe that being flexible is of the utmost importance when it comes to the use of languages" (p.17). Setati (2005) in the context of South Africa, reports the case of a primary teacher that was confronted with a dilemma of choosing whether she should teach mathematics in English or allow the use of Setswana (the home language). This is due to the teacher's belief that English is a solution for a better socio-economic status. During the analysis of Setati and Adler's (2000) interviews, all mathematics teachers reveal what is called the "dilemma of

switching between languages" that Adler (2001) refers to when discussing the tension between utilizing multilingual resources and encouraging the use of formal language. Despite the teacher's beliefs that switching between languages encourages classroom learning and communication, they limit translanguaging practices to avoid denying their students' access to English (the language of instruction). The results show that translanguaging occurred least in rural primary classrooms as opposed to urban secondary mathematics classrooms.

Research in science education in Lebanon (e.g Salloum & BouJaoude, 2020) report that teachers limit the use of translanguaging due to the language of textbooks and examinations. In addition, they were worried about the students' language proficiency and performance of students due to not comprehending the exam items well. On the other hand, some teachers believe that using home language would facilitate students' conceptual understanding (Setati et al., 2002). Other teachers are with the use of translanguaging as long as the explanation is stated correctly (Salloum & BouJaoude, 2020); or at least as long as the students did not yet develop proficiency in the second language (Amin and Badreddine, 2020).

Salloum and BouJaoude (2020) interviewed teachers from public and private schools in Lebanon. Within the analysis of these interviews, three issues are raised by the teachers regarding teaching science in a foreign language. First, in public schools, teachers are worried about the student's language proficiency, while private school teachers are concerned about the performance of the students in the exams due to not comprehending the items correctly. The second is concerned with the limited language training offered by the government – an issue raised by a public-school teacher. The last issue is raised by a biology public-school teacher and is concerned with a mixed

message on how to deal with the Arabic language. Especially that some teachers recommend the usage of Arabic as long as the explanation is stated correctly, while others disagree with this.

Amin and Badreddine (2020), compare teacher-student interaction in two first grade elementary science classrooms in Lebanon where science is taught in Arabic. The researchers held interviews with two teachers who have different preferences regarding the use of Arabic inside the classrooms. One teacher states that she supports the school's policy and that she prefers to use the Modern Standard Arabic inside her classroom rather than the Lebanese dialect. She believes that with using the Modern Standard Arabic, students will get familiarized with the words used in their textbooks and hence their exams. The other teacher argues that the Lebanese dialect should be used as the language of instruction, at least until the students are proficient enough with the language of instruction. In fact, the researchers studied the alignment between the teachers interviews and their classroom instruction and found that the teacher who valued the use of the Lebanese dialect, in fact did use the dialect in the classroom instruction. While the teacher who valued Modern Standard Arabic (MSA) more, used MSA consistently.

One research study, Alhasnawi (2021) addresses teachers' beliefs about translanguaging in university mathematics. The author employs interviews, classroom observations, documentary analysis of assessment materials. The results show that teachers believe that translanguaging is a dynamic practice and that the language policy should start to consider this dynamic nature of translanguaging.

In the view of what was discussed, teachers have different beliefs towards their own use of translanguaging. Some advocate for the use of translanguaging since it

promotes students' meaning making. Others are faced with a dilemma of when and how translanguaging should be used and their main concern is that the examinations are in the language of instruction. In the next section, we investigate what the literature has to say about the relationship between teachers' beliefs and attitudes and their practices.

Relationship between teachers' beliefs, attitudes, and their practices

There is consensus in the literature that teachers' beliefs and attitudes influence their instructional practices (e.g. Borg, 2011; Bovellan, 2014; Pajares, 1992). For instance, Borg (2011) and Pajares (1992) claim that teachers' beliefs and attitudes strongly influence their pedagogical decisions. Within this perspective, Bovellan (2014) reports that teachers' beliefs and attitudes are a "crucial factor guiding teachers' pedagogical practices when teaching through a foreign language" (p.52).

Nambisan (2014) uses Philipp's framework to investigate language teachers' attitudes and practices of translanguaging in mainstream and dual language programs. The findings show that there is a discrepancy between teachers' attitudes and practices. While the majority of teachers had a positive attitude towards translanguaging, only a small portion implemented these practices inside their classroom. For example, these teachers acknowledge the value of translanguaging but prefer to use it less by stating "it is detrimental when it is keeping them from accessing and using their second language" (p.63).

Canturk Gunhan (2020) examines the effects of "mathematics teachers' beliefs about mathematics on the relationship between perception of pedagogical content knowledge and attitude towards mathematics teaching" (p.1). The results determine that "mathematics teachers' perceptions of pedagogical content knowledge affect their attitudes towards mathematics teaching positively, and the relationship between

perception of pedagogical content knowledge and attitude toward mathematics teaching was fully mediated by their beliefs about mathematics" (p.123). Canturk Gunhan's study implies that beliefs about mathematics impact the attitudes towards mathematics teaching. Similarly, Koballa and Crawley (1985) stated that beliefs are the basis for the development of negative/positive attitude towards a behavior or a thing and in turn, the emergence of practice. So, what is interesting to examine is whether this is always the case. Maybe yes, because the beliefs are the most cognitive in Philipp's definition and attitudes are more intense but maybe this is not always the case. So, this study aims to uncover teachers' affect (beliefs and attitudes) towards the functional role of translanguaging and their reported and observed translanguaging practices inside the classrooms. Only through this we would understand the relationship between beliefs, attitudes, and practices.

Conclusion

Through different findings, we can state that there is a relationship between the teacher's beliefs and attitudes and the classroom pedagogical practices. This relation is significant for the practice of teaching, the quality of pedagogy, and the student's performance. In fact, balanced and strategic translanguaging is an important pedagogical source for meaning making through which the teacher would interact with the students and promote their participation and understanding. Therefore, there is a need to describe and examine the teacher's beliefs and attitudes towards using home language (Arabic Lebanese dialect) inside the mathematics classroom, especially in Lebanon, where mathematics is taught in a second language (English or French). In addition, it is important to inspect the functions of translanguaging practices inside the mathematics multilingual classroom. Only through this way we can know how to

approach the issue of adopting a translanguaging stance. The next chapter explains in detail the methodology that was followed in this study.

CHAPTER 3

METHODOLOGY

The study was guided by three research questions:

1. What are teachers' beliefs and attitudes towards the functional role of translanguaging practices in mathematics multilingual classrooms in private schools in Lebanon?

2. How do teachers rationalize their beliefs and attitudes towards the functional role of translanguaging practices in mathematics multilingual classrooms in private schools in Lebanon?

3. What are the patterns of functions of teachers' translanguaging practices in mathematics multilingual classrooms in private schools in Lebanon?

Research design

To examine teachers' affect towards translanguaging practices and the influence they have on their practices, some studies adopted a quantitative research design (e.g. Gorter & Arocena, 2020; Khader, 2012; Khairunnisa & Lukmana, 2020; Sarikaya et al., 2018; Thi To Khuyen, 2021; Thompson, 2009; Zumbrun, 2015), whereas other studies adopted a qualitative design (e.g. Alhasnawi, 2021; Doiz & Lasagabaster, 2016; Haukus, 2016; Fernandes & Kahn, 2021; Wang, 2019; Zainil & Arsyad, 2021). While only few studies used a mixed-method approach (e.g. Fang & Liu, 2020; Guzman-Alcon, 2019; Nambisan, 2014; Pinto, 2020). In most of these studies, the focus was on describing either teachers' beliefs or attitudes towards translanguaging in English language classrooms. In this study, the purpose was to investigate the teachers' beliefs and attitudes towards the functional role of translanguaging practices in mathematics

multilingual classrooms, and the functions of translanguaging practices as observed inside the classroom. This study used a mixed research design: quantitative and qualitative. Quantitatively, the study reported the descriptive statistics of teachers' beliefs and attitudes towards translanguaging practices. On the other hand, qualitative methods were used for more in-depth description of why teachers hold these beliefs and attitudes by highlighting themes emerged from the teachers' responses. In addition, quantitative approach was adopted to report the frequency and percentages of the functions of translanguaging practices as observed inside the teachers' mathematics classroom.

Previous studies used tools such as questionnaires (e.g. Gorter & Arocena, 2020; Guzman-Alcon, 2019; Khader, 2012; Nambisan, 2014; Thi To Khuyen et al., 2020; Zumbrun, 2015) and interviews (e.g. Alhasnawi, 2021; Fernandes & Kahn, 2021; Guzman-Alcon, 2019; Zainil & Arsyad, 2021). Some studies also used focus group interviews (e.g. Doiz & Lasagabaster, 2016; Haukus, 2016) and classroom observations (e.g. Alhasnawi, 2021; Thompson, 2009). In this study, we used a questionnaire, individual semi-structured interviews, and classroom observations to collect data. The questionnaire was used to sample 54 teachers that enabled us to identify 11 teachers that fall into different profiles of attitudes and beliefs (discussed in detail in the Participants section). Moreover, the interviews allowed an in-depth examination of why these eleven teachers held these attitudes and beliefs. On the other hand, the classroom observations helped us examine the functions of translanguaging practices as observed inside the classrooms. Once we had the data from the interviews and classroom observation, the researcher investigated the alignment by looking at the relationship of what the teachers

reported in the interviews and what they actually did inside the mathematics classrooms.

Participants

      The participants of this study were intermediate mathematics teachers who were teaching in private schools in Beirut, Lebanon, in which mathematics was taught in English according to the language-in-education policy that schools must follow. After analyzing the questionnaires and identifying teachers' beliefs and attitudes towards the functional role of translanguaging practices, eleven teachers were selected to represent the different categorization of beliefs and attitudes. Table 2 summarized the categories for which teachers were chosen for the interview. The first row described the different positions that teachers can hold to measure the teachers' beliefs, and the first column described the different attitudes that teachers can hold. Each teacher's response had a certain score. According to the data received, the researcher studied the distribution of scores and chose two teachers with positive attitudes and virtual beliefs, another two with maximal beliefs, and another two with optimal beliefs. The same was followed with teachers with negative attitudes (two teachers with negative attitude and virtual beliefs, the other two with maximal beliefs, and the other two with optimal beliefs).

Table 2

Criteria to choose the eleven teachers

	Virtual beliefs	Maximal beliefs	Optimal beliefs
Negative attitudes	*Two teachers*	*Two teachers*	*One teacher*
Positive attitudes	*Two teachers*	*Two teachers*	*Two teachers*

Note. Based on Macaro's (2009) beliefs framework and Philipp's (2007) definitions

The selection of the teachers according to Table 2 helped us answer our research questions, as better understanding of the relationship between beliefs, attitudes, and their translanguaging practices were evident. There were no specific criteria related to the gender, nationality, experience, and age. The only two conditions were that the teacher is not an international teacher so that the home language would be Arabic Lebanese dialect. Second, the teacher should be an intermediate teacher.

Data collection tools

For this study, a questionnaire, semi-structured interviews, and classroom observation were employed to collect data. Each of these data collection tools was proven to be a common practice for these purposes in studies in the field (as shown in section "Research design"). Combining these three tools provided me with a better and richer understanding of teachers' attitudes and beliefs towards the functional role of translanguaging practices which allowed me to answer my research questions. Data from the questionnaire helped me answer research question 1, while data from interviews helped me answer research question 2. On the other hand, the data from the classroom observations helped me answer research question 3.

Questionnaire

The questionnaire (Appendix 1) was used to collect data about teachers' beliefs and attitudes towards translanguaging practices inside the mathematics classroom within a short amount of time. The first part of the questionnaire collected general background information about the teachers such as their gender, age, educational degree, grade level, home language and curriculum, and the primary language of instruction used inside their classrooms. The multiple-choice questions (questions 1-7)

were developed with the aim of knowing the teacher better, ensuring s/he teach intermediate level and that her/his home language is the Arabic Lebanese dialect.

The second part of the questionnaire measured teachers' beliefs about the functional role of translanguaging practices, the 9 items helped us determine the teachers' belief about their own translanguaging practices. Table 3 showed the items as they were categorized based on the functions of translanguaging. The teachers had to choose between "Never", "Some of the time", and "Very frequently". A score of 0 was given to a choice of "never", a score of 1 was given for "some of the time" and a score of 2 was given for "very frequently". Accordingly, every teacher received a score on his/her response. To conclude that a teacher was of a certain position, we studied the distribution of scores and divided the range of scores into three categories accordingly. We understand that Macaro's (2009) categories of beliefs are beliefs about practices, and we define these categories (virtual, maximal, optimal) operationally as those who falls into the following different range of scores. The range of scores were distributed as follows: 0 to 5 corresponded to the virtual beliefs, 6 to 11 corresponded to the maximal beliefs, and 12 to 18 corresponded to the optimal beliefs.

The items in each column were constructed according to Philipp's (2007) definition of beliefs, Macaro's (2009) categorization of the three distinct belief positions, and Lo's (2015) taxonomy of translanguaging functions presented in chapter 2. According to Philipp (2007), beliefs mainly reflect teachers' perception on when and for what purposes it should be used (i.e. their view of their ability relative to a particular context, and this is where the cognition lies). In addition, beliefs can be held without any direct action and act as a filtering system for the world (Ambrose 2004; McLeod, 1992; Philipp, 2007; Thompson, 1992). According to Macaro (2009), this belief fits in

one of the three positions: virtual, if the teacher believes s/he has to use only English; maximal, if the teacher believes that translanguaging is sometimes beneficial; and optimal, if the teacher believes that translanguaging enhance the students' learning. For example, the item "I use Arabic to negotiate a mathematical problem with the students" aligns with Philipp's definition that this teacher's beliefs are not directed towards an action in hand as the item did not specify which mathematical problem the teacher is talking about. In addition, it targets a specific function (which is content in this example).

Table 3

Items that measure teachers' beliefs towards the functional role of translanguaging

Classroom management	Content	Social
I use Arabic to comment on students' behaviors (e.g. sit on the chair, close the door).	I use Arabic to explain a mathematical concept for the students.	I use Arabic to refer to a real-life example for the students.
I use Arabic when trying to regain authority in the classroom.	I use Arabic to negotiate a mathematical problem with the students.	I use Arabic when the students are working in groups.
I use Arabic to encourage classroom participation.	I use Arabic to translate an unknown word for the students.	I use Arabic for riddles in the classroom.

The third part of the questionnaire measured teachers' attitudes towards the functional role of translanguaging practices by using a 2-point Likert scale (disagree and agree). Using a 2-point scale lessened the choice for the teachers and allowed them to have a perception about the topic. Research have shown that an odd number of points on a scale (e.g. 3-point Likert scale) might allow the users (teachers in this case) to

choose Neutral which does not infer any of the attitudes (Cohen et. al, 2007). Therefore, using a 2-point Likert scale helped us know the teacher's attitudes towards the functional role of translanguaging practices.

The 12 items in the scale determined the teachers' positive or negative attitudes towards translanguaging. For each attitudes (whether negative or positive), 6 items were constructed. Each teacher had a score on her/his response. A score of 0 was given for "disagree" and a score of 1 was given for "agree". The range of scores were distributed as follows: 0 to 5 corresponded to negative attitudes, and 6 to 12 corresponded to positive attitudes. The more advantages the teacher identified (column 1 in table 4), the more positive the attitude was, and the more disadvantages the teacher identified (column 2 in table 4), the more negative the attitude was. Note that the items were mixed randomly when presented in the questionnaire.

The items in each column were constructed based on Philipp's (2007) definition of attitudes, identified advantages and disadvantages of using translanguaging from literature, and Lo's (2015) taxonomy of translanguaging functions. Attitudes reflect the teachers' perception towards the value (as a measure of significance) of translanguaging (i.e. the advantages and disadvantages) and their emotions towards translanguaging. In addition, according to Patten (2016), when we measure attitudes, we ask questions about feelings and actions.

For example, the item "I am interested in being able to use Arabic inside the classroom to make a friendlier atmosphere" reflected a feeling (being interested) and the action associated with this feeling (using Arabic to make a friendlier atmosphere).

Table 4

Items that measure teachers' attitudes towards the functional role of translanguaging

Attitudes ⟍ Translanguaging functions	Positive attitudes *(Identifying the advantages of translanguaging)*	Negative attitudes *(Identifying the disadvantages of translanguaging)*
Classroom management	I **love** using Arabic inside the classroom since it **encourages the classroom participation**	I **feel guilty** when I use Arabic inside the classroom to grab **students' attention**
Classroom management	I feel more **comfortable** using Arabic to **manage the classroom discipline**	I do **not find it necessary** to **allow speaking** in Arabic
Content transmission	I value the use of Arabic as it **can help** the students **relate more the mathematical concepts**	Using Arabic **confuses** the students more, **limiting** their **conceptual understanding**
Content transmission	I think it is **okay** to use Arabic to communicate better when **negotiating mathematical arguments**	I feel it is **harmful** to use Arabic inside the classroom since **the exams** are in English
Social	I **am interested** in using Arabic inside the classroom **to create a friendly atmosphere**	**English has become the main** language of communication, so **no need** to use Arabic inside the mathematics classroom
Social	I **feel encouraged to** use Arabic when **referring to a real-life** example	I feel **annoyed** when I hear students in **group-work communicate** in Arabic

Semi-structured interviews

After choosing the eleven teachers according to the criteria mentioned above, the semi-structured interviews were used to follow up on how the teachers rationalized their beliefs and attitudes towards the functional role of translanguaging practices. As Rubin and Rubin (2005) claim "Qualitative interviews are conversations in which a researcher gently guides a conversational partner in an extended discussion" (p.5).

The interview questions (Appendix 2) contained two questions at the beginning to initiate the conversation from the participants' part. So, question 1 and 2 are generic but allowed me to see the first response of the participating teacher. Then, question 3

asked the teacher to rationalize their choices in the questionnaire, depending on their beliefs and attitudes. For example, if the teacher held virtual beliefs and positive attitudes, then question 3 was as follows: "Can you explain why you indicated in your response to the questionnaire that you never used Arabic in your mathematics classrooms, although you identified the following advantages…?".

In an attempt to gather information about their beliefs towards their own translanguaging practices, the second set of questions (questions 4 and 5) were developed. The main aim of these questions was to uncover their views on when, how and where they believed translanguaging should be used.

The third set of questions (questions 8-10) asked the teachers to elaborate more on their attitudes towards the value (advantage or disadvantage) of translanguaging practice and their emotions towards this practice.

To analyze the interviews, the researcher utilized the grounded theory approach, which involved initial coding, categorization of codes, and identification of themes. The initial coding process involved using descriptive coding to summarize extracts into codes, which were then categorized based on their similarities. Finally, based on the categories, themes related to the teachers' affect were identified.

Classroom observations

The researcher audio-taped one session for three selected teachers (virtual beliefs with negative attitudes, maximal beliefs with positive attitudes, and optimal beliefs with positive attitudes). The data from the observation with that of the questionnaire and interviews led to more valid results, so one session for each teacher was enough. Accordingly, we were able to describe the observed functions of translanguaging practices.

A classroom observation grid (Appendix 3) inspired by Alhasnawi (2021) was used to orient the observation inside the classroom. Questions 1 and 2 inferred the categorization of the functions of translanguaging.

To analyze the classroom observation, the researcher first identified the utterances were translanguaging occurred. An utterance was coded as English if it was purely uttered in English. While an utterance was coded as Arabic if the whole utterance was in Arabic or part of it. After this layer of coding, the researcher coded the Arabic utterances according to Lo's (2015) taxonomy to identify the functions of translanguaging (Table 1). Then, quantitatively, the researcher was able to report the frequencies and percentages of these observed functions of translanguaging.

After the examination of the teachers' attitudes and beliefs and the functions of their translanguaging practices, the researcher was able to discuss the degree of alignment between what the teacher reported through the interviews and what was observed inside the classrooms.

Data collection procedure

After getting the approval to conduct this research from the Institutional Review Board (IRB), the researcher contacted 45 schools to get their approval to allow their intermediate teachers to participate in this study. Out of the 45 schools, 22 schools approved to let their teachers participate. The researcher explained to the schools' principal the purpose of the study, what was required from the teachers, and then received their approval for the teachers' participation through signing a consent form. After that, the researcher received the approval of the intermediate mathematics teachers in each school through an online consent document stating that completing the questionnaire meant giving your consent to participate in the study, voluntary. The

researcher was able to collect 54 teachers' responses from 45 different schools around Lebanon.

After receiving the questionnaires, the researcher analyzed the data and selected eleven teachers according to the criteria mentioned earlier from the pool of teachers who agreed to participate in an interview. The researcher contacted the teachers by email and agreed on a time and place to conduct the interview after signing a consent form. Each teacher was interviewed individually by the researcher for around 30-60 minutes, all interviews were audio-recorded and later transcribed for analysis.

After the interviews, three teachers from these eleven teachers were chosen to do a one-time classroom observation. Again, the observed teacher signed a consent form. The classroom observations were audio-recorded and later excerpts were chosen to describe the observed functions of translanguaging.

Data analysis procedure

After gathering data from the questionnaires, interviews and the classroom observations, the researcher started analyzing the data in order to answer the three research questions.

Analysis of attitudes and beliefs towards the functional role of translanguaging practices

To analyze teachers' attitudes and beliefs towards the functional role of translanguaging practices, data from the questionnaire was coded. The researcher identified what are the different beliefs and attitudes that intermediate mathematics teachers can hold in private schools in Lebanon. Quantitatively, the researcher reported the frequencies and percentages of the different teachers' beliefs and attitudes.

Once the data is collected from the interviews, the researcher transcribed the audio-recordings. Then, using DeDoose application, the researcher imported the transcriptions and did initial descriptive coding by summarizing extracts by a code. Then the researcher reviewed the data line-by-line and refined the codes. Later on, the codes were categorized into categories by similarity. Finally, these categories were then grouped into a theme related to how did teachers rationalize their beliefs and attitudes.

Accordingly, we were able to investigate teachers' beliefs and attitudes towards the functional role of translanguaging practices and answered our two research questions "What are teachers' beliefs and attitudes towards translanguaging practices in mathematics multilingual classrooms in private schools in Lebanon?" and "How do teachers rationalize their beliefs and attitudes towards translanguaging practices in mathematics multilingual classrooms in private schools in Lebanon?"

Analysis of the functions of translanguaging practices

The data collected from the classroom observations were coded based on Lo's (2015) taxonomy of the functions of translanguaging (Table 1). In this view, extracts were taken from the classroom observations corresponding to the sub-categories found in Table 1. Accordingly, we were able to identify the evident functions (pedagogical: content or management; or social) that the teachers used inside the classroom.

Lo (2015) claimed that the functions of translanguaging can be categorized as follows: (1) classroom management that deals with managing the discipline, commenting on students' behaviors, encouraging classroom participation; (2) content transmission includes explanation of concepts, vocabulary translation, and providing examples from real life situations to explain a concept; and (3) social functions which refers to working in groups, building a friendlier atmosphere.

This analysis answered the third research question "What are the patterns of functions of teachers' translanguaging practices in mathematics multilingual classrooms in private schools in Lebanon"

Validity and reliability

Quantitative research design

Validity. Validity was ensured in the study by discussing the items with an expert and agreeing on the items. In addition, construct validity was ensured by confirming the construction of the items with the relevant literature definitions.

Reliability. The method used to measure reliability was internal consistency reliability which is a measure of consistency between different items of the same construct (Bhattacherjee, 2012). Cronbach alpha was used to measure the reliability of the beliefs' items (0.884) and that of the attitudes' items (0.803).

Qualitative research design

Trustworthiness criteria. Trustworthiness is defined as "that quality of an investigation (and its findings) that made it noteworthy to audiences" (Schwandt, 2015, p.308). There are four criteria to ensure the trustworthiness of the study and its findings: credibility, transferability, dependability, and conformability of the research (Schwandt, 2015). Lincoln and Guba (1985), and Merriam (2002) suggested several ways to ensure these four criteria, these include prolonged engagement, persistent observation, peer examination, triangulation, member checks, etc.

For this study, triangulation was used to ensure the trustworthiness of the study and its findings. Triangulation "may be defined as the use of two or more methods of data collection in the study of some aspect of human behavior" (Cohen et al., 2007, p.141). To be more precise, I used a specific type of triangulation which was the

methodological triangulation as I am using different data collection tools to complete the investigation of teachers' beliefs and attitudes towards the functional role of translanguaging practices (Cohen et al., 2007). Johnson (1992) claimed that triangulation reduces the bias of the researcher and enhances the reliability of the findings.

To ensure reliability in the coding for the classroom observations, and the semi-structured interviews and to make sure that categories were trustworthy, an independent researcher coded the data following the strategy of the researcher. The independent researcher coded three of the eleven teachers' interviews and one of the three classroom observations. First, the researcher met with the second researcher and described the process of coding. Then, the second researcher did the coding and met again with the researcher to discuss and compare the obtained results. When a disagreement occurred, the researcher and the second researcher discussed the results until an agreement is reached. The results of the comparison showed that there was more than 80% agreement between the researcher and the second researcher for the teachers' interviews and for the coding of the classroom observations.

CHAPTER 4

RESULTS

This research aimed to investigate intermediate mathematics teachers' attitudes and beliefs about the functional role of translanguaging practices in mathematics classrooms and the reasons why they hold these beliefs and attitudes. In particular, the study explored teachers' beliefs and attitudes regarding functional role of translanguaging practices as reported by the teachers and their translanguaging practices as observed by the researcher in the classroom. This chapter reports the results of this study following the order of the research questions. To simplify reporting the results of the questionnaire and the semi-structured interviews, I refer to "using Arabic" interchangeably with "translanguaging practices", if needed. The rationale behind this simplification, is because in the questionnaire and the semi-structured interviews, I used "Arabic" to refer to the "Arabic Lebanese dialect" which is considered the home language in this study.

The first part of the chapter reports the teachers' beliefs and attitudes towards the functional role of translanguaging practices. The second part of the chapter reports the themes emerged from the teachers' interview responses of why they hold such beliefs and attitudes. The last part of the chapter illustrates the functions of translanguaging practices as observed inside the mathematics classrooms.

Teachers' beliefs and attitudes towards the functional role of translanguaging practices

The percentage of the different types of beliefs and attitudes that the participating teachers hold regarding the functional role of translanguaging practices was distributed with variations across beliefs and across attitudes. Table 5 showed that

the majority of the participating teachers held either virtual beliefs (40.8%) or maximal

beliefs (46.3%) with variations between negative and positive teachers' attitudes

regarding the functional role of translanguaging practices. For instance, 27.8% of the

teachers held negative attitudes whereas 13% held positive attitudes regarding teachers'

virtual beliefs. In contrast, 18.5% of teachers held negative attitudes whereas 27.8%

held positive attitudes for maximal beliefs.

Table 5

Teachers' affect towards the functional role of translanguaging practices based on the

questionnaire

		Teachers' beliefs towards the functional role of translanguaging practices							
		Virtual		Maximal		Optimal		Total	
		Freq.	%	Freq.	%	Freq.	%	Freq.	%
Teachers' attitudes towards the functional role of trans-languaging practices	Negative	15	27.8%	10	18.5%	1	1.9%	26	48.2%
	Positive	7	13%	15	27.8%	6	11%	28	51.8%
Total		22	40.8%	25	46.3%	7	13%	54	100

Virtual beliefs

Teachers with virtual beliefs regarding the functional role of translanguaging

practices believed that they did not use Arabic in mathematics classroom. The most

frequent response was "never" to the following questionnaire items regarding the use of

Arabic for: (1) commenting on students' behaviors (mode = 0), (2) encouraging

classroom participation, (3) explaining a mathematical concept (mode = 0), (4)

negotiating a mathematical problem (mode = 0), (5) referring to a real-life example (mode = 0), (6) circulating between the students (mode = 0), and (7) telling riddles in the classroom (mode = 0). While the most frequent response to each of the following questionnaire items was "some of the time": (1) regaining authority in the classroom (mode = 1), (2) translating an unknown word for the students (mode = 1).

There was a distinction between teachers with virtual beliefs and negative attitudes from teachers with virtual beliefs and positive attitudes regarding the functional role of translanguaging practices. In the following paragraphs we illustrate these differences. Teachers with virtual beliefs and negative attitudes believed that they did not use Arabic in mathematics classrooms, and they did not find value in using Arabic to teach mathematics. The most frequent response was "disagree" to each of the questionnaire items that identified the advantages of using Arabic: (1) I love using Arabic inside the classroom since it encourages the classroom participation (mode = 0), (2) I value the use of Arabic as it can help the students relate more the mathematical concepts (mode = 0), (3) I think it is okay to use Arabic to communicate better when negotiating mathematical arguments (mode = 0), (4) I feel more comfortable using Arabic to manage the classroom discipline (mode = 0), (5) I am interested in using Arabic inside the classroom to create a friendly atmosphere (mode = 0), and (6) I feel encouraged to use Arabic when referring to a real-life example (mode = 0). Yet, the most frequent response to the rest of the questionnaire items that identified the disadvantages of using Arabic was "disagree" as follows: (1) I do not find it necessary to allow speaking in Arabic (mode = 0), (2) I feel annoyed when I hear students in group-work communicate in Arabic (mode = 0), (3) I feel it is harmful to use Arabic inside the classroom since the exams are in English (mode = 0), (4) Using Arabic

confuses the students more, limiting their conceptual understanding (mode = 0), (5) I

feel guilty when I use Arabic inside the classroom to grab the students' attention (mode

= 0), and (6) English has become the main language of communication, so no need to

use Arabic inside the mathematics classroom (mode = 0). So, these teachers neither

agreed to the advantages of using Arabic, nor agreed to the disadvantages of using

Arabic.

Conversely, teachers with virtual beliefs and positive attitudes believed that they

did not use Arabic in mathematics classrooms even though they found minimal value in

using Arabic in some cases such as when referring to real-life examples to illustrate a

mathematical concept or when encouraging classroom participation. The most frequent

response was "agree" to the following questionnaire items related to the advantages of

using Arabic: (1) I love using Arabic inside the classroom since it encourages the

classroom participation (mode = 1), (2) I value the use of Arabic as it can help the

students relate more the mathematical concepts (mode = 1), (3) I feel more comfortable

using Arabic to manage the classroom discipline (mode = 1), (4) I am interested in

using Arabic inside the classroom to create a friendly atmosphere (mode = 1), and (5) I

feel encouraged to use Arabic when referring to a real-life example (mode = 1). While,

the most frequent response to the rest of the items was a mix between "agree" and

"disagree" (0 is the score given for disagree, and 1 is the score given for agree): (1) I do

not find it necessary to allow speaking in Arabic (mode = 1), (2) I feel annoyed when I

hear students in group-work communicate in Arabic (mode = 1), (3) I feel it is harmful

to use Arabic inside the classroom since the exams are in English (mode = 1), (4) I think

it is okay to use Arabic to communicate better when negotiating mathematical

arguments (mode = 0), (5) Using Arabic confuses the students more, limiting their

conceptual understanding (mode = 1), (6) I feel guilty when I use Arabic inside the classroom to grab the students' attention (mode = 0), and (7) English has become the main language of communication, so no need to use Arabic inside the mathematics classroom (mode = 1).

In summary, teachers with virtual beliefs and negative attitudes towards the functional role of translanguaging practices believe they did not use Arabic inside their mathematics classrooms, and they did not see value in it. While those teachers with virtual beliefs and positive attitudes did not believe in using Arabic in their mathematics classrooms but acknowledged the benefits of using Arabic in some cases.

Maximal beliefs

Teachers with maximal beliefs regarding the functional role of translanguaging practices believed that the perfect English-speaking classroom was not attainable because English is not the students' home language, so they resorted to Arabic. The most frequent response was "some of the time" to the following questionnaire items regarding the use of Arabic for (1) commenting on students' behaviors (mode = 1), (2) regaining authority in the classroom (mode = 1), (3) encouraging classroom participation (mode = 1), (4) explaining a mathematical concept (mode = 1), (5) negotiating a mathematical problem (mode = 1), (6) translating an unknown word for the students (mode = 1), (7) referring to a real-life example (mode = 1), (8) circulating between the students (mode = 1), and (9) telling riddles in the classroom (mode = 1).

Teachers with maximal beliefs and negative attitudes or positive attitudes regarding the functional role of translanguaging practices felt guilty about using Arabic inside the mathematics classrooms. They answered "agree" to the following questionnaire item: I feel guilty when I use Arabic inside the classroom to grab the

students' attention (mode = 1). What differed between teachers with maximal beliefs and positive attitudes and teachers with maximal beliefs with negative attitudes was the extent at which these teachers agreed or disagreed on some items of the questionnaire regarding the benefits/advantages of using Arabic inside the mathematics classrooms. For instance, teachers with maximal beliefs and negative attitudes answered "agree" only to one advantages of using Arabic: I feel encouraged to use Arabic when referring to a real-life example (mode = 1). Nevertheless, these teachers also answered "disagree" to the questionnaire items that identified the disadvantages of using Arabic: (1) I do not find it necessary to allow speaking in Arabic (mode = 0), (2) I feel annoyed when I hear students in group-work communicate in Arabic (mode = 0), (3) I feel it is harmful to use Arabic inside the classroom since the exams are in English (mode = 0), (4) Using Arabic confuses the students more, limiting their conceptual understanding (mode = 0), and (5) English has become the main language of communication, so no need to use Arabic inside the mathematics classroom (mode = 0).

On the contrary, teachers with maximal beliefs and positive attitudes answered "agree" to all of the questionnaire items that identified the advantages of using Arabic: (1) I love using Arabic inside the classroom since it encourages the classroom participation (mode = 1), (2) I value the use of Arabic as it can help the students relate more the mathematical concepts (mode = 1), (3) I think it is okay to use Arabic to communicate better when negotiating mathematical arguments (mode = 1), (4) I feel more comfortable using Arabic to manage the classroom discipline (mode = 1), (5) I am interested in using Arabic inside the classroom to create a friendly atmosphere (mode = 1), and (6) I feel encouraged to use Arabic when referring to a real-life example (mode = 1). Yet, they answered "agree" to the questionnaire items that identified the

disadvantages of using Arabic: (1) I do not find it necessary to allow speaking in Arabic (mode = 1), (2) I feel annoyed when I hear students in group-work communicate in Arabic (mode = 1), (3) I feel it is harmful to use Arabic inside the classroom since the exams are in English (mode = 1), (4) Using Arabic confuses the students more, limiting their conceptual understanding (mode = 1), and (5) English has become the main language of communication, so no need to use Arabic inside the mathematics classroom (mode = 1).

In short, teachers with maximal beliefs regarding the functional role of translanguaging practices believed in the use of Arabic since English is not the students' home language. Teachers with maximal beliefs and negative attitudes or positive attitudes felt guilty about using Arabic inside the mathematics classrooms. What differed was that teachers with maximal beliefs and positive attitudes tended to recognize more benefits for Arabic use in mathematics classrooms.

Optimal beliefs

Teachers with optimal beliefs regarding the functional role of translanguaging practices believed that they frequently use Arabic inside the mathematics classroom. The most frequent response was "very frequently" to the following questionnaire items regarding the use of Arabic for: (1) commenting on students' behaviors (mode = 2), (2) regaining authority in the classroom (mode = 2), (3) negotiating a mathematical problem (mode = 2), (4) translating an unknown word for the students (mode = 2), and (5) referring to a real-life example (mode = 2), While, the most frequent response was "some of the time" to the following items: (1) encouraging classroom participation (mode = 1), (2) explaining a mathematical concept (mode = 1), (3) circulating between the students (mode = 1), and (4) telling riddles in the classroom (mode = 1).

There were differences between teachers with optimal beliefs and negative attitudes and teachers with optimal beliefs and positive attitudes regarding the functional role of translanguaging practices. In the following paragraphs we illustrate these differences. Teachers with optimal beliefs and negative attitudes regarding the functional role of translanguaging practices were teachers who believed they use Arabic more frequently although they did not see value in the usage of Arabic in mathematics classrooms. The most frequent response was "disagree" to the questionnaire items related to the disadvantages of using Arabic: I love using Arabic inside the classroom since it encourages the classroom participation (mode = 0), I value the use of Arabic as it can help the students relate more the mathematical concepts (mode = 0), and I feel more comfortable to use Arabic inside the classroom since the exams are in English (mode = 0). These teachers answered "agree" to the items that identified the disadvantages of using Arabic: I feel annoyed when I hear students in group-work communicate in Arabic (mode = 1), English has become the main language of communication, so no need to use Arabic inside the mathematics classroom (mode = 1).

On the contrary, teachers with optimal beliefs and positive attitudes regarding the functional role of translanguaging practices believed that they frequently use Arabic inside the mathematics classroom, and they acknowledged the benefits of using Arabic inside the mathematics classrooms. The most frequent response was "agree" to most of the items that indicated the benefits of using Arabic such as: I love using Arabic inside the classroom since it encourages the classroom participation (mode = 1), I value the use of Arabic as it can help the students relate more the mathematical concepts (mode = 1), I feel more comfortable using Arabic to manage the classroom discipline (mode = 1), I am interested in using Arabic inside the classroom to create a friendly atmosphere

(mode = 1), I feel more comfortable using Arabic to manage the classroom discipline (mode = 1).

In summary, teachers with optimal beliefs frequently used Arabic in their mathematics classroom instruction. Some of those teachers did not see the value in using Arabic (those with negative attitudes), while others acknowledged the benefits of using Arabic inside the mathematics classrooms (those with positive attitudes).

Teachers' rationale for their beliefs and attitudes towards the functional role of translanguaging practices

Teachers rationalized their beliefs and attitudes according to various themes, which I present in the following sections: (1) the language school policy and how they relate to it, (2) their responsibilities as mathematics teachers and what this responsibility entails, (3) purpose and extent of using Arabic inside their mathematics classrooms, and (4) their perceptions about the importance of using Arabic in mathematics classrooms.

In the below paragraphs, I present these themes that emerged from the qualitative analysis based on the distinction between negative and positive attitudes for each of the three beliefs regarding the functional role of translanguaging practices.

Influence of language school policy on mathematics teachers' affect regarding language use in mathematics classrooms

Teachers in the semi-structured interviews revealed that their beliefs and attitudes were influenced by the school policy about language use in teaching mathematics and whether they abide by it. Below, I illustrate, with examples, the different beliefs and attitudes that teachers hold regarding the school policy and how they relate to it.

Virtual beliefs. The results of the analysis of the interviews with teachers who hold virtual beliefs and negative attitudes (Teachers 1 and 2) were similar to those of

the teachers who hold virtual beliefs and positive attitudes (Teachers 3 and 4). These teachers believed that adhering to the school policy in using English as the language of instruction in mathematics classrooms would enhance the students' language acquisition and would contribute to their success in exams and future university studies. They believed that they should use the language of the book, which is English, all the time in class (Teacher 4). Also, they believed that they are expected to talk in English during classroom instruction (Teacher 3). Teacher 1 argued "it is forbidden to talk in Arabic", and Teacher 2 stated "I am not allowed as a mathematics teacher to use Arabic in my classes, this is the school policy". Teacher 1 also mentioned that "after two years of online courses, the English language acquisition has deteriorated a lot; so, this is why we are expected to reinforce the English language".

Maximal beliefs. The findings regarding teachers with maximal beliefs and negative attitudes (Teachers 5 and 6) revealed that these teachers believed they are not effectively promoting the English language which the school policy dictated. Teacher 5 mentioned "we are helping the students inside the classroom by abiding with the school policy, I am against using Arabic, we have to use the language of the book". Teacher 6 added, "I abide by the school policy, and sometimes when students would speak in Arabic, I would tell them I do not understand Arabic, please elaborate in English"; she argued "they use English in social medias, and on TVs, so I do not find a reason for them not to use English in my math classes".

Similarly, teachers with maximal beliefs and positive attitudes (Teachers 7 and 8) experienced guilt for deviating from the school's policy for using English as a language of instruction in mathematics classroom. Teacher 7 expressed that "in our school, we only give mathematics in English, however, we cannot speak English all the

time", she rationalized that "the idea will reach the students faster if we use Arabic, because it is closer to them". Teacher 8 had a slightly different stance where he mentioned "language of instruction is the language of the book", however he admitted that "on and off, it is okay to use Arabic for facilitating the content, even if the school policy is against this".

Optimal beliefs. The analysis of the interview with the teachers who hold optimal beliefs and negative attitudes (Teacher 9) revealed that these teachers felt a sense of uncertainty and inadequacy in using Arabic during mathematics classroom instruction. Moreover, these teachers were in favor regarding the school policy, which stated that only English was used inside the mathematics classroom. However, these teachers sometimes felt that they were not able to abide by this policy due to lack of proficiency in English by the learners. For instance, Teacher 9 argued "it is wrong to speak in Arabic inside the classroom, but sometimes you are obliged to do so because the students' English language is not strong". He continued to say, "the school should do some planning, especially after the online classes, the students had some weaknesses in English."

On the contrary, teachers with optimal beliefs and positive attitudes (Teachers 10 and 11), disregarded the school's language policy in teaching mathematics. This is because they prioritized their students' understanding over demonstrating English proficiency. For instance, Teacher 10 clearly stated "I use English whenever I see fit, and if I am prohibited to use Arabic which is closer to the students and lose them; then sorry, I will not abide by the policy because I want my students to succeed." Teacher 11 believed that if she abided by the school policy and did not resort to Arabic, then "the

students will be scared of two things, the language itself and the mathematical concept, so s/he would end up hating the subject".

Teachers' stance regarding their responsibilities towards English as a language of instruction in mathematics classrooms

According to the semi-structured interviews with teachers, their beliefs and attitudes were shaped by their perceptions of their responsibilities regarding language use in teaching mathematics. Some teachers prioritized supporting the English language teacher in their instruction, while others focused solely on achieving mathematical objectives, regardless of language. Additionally, some teachers felt that it was their duty to establish an English-only environment in preparation for exams and university. Below, I illustrate, with examples, the different beliefs and attitudes that teachers hold regarding their responsibilities as mathematics teachers.

Virtual beliefs. Teachers with virtual beliefs and negative attitudes felt a sense of obligation to prepare the students for exams, which were conducted in English. For instance, Teacher 1 argued that "The exams and official exams are all in English. So, the students should be acquainted with this. Everything should be in English". Teacher 2 shared a similar stance, stating "sometimes if I give them the chance to speak in Arabic, I will not be patient and I will not be helping them to speak in English later on", she then added that "at a certain age, the students know how to read and understand English, so English should not be a problem in the mathematics classroom", therefore, "it is the teachers' responsibility of all the specialties (math, science, English, etc.) to use the language of the book to help the students".

On the other hand, teachers with virtual beliefs and positive attitudes embraced the usage of Arabic as long as the students were at ease and comprehended the material. They foresee their responsibility to maintain consistency in language use to avoid

confusion among students (Teacher 3 and Teacher 4). Both teachers emphasized the importance of ensuring that their students understood what they said, stating that "using Arabic is not wrong as long as my students are comfortable and understanding what I am saying", Teacher 3 said. "If the teacher did not use Arabic, then the student would struggle in two subjects: English and Math", Teacher 4 mentioned.

Maximal beliefs. Teachers with maximal beliefs and negative attitudes felt pressured and responsible to expose students to English. They felt obliged to support the language teacher by speaking only in English during mathematics classes, especially that students tend to imitate the teachers. Teachers 5 and 6 articulated their perspective as follows, "I feel compelled to support the English teacher in promoting the language to the students and the parents. It is important that we live in a society where English communication is prevalent, and where sometimes math is given in Arabic up to a certain grade level" said Teacher 5. Teacher 6 explained, "If all the teachers, including those teaching math, science, and language, were to adopt a unified approach of using English, there would not be an issue." She argued further "why would students in their daily life and on social media use slang English, but in my math classes they want to use Arabic? They can use English, but it is all the teachers blame, they are allowing them to speak in Arabic and they are getting used to it."

On the contrary, teachers with maximal beliefs and positive attitudes utilized Arabic more frequently in the lower grades, possibly to foster a closer relationship with their students and to improve their understanding of the material. They shared a similar stance in setting a good image for their students, who tend to imitate them. Teachers 7 and 8 rationalized their stance by stating that "I use Arabic in lower grades, more than the intermediate level. If the student understood the concept in his home language, then

s/he will understand it in English … they will imitate how you talk and what language you use", teacher 7 said. Similarly, teacher 8 mentioned "When I am teaching, I like to use English, because they are expected to use English … as much as you get the students to be dipped into English, as much as s/he can be familiar and friendlier with English."

Optimal beliefs. Teachers holding optimal beliefs and negative attitudes believed that the teaching approach, not just in mathematics but across all subjects, needed to be unified in its use of English. For instance, Teacher 9 believed that it was his responsibility to enrich the students' English language because outside the school, they had no space for them to practice English. Teacher 9 supported his stance by the following quotation,

> "… it is wrong to speak in Arabic inside the classroom, but sometimes you are obliged to do so because the students' English language is not strong. In their homes, if they use Arabic and don't practice what they take in the school, they will not enrich their English" (Teacher 9)

He felt guilty for using Arabic inside the mathematics classroom and proceeded to holding accountable teachers of all subjects: "I feel guilty when using Arabic, but this guilt should not be on one teacher's shoulders, it should be a collaborative work to help the students' English language". He argued that "throughout my experience outside the school, I see that students from prestigious schools, speak fluently in English, even in the private tutoring sessions."

Teachers with optimal beliefs and positive attitudes viewed the goal of mathematics classes as understanding mathematical concepts, regardless of the language used, whereas the goal of English classes was to improve English proficiency.

These teachers placed greater emphasis on English writing rather than reading. Teacher 10 stated "my goal is not only to succeed in the subject, but to understand it. If students walking with their parents were able to link what they took in class to what they see and experience in their Arabic-speaking society, then he will love the subject more and relate to it". He argued further

> "I do not see any disadvantage of using Arabic, if a student scored 20/20 in her exam, and in class she discussed the problem in Arabic because it is her home language; does that make her a low achiever? She achieved her math goals, and this is what is important to me. I am with empowering their English, but not in my math classroom; this is not my goal." (Teacher 10)

Although Teacher 11 shared commonalities with Teacher 10 on his stance, she felt a little bit annoyed when using Arabic because "they have to practice their English" (Teacher 11). She believed that if she did not resort to Arabic, then the students would be scared of two things "the language itself and the problem, and so he would end up leaving. For this reason, I prefer to focus on the math and raise the issue to the English teacher to help in the vocabulary", she claimed.

Teachers' purposes of using Arabic inside the mathematics classrooms

Teachers in the semi-structured interviews revealed that their beliefs and attitudes were influenced by how they foresee the purpose of using Arabic inside their mathematics classroom instruction. All teachers with different beliefs and attitudes agreed that Arabic facilitated learning as it relates to the students' daily life. However, some teachers associated the usage of Arabic for practical purposes only, for example giving a real-life example to facilitate the learning process. Others would foresee Arabic as means to bridge the gap between the abstract mathematical concepts and the

students' surroundings. Also, these teachers relied on Arabic depending on the students' limited English proficiency. Below, I illustrate, with examples, the different beliefs and attitudes that teachers hold regarding the functional role of Arabic.

Virtual beliefs. Teachers with virtual beliefs and negative attitudes believed that they only use Arabic for real-life examples to enhance the learning experience. These teachers encouraged the students to repeat their Arabic-spoken statements in English, because they believed that the frequent use of English would acclimate the students to the language. Teacher 1 stated:

> "You should always talk in English and use the language of the book while explaining, giving examples, while working with the students, all the time in class. Sometimes, I use real-life examples in Arabic to help students understand better … Another exception would be new students coming from different background where they are used to Arabic more" (Teacher 1)

Teacher 2 also mentioned: "Usually, I ask them to rephrase their statements, and try to use English … It depends on the situation, I might use Arabic in real-life examples or in word problems, and they would understand; but this is not my strategy." In response to the question "how do they overcome the difficulty that students might face related to language inside the mathematics classroom", teacher 1 claimed that "I teach them how to read for keywords", while teacher 2 claimed "I use peer-to-peer techniques for students to help each other".

Similarly, teachers with virtual beliefs and positive attitudes used Arabic when referring to real-life examples in order to enhance the learning experience. In addition, they foresee Arabic as essential for instructional and management purposes. Teacher 3 mentioned, "For the whole classroom, the main language is in English. For math

terminologies, instructions, everything we use English in class … sometimes I use

Arabic to give a real-life example that is closer to the students' daily life." Similarly,

teacher 4 mentioned "When we are explaining a theorem or a problem, we always have

to speak in English. But sometimes, you have to use Arabic to make it closer to their

real life".

If the students faced any language difficulty in mathematics classroom, teacher 3

mentioned that she employed "the use of visual aids, such as pictures, videos, and

projects, to explain difficult concepts in the classroom" before resorting to Arabic.

While teacher 4 believed that "resorting directly to Arabic was the most effective way

to bridge the gap between the students and the subject matter".

Maximal beliefs. Teachers with maximal beliefs and negative attitudes believed

that they used Arabic depending on students' comprehension. These teachers resorted to

Arabic, when necessary, to explain a concept or give a real-life example or even discuss

a problem. They encouraged their students to speak in English but tolerated the

students' statements in Arabic if necessary. Teacher 6 noted that "English makes you

look good. Students when they hear you speak English fluently, appropriate sentences,

good terminology, you find that the class is disciplined and they are motivated to listen

… when I use English, I feel that they are intrigued to listen." However, she admitted

that her classroom was not entirely English-speaking, "sometimes the students force me

to use Arabic to explain things, but I am not happy about it." Teacher 5 mentioned "I

am against using Arabic for things related to the mathematical concepts and technical

words", however "if we watch a video or we are solving a worksheet, the discussion

ends up being in Arabic. I do not interrupt the student, but I try to help them express

their ideas in English". Teacher 5 also added "I am obliged to comment on the students' behaviors or explain instructions in Arabic because they are low achievers in English".

In response to the interview question "how do you overcome the students' difficulties related to language in mathematics classrooms" teacher 6 used an English-math dictionary and found it helpful in translating concepts into mathematical equations. Meanwhile, teacher 5 used reinforcement method by telling the students "If you do not use any Arabic word today, I will give you a bonus point and you will be crowned as a queen/king of mathematics".

Teachers with maximal beliefs and positive attitudes shared a similar stance with those holding maximal beliefs and negative attitudes. They believed that the usage of Arabic was associated with the extent of the students' understanding. Teacher 7 mentioned "I would use Arabic to convey the message easier and faster to the students, but for the mathematical terminologies and concepts, I use English", she added "I might use Arabic in examples to make it closer to the students, or I might restate the instructions in Arabic to make sure every student is following what we are working on". Teacher 8 found fewer purposes for using Arabic than Teacher 7. He said "I could say whatever I want to say in English, no need to say it in Arabic. So, I prefer not to use it." However, he stated "if the student is saying something in Arabic, I would listen to him, especially if I know he is a low achiever". In this case, "I try to correct or rephrase his statement, in a nice way to boost him" (Teacher 8).

Teacher 7 used a play approach to overcome the language difficulties of her students, "sometimes we play hangman games to include the terms and words we might use today" (Teacher 7). Teacher 8 claimed that in his initial teaching years, he resorted to Arabic directly when students faced language difficulties. Now his technique is to

"rephrase the statement in another way, using English, to make it closer to their understanding" (Teacher 8).

Optimal beliefs. The teacher holding optimal beliefs and negative attitudes felt that he had to use Arabic to "feel closer to the students and relate to them" (Teacher 9), otherwise he would lose their interest and motivation in mathematics. He also admitted that he frequently used Arabic not because he liked to, but because of the students' limited English proficiency. "I would use Arabic particularly in word problems where students must translate the language into mathematical concepts", Teacher 9 said. To overcome students' language difficulties inside the mathematics classrooms, Teacher 9 mentioned, "I give more than one problem daily purely in English so that the student would practice his/her English".

On the contrary, teachers with optimal beliefs and positive attitudes believed that Arabic served as a bridge between the students' daily life and mathematical concepts. They integrated Arabic into all aspects of the classroom instruction because they believed if Arabic was used effectively, the students would have less language difficulties. Teacher 10 rationalized his stance by stating that

> "It is not about a word translation; the students have to understand the lesson as a whole and how s/he can use it in their daily life. I always tell my students, if you know how to solve a problem but don't know where to apply it in your life. Then you didn't understand the concept, because math is in your everyday life. So, I use Arabic to bridge between their everyday life and the mathematical concepts" (Teacher 10)

He gave two examples, the algebraic expressions and the remarkable identities, and he argued that if the student did not understand what "expressions" or "remarkable"

means, "how can s/he relate to it?", Teacher 10 argued. Teacher 11 shared similar stance by stating, "In problem solving, the students get scared from the problem itself. In my opinion, I do not care about the whole problem, I care about picking up the mathematical indications that would allow me to solve it, and here I end up explaining the context in Arabic". Teachers 10 and 11 believed that Arabic could be used in all aspects of the classroom, and it did not affect the students' achievements, instead they felt it helped them succeed more in the exams because they understood the question better. For this reason, Teacher 10 claimed "less than 5% of my students find difficulties related to language in my math classes, because I link the math concepts to their everyday life". While teacher 11 would overcome her students' language difficulties by "hinting to the words that would imply the mathematical meaning in a problem" (Teacher 11).

Teachers' perceptions regarding the value in using Arabic in mathematics classrooms

Teachers in the semi-structured interviews revealed that their beliefs and attitudes were influenced by whether they saw an advantage and positive impact of using Arabic, or whether Arabic was considered a drawback in their mathematics classroom instruction. Some of these teachers found no value in using Arabic and even felt frustrated when they had to use it; while others claimed that Arabic is the students' identity, so they had the right to use it to relate to their surroundings. Below, I illustrate, with examples, the different beliefs and attitudes that teachers hold regarding the value of using Arabic.

Virtual belief. Teachers with virtual beliefs and negative attitudes did not value the use of Arabic, and they felt it had zero to minimal advantages. They felt frustrated when they were compelled to use Arabic in the mathematics classroom instruction.

They associated negative feelings with using Arabic and believed it had a negative impact on the students. They preferred talking in English and letting the students get used to it. Teacher 1 mentioned "I do not like to use Arabic in my math classes, but sometimes when I have to. I use it, but I do not like it." She then added "There are no advantages in my opinion. The best way is to talk in English and let them get used to it. Although sometimes we interfere in words and introduce Arabic words while giving examples to relate to real-life experience, but I do not like it. I prefer not to use it." While teacher 2 stated "I do not like using Arabic in my math classes, because we are teaching math in English. I prefer to talk and explain in English, the students have the ability to speak and understand English."

Teachers with virtual beliefs and positive attitudes valued the use of Arabic, as it promoted student engagement and cultural relevance. Teacher 3 recognized that "Arabic is our home language and using it attracts students to the subject". Teacher 4 acknowledged that "our societies and culture are not English-based" and that it was important to make the material more relatable and engaging for the students. These teachers were comfortable in their use of Arabic and did not experience frustration or guilt. The effectiveness of using Arabic was seen as a shared responsibility between the teacher and the students' ability to understand. They expressed that they did not prefer to use Arabic as the sole medium of instruction, but they acknowledged that it had its advantages and could bring the students closer and more engaged in the learning process.

Maximal beliefs. Teachers with maximal beliefs and negative attitudes experienced frustration or guilt as they blamed themselves and others for not consistently using English in the classroom. Both teachers acknowledged feeling guilty

when using Arabic, explaining, "We sometimes have to resort to Arabic to make sure the students understand, but it feels like we are doing something wrong" (Teacher 6). Teacher 5 went on to say, "As teachers, we serve as role models for our students, and using Arabic myself makes it difficult for me to ask them to use English."

On the other hand, teachers with maximal beliefs and positive attitudes recognized the benefits of using Arabic "as it can build the repertoire of the children", Teachers 7 and 8 mentioned. Teacher 7 argued "using Arabic would create in the students' mind that they are at ease, which sometimes, is what we need. We want the student to be able to express themselves in the way they want". They also remarked that using Arabic had its benefits as it is the home language of the students "Of course, it is their mother tongue, they use it for communication. We cannot move them from an atmosphere where they are using Arabic, and directly use English. They are not living in a country where its home language is English. This takes time for adjustment. But, as far as they get used to that, it will be with them", Teacher 8 said.

Optimal beliefs. The teachers with optimal beliefs and negative attitudes saw Arabic as means to help the low achievers, while he recognized the disadvantages of using Arabic as it can limit the students' English language proficiency. He mentioned "we should not use Arabic inside the classroom, but I use it because I want them to love mathematics and it makes me more approachable to them" (Teacher 9).

On the contrary, teachers with optimal beliefs and positive attitudes saw Arabic as an integral part of the students' identity. They also believed that it helped in all aspects of the classroom instruction. Teacher 10 mentioned, "There is no disadvantage of using Arabic inside the mathematics classroom. It all depends on the perspective of each teacher, why does s/he need English or Arabic in the classroom? What are her

goals as a mathematics teacher?" He added "personally, my goal is that my students achieve the mathematics objectives in whatever language they want. In the English classes, speaking in English is an objective and a goal to achieve in the classroom, but in my classes, it is not a goal." Teacher 11 mentioned, "Arabic is their home language, it is normal to use it, and it is the students' right to do so … using Arabic is related to an emotional aspect, you feel relaxed and at ease while doing so".

In the last section, we discuss the frequency of the functions of translanguaging in three classroom observations for three different teachers holding different beliefs and attitudes.

Functional role of translanguaging practices in mathematics classrooms

The results obtained from audio-taping teachers' talk during mathematics classroom instruction for three teachers with different beliefs and attitudes regarding the usage of Arabic shed light on the various functions of using Arabic within mathematics classrooms. The analysis of the three sessions, presented in Table 6, provided the frequency and corresponding percentages of the language of instruction utilized by the three teachers in their mathematics classrooms. Each session was about 40 minutes long. Any utterance that had Arabic in it, was coded as Arabic. The teacher who exhibited virtual beliefs with negative attitudes (Teacher 1) utilized English for 84.7% of the time in her classroom with 124 utterances in the observed lesson. While the teacher who held maximal beliefs with positive attitudes (Teacher 7) employed Arabic for 63.9% of her mathematics classroom with 122 utterances in the observed lesson. In contrast, the teacher who demonstrated optimal beliefs with positive attitudes (Teacher 10) used Arabic exclusively, accounting for 100% of his 108 utterances in his mathematics classroom.

Table 6

Frequencies and percentages of language use in three different classrooms

		Teachers' affect towards the functional role of translanguaging practices					
		Virtual beliefs with negative attitudes		Maximal beliefs with positive attitudes		Optimal beliefs with positive attitudes	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Language of instruction	English	105	84.7%	44	36.1%	0	0%
	Arabic	19	15.3%	78	63.9%	108	100%
Total		124	100%	122	100%	108	100%

The findings, presented in Table 7, display the frequency and corresponding percentages of each function (management, content, and social) employed in the mathematics classrooms. Table 7 showed that the teacher with virtual beliefs and negative attitudes (Teacher 1), referred to Arabic 89.5% for classroom management purposes. While the teacher with maximal beliefs and positive attitudes (Teacher 7) referred to Arabic mostly for management purposes (55.1%) and content purposes (33.3%). Similarly, the teacher with optimal beliefs and positive attitudes (Teacher 10) referred to Arabic for management purposes (34.3%) and content purposes (52.8%).

Table 7

Frequencies and percentages of the functions of translanguaging practices for three teachers with different beliefs and attitudes regarding the functional role of translanguaging practices

		Teachers' affect towards the functional role of translanguaging practices					
		Virtual beliefs with negative attitudes		Maximal beliefs with positive attitudes		Optimal beliefs with positive attitudes	
		Freq.	%	Freq.	%	Freq.	%
Functions of translanguaging practices	Management	17	89.5%	43	55.1%	37	34.3%
	Content	1	5.3%	26	33.3%	57	52.8%
	Social	1	5.3%	9	11.5%	14	13%
Total		19	100%	78	100%	108	100%

The three observed teachers, namely teachers 1, 7, and 10, demonstrated a direct alignment between their interviews and classroom practices. In the below paragraphs, I present the purposes in detail for each of the functions with illustrative examples from the observed classrooms for each of the three teachers.

Virtual beliefs with negative attitudes

Teacher 1, who displayed virtual beliefs with negative attitudes expressed reluctance towards using Arabic in her semi-structured interview. However, she admitted that sometimes she was obliged to use Arabic and that would make frustrated. It is worth noting that throughout the observation, Teacher 1 frequently requested her students to rephrase their responses in English and occasionally interrupted them when they were unable to do so. In one instance, a student who was eager to participate asked his peer, "بل هيدي ل المنقلا شو English? [How can we say this in English?]", highlighting the students' reliance on their home language in the classroom.

Teacher 1 with virtual beliefs and negative attitudes used Arabic for the following classroom management purposes: (1) arousing the student's attention and focus by regularly telling them to come to the board, or to start working on something: "يلا start thinking [let us start thinking] … "يلا hurry up [come on, hurry up]" ; (2) encouraging classroom participation such as " يا يلا George [let us go George] … "يلا come to the board".

The teacher rarely resorted to Arabic to address content (5.3%) or to address social issues (5.3%) during classroom instruction. Within the content function, she used Arabic for linkage purpose, "the diagonal does not bisect this angle, يعني [this means that] this angle is not necessarily equal to this angle". On the other hand, within the social function, she used Arabic for the purpose of circulating between the students. For

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example, when she did not hear the student while working in a group work, she stated "شو حدّا؟ [what's next to it?], it is okay we will fix it".

Maximal beliefs with positive attitudes

During the semi-structured interview, teacher 7, who holds maximal beliefs with positive attitudes recognized the benefits of incorporating Arabic into the classroom and expressed that as long as it made the students comfortable, she saw no issue with its usage. During the observation, it was evident that she frequently employed Arabic in various classroom practices. Although she admitted to feeling guilty about using Arabic in her interview, she displayed no hesitation in doing so during the classroom session and did not prompt any of her students to rephrase their statements in English.

Teacher 7 with maximal beliefs and positive attitudes used Arabic for the following management purposes: (1) giving instructions or commands "خلينا نبلش نصلح لـ assignment [let us start correcting the assignment] ... يللي مش كاتبة اسمها عالورقة تكتبوا [if you did not write your name on the paper, write it.]"; (2) comment on students' behaviors and managing the discipline such as "حبيباتي ما قلنا بلشنا حكي، قلنا حطينا الوظيفة قدامنا [darlings, we did not say start talking, we said put your assignment in front of you]"; (3) encourage classroom participation "يلا يا نور، طلعي عاللوح [Nour, come to the board]"; (4) arousing students' attention or focus such as "شوفو شو عندي هون؟ [Look, what do I have here?]".

While for the content function, she used Arabic for the (1) back-and-forth discussion with the students such as "على شو بتطلع؟ divisible by اذا هيي to check لـ حتى [To check it is divisible by, what do I look for?]; (2) translating a word "شو يعني divisible by [what do we mean by divisible by]"; (3) explanation of concepts and checking for students' understanding "عرفنا كيف نعمل checking لـ divisible by [do we know how to

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check for divisible by] … ع مين بدي اعمللا78 اذا كان عندي dividing to check if it is prime [if we have the number 78, what should I divide 78 with to check if it is prime]".

Lastly, for the social function (11.5%), she mainly used Arabic to joke around what chapters to include in the exam as a way to make the atmosphere friendlier such as "عم فكر اذا بفوت ل geometry او لا بل امتحان [I am thinking whether I will include geometry in the exam]; or to joke around whose turn is next such as: "مش شكلي رح بلّش دور جديد [I do not think I am going to start a new turn] … المجموعة يللي عم تحكي كتير مش رح بلش من عندا [The group who is talking a lot will not initiate the turn]". Also, she used Arabic while circulating between the students to check their assignment by stating "قري السؤال منيح، شو عم يقول [read the question carefully, what does it state]".

Optimal beliefs with positive attitudes

Teacher 10 who holds optimal beliefs and positive attitudes held a firm belief that the ultimate objective was to meet the mathematics goals, regardless of the language used, and thus opposed the school's language policy. In fact, throughout the observation, he did not utilize a single English-only statement, and his students appeared highly engaged, actively participating, and asking questions. Notably, this teacher often attempted to connect mathematical concepts to the students' real-life experiences. For example, he posed the question "كم شخص عندي هون [how many persons do I have here?]" when introducing a multiplication expression, and when the students replied "two", he continued by asking "عم ب سلمو ع كم شخص [they are greeting how many persons?]", to which they responded "two", and he then concluded by asking "كم عملية سلام عندي [how many greetings do I have in total?]" and the students answered "four". This analogy helped the students understand that when multiplying two expressions with two terms, there would be four terms in total.

Teacher 10 used Arabic very frequently for the content function (52.8%) in the mathematics classroom. The teacher used Arabic for the following purposes: (1) discussing what are the different ways of asking the same question in the exam, such as: "ما بهمنا شو اسمن. دائما مثل ما قلنا، بيجي ب امتحان الرسمي, two expressions, A and B, C and Q في سؤال factorize أو expand [in the official exam, we always have a question with two expressions as a given, A and B, C and Q, we do not care about their names, and they either ask you to expand or factorize]"; (2) explaining a question while solving it such as " اطلعو معي، هون عندي هودي ل two expressions كيف فيي لاقي ل common [look with me, I have these two expressions, how do I find the common term] ... هون ب هل سؤال بيكون عم [in بس بالآخر بدك توصل ل هيدا الشكل factorize بيساعدك مش عم يتذاكى عليك، يعني عم يقللك عملا these type of questions, he is trying to help you, this means he is telling you to factorize and reach the term that he is asking you to show]"; (3) parallel translation of a concept "expand شو يعني؟ يعني نفكك، نمددها، نوسعها [what do we mean by expand, we mean take it apart, stretch it]"; (4) providing real-life examples for giving an analogy on why the variables does not change while adding or subtracting "اذا انا معي 50$ وانت معك 20$, قدي معنا يعني؟ [if I have 50$ and you have 20$, how much do we have in total?], the students answered 70, he added "شو 70" [70 what?], they said "dollar".

The management function had a percentage of 34.3% for the following purposes: (1) managing classroom discipline "طيب شباب، اول شي هادي وين؟ [okay guys, first, where is Hadi?]"; (2) arousing students' attention or focus by asking "شو اللي عملنا هلأ اللي رح نعملو مثل ما قلنا [what did we do last time]"; (3) giving instructions "هيديك المرة من الأسهل لل أصعب applications هيديك المرة، بدنا نمشي بل [like what we discussed last time, we are going to solve the applications from the easiest to the hardest]".

The social function (13%) had the following purposes: (1) making the classroom atmosphere friendlier by saying "يرفع ايدو factorize ومين بيقول expand مين بيقول" [who says expand, and who says factorize, raise your hands]"; or (2) circulating between the students and commenting on their home work such as: " ليش قسمتي على تلاتة [why did you divide by three]".

Conclusion

Teachers who hold virtual beliefs with either negative or positive attitudes shared a common understanding of the limitations in using Arabic. These teachers believed that adhering to the school policy in using English as the language of instruction will enhance students' language acquisition and contribute to their success in exams and future university studies. However, they acknowledged that there may be exceptions where the use of Arabic can be beneficial, such as when students are struggling to understand abstract concepts or when cultural or background considerations make the use of Arabic more appropriate. Teacher 1 who exhibited virtual beliefs with negative attitudes utilized Arabic for 15.3% of the time in her classroom, accounting to 89.5% for classroom management purposes. Although, this does not totally align to her reported beliefs and attitudes in the semi-structured interviews, one explanation would be that she did not find these usage of Arabic to be of significance for her.

On the other hand, despite the differing perspectives regarding the use of Arabic in the maximal beliefs, teachers with both positive and negative attitudes acknowledged the reality that a fully English-medium classroom is not achievable in a multilingual society where English is not the first language for all students. While some teachers adapted to this scenario by using Arabic based on the students' understanding and

abilities, a sense of guilt was a common experience among these teachers. Those with negative attitudes felt that they are doing something wrong by using Arabic, whereas those with positive attitudes understood the benefits of using Arabic for student comprehension but are bound to follow the school policy. Teacher 7 with maximal beliefs and positive attitudes employed Arabic for 63.9% of her mathematics classroom. She referred to Arabic mostly for management purposes (55.1%) and content purposes (33.3%). Despite acknowledging her guilt for using Arabic in the semi-structured interview, she did not show any reluctance to speak it during the classroom session and did not encourage her students to express themselves in English instead. This needs further investigation to know the alignment between the reported beliefs and attitudes and the actual classroom practices.

Teachers with optimal beliefs recognized that students have the right to use Arabic, as it is an intrinsic part of their identity. The usage of Arabic could actually bring teachers closer to their students and does not negatively impact the teachers' professional image. However, those with negative attitudes believed that uniformity and collaboration among teachers is necessary for improving students' English proficiency, while those with positive attitudes believed that strategic use of both Arabic and English could create a bridge between students' daily life experiences and mathematical content, leading to their success in exams. Teacher 10 holding optimal beliefs with positive attitudes used Arabic exclusively, accounting for 100% of his mathematics classroom. He referred to Arabic for management purposes (34.3%) and content purposes (52.8%). This aligns to his reported beliefs about practices and attitudes that were mentioned in the semi-structured interview.

CHAPTER 5

DISCUSSION

This research study aimed to investigate intermediate mathematics teachers' attitudes and beliefs towards the functional role of translanguaging practices in mathematics classrooms and the reason behind these beliefs and attitudes. The study also aimed to investigate the functions of the translanguaging practices in three observed classrooms. This study was guided by three research questions (1) What are teachers' beliefs and attitudes towards the functional role of translanguaging practices in mathematics multilingual classrooms in private schools in Lebanon? (2) How do teachers rationalize their beliefs and attitudes towards the functional role of translanguaging practices in mathematics multilingual classrooms in private schools in Lebanon? (3) What are the patterns of functions of teachers' translanguaging practices in mathematics multilingual classrooms in private schools in Lebanon?

In this chapter, we discuss and explain the results of this study in light of what was presented in the literature related to teachers' beliefs and attitudes towards translanguaging practices. First, we discuss the teachers' beliefs and attitudes towards the functional role of translanguaging practices (research question 1), and why do we have such variations in teachers' beliefs and attitudes. The rationale for these variations was tackled through our second research question. For this reason, when discussing the findings, we discuss results related to research questions 1 and 2, as they are interrelated. Second, we discuss the results regarding the functional role of translanguaging practices as observed in the classrooms. Finally, we identify the limitations and implications for practice and further research.

Teachers' beliefs and attitudes and their rationale towards the functional role of translanguaging practices

In this study, the results showed that teachers were categorized into six different profiles of beliefs and attitudes towards the functional role of translanguaging practices. The teachers' beliefs ranged from teachers who believed Arabic should not be used inside the mathematics classroom instruction, to teachers who believed Arabic served as a bridge between the classroom instruction and the students' daily life. Similarly, teachers' attitudes ranged from teachers who do not value the use of Arabic and associate negative feelings with the usage of Arabic inside the mathematics classrooms, to teachers who embrace the advantages and benefits of using Arabic inside their mathematics classrooms.

The most frequent response to the items that measured teachers' beliefs fall under the maximal beliefs (they believed that a fully English-medium classroom was not achievable in a multilingual society where English is not the first language of all students) with variations between negative and positive attitudes. These results were different than those found in the study of Doiz and Lasagabaster's (2020) where the majority of teachers (8 out of 13 teachers) held virtual beliefs (teachers who believed that they should not use the home language in the classroom instruction). It is important to note that one of the reasons for the difference in the results could be that the teachers in Doiz and Lasagabaster's (2020) study were teaching university courses in an English-medium instruction in a bilingual community (North of Spain). Another reason could be that teachers teaching mathematics at the school level fear that they would lose the students' interest if they immerse the students in a fully English-medium classroom.

On the other hand, the findings of the current study showed that the majority of participating teachers had positive attitudes (51.8%) towards the functional role of translanguaging practices with variations between virtual, maximal, and optimal beliefs. These findings were similar to Nambisan's (2014) and Khairunnisa and Iwa Lukmana's (2020) results, which indicated that the majority of teachers had positive attitudes towards translanguaging practices. The similarity of these results is attributed to the similarity of the context in terms of the rich multilingualism and colonial history. The teachers in Nambisan's (2014) study were teachers in mainstream schools with a large number of Spanish-speaking students. Similarly, teachers in Khairunnisa and Iwa Lukmana's (2020) were teaching English as a Foreign Language classrooms in Indonesia. Therefore, we can conclude that teachers in a non-English-based societies embrace the advantages of using the home language in the classroom instruction.

Another explanation for the variety of teachers' beliefs and attitudes in the current study are the themes emerged from the teachers' responses (research question 2) in which they state the reason they hold such beliefs and attitudes towards the functional role of translanguaging practices. These rationales were: (1) the language school policy and how teachers relate to it; (2) teachers' stance regarding their responsibilities as mathematics teachers; (3) teachers' stance regarding the purposes of using Arabic inside the mathematics classrooms; and (4) teachers' perceptions regarding the value of using Arabic inside the mathematics classrooms. While these rationales are the results obtained for research question 2, they serve as justifications for the variety of teachers beliefs and attitudes (research question 1). Briefly speaking, these varieties that ranged from acceptance for using translanguaging as a pedagogical practice to nonacceptance of using it, is attributable to the contextual differences regarding the flexible language

school policy, language and medium of instruction, societal, cultural, and educational aims, and also the students' English language proficiency (Cenoz, 2017). The participating teachers in this study came from different geographical background covering more than one area in Lebanon. This different geographical areas carried different cultural relevance which might relate to a preferred language use within the students' home and in their surroundings (Shaaban & Ghaith, 2002).

While the themes provided reasons for the variety in beliefs and attitudes towards the functional role of translanguaging practices (research question 1), they are also findings that impacted teachers' beliefs and attitudes. In the sections below, we discuss each of these themes.

Discussion of the language school policy and how teachers relate to it

The variation of beliefs and attitudes that was noticed in this study is due to the presence and flexibility of implementation of a language policy at the schools where these teachers are. Even though teachers reported that their schools have a strict policy of using English in teaching mathematics, some adhered to this school policy, and others disregarded it focusing on the mathematical goals. This variation in language policy in schools can be attributed to the fact that there is no clear language policy at the country level in Lebanon (Bahous et al., 2011). The ministry of education gave the choice for the schools to teach science and mathematics in a second language (English or French), and books were printed in either language (Shaaban & Ghaith, 1999). The history of languages in Lebanon witnessed fluctuations due to political, social, economic, and educational factors that favored one language over the other. Before the 19th century, Arabic was the main language in society and education. During the French mandate, French was the major language of government and education. After

independence, and due to the forces of globalization, English dominated the various social, economic, and educational domains (Shaaban & Ghaith, 1999). The results of the current study were similar to the results of Alhasnawi (2021), which indicated that the policy of using English as the medium of instruction in Iraqi universities did not consider teachers practices, objectives, and challenges in using English for academic purposes.

Discussion of the teachers' stance regarding their responsibilities as mathematics teachers

The second reason why teachers held a variety of attitudes and beliefs towards the functional role of translanguaging was their own stance regarding their responsibilities as mathematics teachers. Some teachers prioritized supporting the English language teacher in their instruction and believed it is their duty to establish an English-only environment in preparation for exams and university. While other teachers focused solely on achieving the mathematical objectives, regardless of language used during instruction. One explanation for this result is that English is often valued for its practical purposes and is commonly used in higher education, business, science and technology (Akl, 2007), so teachers perceive English as a prestigious language. The reasonings and responsibilities stated by the participating teachers in this study aligned with the abovementioned studies that focused on attitudes (Khairunnisa & Iwa Lukmana, 2020; Nambisan, 2014; Pinto, 2020). These studies reported that teachers had negative attitudes towards translanguaging because they feared the proper acquisition of the second language. In addition, teachers had negative attitudes due to their ideology behind prestigious languages. On the other hand, teachers with positive attitudes valued the use of home language as it aided in the comprehension of the subject matter and did not have any negative impact on the learning experience. Although the teachers in the

current study reported a clear stance regarding their responsibilities as mathematics teachers, yet this variation in stances between teachers is widely discussed in literature on translanguaging (Adler, 2001; Doiz & Lasagabaster, 2021). The dilemma between whether teachers should limit their role to teaching mathematics and make sure that students understand it regardless of the language they are using or whether teachers have more responsibilities that goes beyond mathematics to enhancing and encouraging the use of English.

Discussion of the teachers' perceptions of the purposes of using Arabic inside the mathematics classrooms

The third rationale in this study was teachers' perceptions of the purposes of using Arabic inside the mathematics classrooms. Despite the variation in teachers' beliefs and attitudes towards the functional role of translanguaging practices, all participating teachers agreed that using Arabic facilitated learning when used in different ways. While some teachers felt obliged to use Arabic to explain instructions or concepts because of the students' low English language comprehension, other teachers used it voluntarily to explain mathematical concepts or give real-life examples that make mathematics closer to the students' daily life. Previous studies that focused on teachers' beliefs towards translanguaging practices (Macaro, 2014; Setati et al., 2002) demonstrated similar results where some teachers believed that translanguaging is a pedagogical practice and could be used to facilitate students' learning experiences. The findings of the current study also aligned with Palmer et al. (2014) and Sanchez et al. (2018) findings that suggested using translanguaging systematically to facilitate the learning of mathematics.

Language is an element of students' culture and identity (Creese & Blackledge, 2015), and the literature suggests that building on students' home language as a

resource in teaching can help facilitate students' learning experiences (Garcia, 2009;

Garcia & Wei, 2014). In Lebanon, the context of this study, the spoken home language

by the majority of students is the Arabic Lebanese dialect, so that is why using Arabic

while teaching would facilitate students learning as this will implicitly provide cultural

relevance for them and make them feel more connected to what they are studying.

Discussion of the teachers' perceptions regarding the value of using Arabic inside the mathematics classrooms

The fourth rationale that emerged in this study was teachers' perception of the

advantages regarding the use of Arabic inside the mathematics classrooms and their

own feelings towards the use of Arabic. Although teachers' perceptions of the

advantages and feelings could be related to their stance regarding their responsibilities

as teachers and their perception of the purposes of using Arabic, yet their described

advantages and feelings presented a strong justification for their beliefs and attitudes.

Some of these teachers found zero to minimal advantage in using Arabic in the

mathematics classrooms and felt frustrated when they were obliged to use it. Others

claimed that they felt comfortable since Arabic is the students' identity, and they have

the right to use it to relate the mathematical concepts with their surroundings. One

explanation for this finding is the different perspectives suggested by Ruiz (1984) about

language being a right and a resource for the students to use inside the classroom

instruction. Also, with no clear language policy in Lebanon, teachers lack the awareness

of the advantages of using Arabic and building on the students' linguistic repertoire to

convey the mathematical concept. The findings of this study regarding teachers'

feelings were also evident in previous studies that discussed teachers' perceptions on

translanguaging practices. These feelings included guilt (Macaro, 2014), worry and

concern (Salloum & BouJaoude, 2020), fear (Setati et al., 2002), comfortable (Amin & Badreddine, 2020), pleased (Nambisan, 2014), and frustration (Guzman-Alcon, 2019).

Functional role of translanguaging practices in mathematics classrooms

In this study, teachers with different beliefs (virtual and maximal) and different attitudes (positive and negative), utilized Arabic for management purposes more than content related purposes. On the other hand, the content function was dominant in the one of the observed classroom (teacher with optimal beliefs and positive attitudes). One explanation for this finding is that mathematics in Lebanon is conceived as a hard subject, so most of the teachers expressed the fear of losing the students' interest and motivation for learning mathematics. To overcome this fear, they would resort to Arabic as long as the students were comfortable and rationalized this practice by stating that Arabic is the students' identity, and they had the right to use it. Moreover, previous studies (Chen & Rubinstein-Avila, 2018; Lo, 2015) discussed translanguaging functions and revealed that home languages were used for interactional and pedagogical purposes to reach the learning outcome in their classrooms. On the other hand, our findings did not align with Lo's (2015) findings that illustrated that 60-70% of teachers' translanguaging was content-related, and around 30% of translanguaging was for classroom management. As mentioned above, in this study, the management function was dominant in two of the observed classrooms, while the content function was dominant in only one of the observed classrooms.

Conclusion

Our study showed that the majority of intermediate mathematics teachers held either maximal beliefs or virtual beliefs, whether it was associated with negative or

positive attitudes. More teachers held negative attitudes associated with virtual beliefs than the teachers with maximal beliefs.

~~For instance, 27.8% of the teachers held negative attitudes whereas 13% held positive attitudes regarding teachers' virtual beliefs. In contrast, 18.5% of teachers held negative attitudes whereas 27.8% held positive attitudes for maximal beliefs. The rest of the teachers held optimal beliefs (13%). Of these, 1.9% held negative attitudes, and 11% held positive attitudes.~~

Our study showed that teachers with virtual beliefs (whether negative or positive attitudes) shared a common understanding regarding the limitations in using home language to teach mathematics. Moreover, they believed that adhering to the school policy regarding the use of English as language of instruction enhanced students' language acquisition and contributed to their success in the future. Further analysis showed that teachers with maximal beliefs (whether negative or positive attitudes) acknowledged that using English only as language of instruction to teach mathematics was not applicable in their classrooms. Sometimes they had to use home language in order to proceed with their teaching. Teachers with optimal beliefs (whether negative or positive attitudes) acknowledged that their students had the right to use home-language. Our study also showed that the management function was dominated in two of the observed classrooms. Also, the beliefs and attitudes of two of the observed teachers aligned with their classroom practices, while one of the teachers had a misalignment between her reported beliefs and attitudes and the classroom practices. In the next section, we discuss the limitations and further recommendations on practice and research.

Limitations

This study classified the teachers based on their different beliefs and attitudes towards the functional role of translanguaging practices. Thus, the first limitation that is worth mentioning is the themes revealed from the analysis of 11 interviews which may limit the generalizability of the findings. To address this limitation, future research should aim to include a larger sample size of teachers with diverse beliefs and attitudes to compare the rationale of these teachers with different beliefs and attitudes. This would help better understand how we can improve the teacher's development.

Another limitation is the setting of the study, which only included teachers from private schools in Lebanon. This may limit the generalizability of the findings to public schools or other settings with different contextual factors. Future research should aim to include teachers from a variety of settings, including public schools, to gain a more comprehensive understanding of the attitudes and beliefs towards the functional role of translanguaging practices in mathematics classrooms.

Also, this study is limited in the generalization of what component of affect (whether beliefs or attitudes) influences the teacher's instructional practices. This study only observed three classrooms in which two of these teachers held similar beliefs and attitudes (virtual beliefs with negative attitudes, and optimal beliefs with positive attitudes). Further research should aim to include variety of beliefs and attitudes to see which of these are influencing the teacher's classroom practices.

Overall, while this study has provided valuable insights into the beliefs and attitudes of teachers towards the functional role of translanguaging practices in mathematics classrooms, further research is needed to address these limitations and to deepen our understanding of this important topic.

Future Recommendations

The findings of this research are significant and offer valuable insights for future studies. One important result to consider is the ability to classify teachers based on six different beliefs and attitudes and identify the contradictions between their beliefs and attitudes. Expanding the sample size and including more grade levels could lead to important recommendations for improving teachers' professional development, particularly regarding the use of translanguaging as a strategic resource in mathematics classrooms.

Furthermore, it is crucial to recruit a diverse group of teachers, taking into account factors such as region, school setting (public or private), socio-economic status, and English proficiency level. The results of this study suggested that teachers associated the need to use Arabic with low proficiency students or those from certain backgrounds and societies. Therefore, a teacher with language barriers may hold different beliefs and attitudes compared to a proficient English-speaking teacher. Elaborating on the factors that could influence such beliefs and attitudes is important as well.

In addition to exploring teachers' beliefs and attitudes, it would be beneficial to investigate parents' expectations and perspectives on their child's language proficiency, especially in lower grades where the child may primarily speak Arabic Lebanese dialect at home.

Finally, the study highlights the importance of investigating the beliefs and attitudes that guide teaching practices. Given that strategic translanguaging has been shown to be an effective pedagogical resource for achieving mathematics goals while

also promoting second language proficiency, further exploration in this area is necessary.

APPENDIX 1

QUESTIONNAIRE

Arabic here is used to refer to the Arabic Lebanese dialect, but for simplicity I stated it as Arabic.

PART 1: Background Questions
1. Gender:
    Male
    Female
2. Age: _____
3. Which of the following degree(s) have you earned? *[People here can tick more than one option]*
    Bachelor, specify major: _____
    Masters, specify major: _____
    Ph.D., specify major: _____
4. Which curriculum are you currently teaching? *[People here can tick more than one option]*
    Lebanese curriculum
    American curriculum
    International Baccalaureate
    Other, please specify: _____
5. Which grade level are you currently teaching? *[People here can tick more than one option]*
    Lower Elementary (Grades 1, 2, 3)
    Upper Elementary (Grades 4, 5, 6)
    Intermediate (Grades 7, 8, 9)
    Secondary (Grades 10, 11, 12)
6. What is the primary language of instruction in your class? *[People here can tick more than one option]*
    English
    Arabic
    French
7. What language do you use **most** in your everyday life? *[People here can tick more than one option]*
    English
    Arabic (Lebanese Dialect)
    French
    Other, please specify: _____

PART 2: Kindly answer the following questions

This part targets teachers' beliefs towards translanguaging.

Choose how often do you usually use Arabic in the following situations inside the mathematics classrooms in Lebanon.

1. I use Arabic to comment on student's behavior (e.g. sit on the chair, close the door).

a. Never   b. Some of the time   d. Very frequently

2. I use Arabic when trying to regain authority in the classroom.

a. Never   b. Some of the time   d. Very frequently

3. I use Arabic to encourage classroom participation.

a. Never   b. Some of the time   d. Very frequently

4. I use Arabic to explain a mathematical concept for the students.

a. Never   b. Some of the time   d. Very frequently

5. I use Arabic to negotiate a mathematical problem with the students.

a. Never   b. Some of the time   d. Very frequently

6. I use Arabic to translate an unknown word for the students.

a. Never   b. Some of the time   d. Very frequently

7. I use Arabic to refer to a real-life example for the students.

a. Never   b. Some of the time   d. Very frequently

8. I use Arabic when the students are working in groups.

a. Never   b. Some of the time   d. Very frequently

9. I use Arabic for riddles in the classroom.

a. Never   b. Some of the time   d. Very frequently

PART 3: Kindly answer the following questions

This part targets teachers' attitudes towards translanguaging.

How much do you agree or disagree with the following situations?

	Disagree	Agree
I love using Arabic inside the classroom since it encourages the classroom participation.		
I do not find it necessary to allow speaking in Arabic.		
I value the use of Arabic as it can help the students relate more the mathematical concepts.		
I feel annoyed when I hear students in group-work communicate in Arabic.		
I feel it is harmful to use Arabic inside the classroom since the exams are in English.		
I think it is okay to use Arabic to communicate better when negotiating mathematical arguments.		
I feel more comfortable using Arabic to manage the classroom discipline.		
Using Arabic confuses the students more, limiting their conceptual understanding.		
I am interested in using Arabic inside the classroom to create a friendly atmosphere.		
I feel guilty when I use Arabic inside the classroom to grab students' attention.		
English has become the main language of communication, so no need to use Arabic inside the mathematics classroom.		
I feel encouraged to use Arabic when referring to a real-life example.		

APPENDIX 2

INTERVIEW QUESTIONS

1. What are your beliefs/attitudes on the use of Arabic inside the mathematics classroom?
2. Could you give me a classroom example where you had to use Arabic inside the mathematics classroom?

3. In the questionnaire, you chose (agree or disagree) to the following item […]
(The researcher might ask questions about what was chosen to get more details)

The following questions will be used to uncover teachers' beliefs about translanguaging practices.

4. How often do you use Arabic inside the mathematics classroom? Where, when and how?
5. What are the difficulties your students face related to language inside the mathematics classroom? How do you overcome this difficulty?

The following questions will be used to uncover teachers' attitudes about translanguaging practices.

6. Do you like using Arabic inside the mathematics classroom? Why?
7. What advantages/disadvantages do feel in using Arabic inside the mathematics classroom? *(ask the teacher to give examples)*
8. What impact (positive or negative) do you feel using Arabic has on your students? *(ask the teacher to give examples)*

APPENDIX 3

CLASSROOM OBSERVATION

Classroom observation grid (Inspired by Alhasnawi, 2021)

Date:

Time:

Participant:

Position held:

Topic:

1. To what extent Arabic is resorted to in classroom practices?

2. Does the teacher use English and Arabic interchangeably? If yes, for what purposes? Is it for:

   a. Pedagogical functions

      i. Classroom management

      ii. Content transmission

         a. Explanation

         b. Argumentation

         c. Narration

   b. Social or affective functions

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