International new arrivals in an English secondary mathematics classroom: an exploration of their learning experience and the impact of using a home language pedagogy of translanguaging to promote mathematical discourse on their learning experience

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Abstract

This is a practitioner research study into the learning experience of International New Arrival students who also have English as an additional language at a secondary state school in North-West of England.

Firstly, the study sought to understand INA students through a literature review and learn the aids and barriers to INA students' positive learning experience in maths, specifically at Queensway High School (pseudonym). Following the further reading, the study explored the impact of using a home language pedagogy of translanguaging (intervention) to promote mathematical discourse in their learning experience. Year 8 INA class (COVID-19 bubble class), their two maths teachers and all INA department teaching assistants were researched in this study. During the 2-week-long intervention, students discussed in their home language with their peers and maths teachers the lesson launch questions (starter activity) on the topic (objective) taught in English in the previous lesson(s). Semi-structured interviews, questionnaires, and focus groups were used to gather qualitative data with thorough ethical consideration for all participants and non-participants, including COVID-19 restrictions. These data were coded thematically under an interpretive paradigm to make meanings of perceptions of maths teachers of INAs, their specialist teaching assistants (INA-TAs), and the students themselves on the INAs' learning experience and their reflection on the intervention.

The analysis highlighted many key aids and barriers to INAs' positive learning experience at Queensway, including with sense of inclusivity (rapport with teachers, peer support), prior mathematical education, and language proficiency as major influences. The analysis also revealed that the intervention of using home language

pedagogy promoted mathematical discussion and overall positive learning experience and can be conducted by teachers who do not share the language of the learners, despite being misunderstood by some students on the importance of discussing maths.

The study is evaluated throughout the report, and further limitations and opportunities for future research are discussed following the conclusion.

This study was conducted during the restrictions resulting from the COVID pandemic (2020-21), including the use of online learning, changes to class structures, individual and band isolations, and school closures. The opportunities and limitations arising from these are also discussed.

Impact of COVID-19

2020-21 has not been a typical academic year for schools nationwide. There have been several disruptions at Queensway and myself as a practitioner, including self-isolations of teachers and students, school closures, and restrictions on what can be done inside the classroom. In Queensway, the students were put into the bubbles across all three core subjects English, mathematics and science. This meant that students were in different sets to those they would have been based on their prior attainment in mathematics; for example, we have had students who usually be in set 1 in maths but were placed in set 3 due to their lack of performance/data in science or English. For many INA students, this meant they were placed in set 3 (the lowest set) because of their difficulties with English. Due to the push from the Head of INA at Queensway; an utterly new bubble was created just for INAs, and we continued to gain a lot of INA students throughout the academic year (including all the backlog of admissions from the first lockdown in October/November 2021) who then, irrespective of their mathematical performance, went straight into this standalone INA bubble. Teaching classes with such a wide variation in prior attainment was new to the mathematics teachers at Queensway.

In the mathematics department, unlike in previous years, the plan was to assess students' mathematical attainment and then place them in the sets accordingly and independently from their grouping in English. However, due to the pandemic, for the year 8 INAs who are the focus of this study all ended up in a mixed attainment class of 22 students with different levels of fluency in English, various dates of entry to the country over the past year/year and a half, and a wide variety of home and other

languages. As a result of grouping INA students together, for each home language spoken in that year 8 class, there were at least 2 students in the class who spoke that language, which was seen as a unique opportunity for this study. To lessen the impact of this pandemic, the research study naturally evolved (including the research intervention length and methods as discussed in the methodology section). There were additional disruptions due to my own personal circumstance, including medical and bereavement leave. Consequently, the data collected for the research questions and all discussions must be considered within the following context: the described Queensway's response to COVID-19, the closure of the band twice, which included the INA bubble in year 8, the impact of COVID-19 on INAs in general (e.g. before admission from arrival, during the admission process and lack of usual levels of pastoral support), self-isolation of the maths teachers and teaching assistants who teach the group, maths teachers teaching mixed ability classes for the first time without any training, and periods of self-isolation for me, the researcher, during the academic year.

It is also to be noted that due to self-isolation, the INA teaching assistant working with the year 8 class was not involved during the intervention. Hence the planned data collection from them after the intervention was not collected.

Acronyms used:

INA(s): International New Arrival (students)

EAL: English as an Additional Language

INA-EAL – EAL students who are also INA

Using Bell's EAL Assessment Framework for school, the English language proficiency of a child can be determined. (Bell Foundation, 2017; Appendix 3)

INA-EAL_A: INA-EAL whose language proficiency is at band A – New to English/Beginning

INA-EAL_B: INA-EAL whose language proficiency is at band B – Early Acquisition/Emerging.

INA-EAL_C: INA-EAL whose language proficiency is at band C – Developing competence/Expanding

INA-$EAL_{D:}$ INA-EAL whose language proficiency is at band D – Competent /Diversifying

INA-$EAL_{E:}$ INA-EAL, whose language proficiency is at band E – Fluent.

SEN: Special Educational Needs

TA: Teaching Assistant

INA-TA: INA specialist Teaching Assistant

EL/ELL: English Learners/English Language Learner (some literature discussed in this research use refers to students who use EAL as EL/ELL)

Context/research-specific vocabulary:

Lesson launch – 10 minutes starter activity used at Queensway High School (pseudonym). Teachers often use this for recall/retrieval practice, prior knowledge check or scaffolding for the main activity.

Home language – (this is a language that the students feel comfortable speaking in(not necessarily their first language nor the language they speak at home but for the ease of their understanding during interviews, I used the phrase “home language”.

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1. Introduction

English as an additional language (EAL) refers to learners whose first language is not English (Hall, 2018). The Department for Education (DfE) defines the first language as "the language to which a child was initially exposed during early development and continues to be exposed to this language in the home or the community" (DfE, 2013, pg.7). This would include many students born and raised in the UK in the British education system and having a home language that is not English. It is therefore important to acknowledge that EAL is a very heterogeneous group made up of students not only in terms of different linguistic and ethnic backgrounds and different stages of proficiency in English (Feyisa, 2018) but also in terms of their "educational history and experience, levels of literacy in the own or main language(s) and immigration status and reasons for migration" (Hall, 2018, pg.2).

International New Arrivals (INAs) is a term used to describe children who are international migrants, including both involuntary (e.g., refugees or asylum seekers) and voluntary/economic (e.g., children of people working or studying in England from overseas) (Bell Foundation, 2021). An asylum seeker is someone who has fled from their home country in search of safety and has applied for political asylum in another country. A refugee is a person whose claim for asylum has been accepted and has been granted refugee status in the UK. Refugees have often fled their home country and cannot return there owing to a well-founded fear of persecution for race, religion, nationality, membership of a particular social group or political opinion. It is essential to understand that refugees differ from economic migrants who have chosen to leave their country and have not necessarily had the traumatic experiences that most refugees have faced. In

the UK, refugee and asylum-seeking children have equal access to the entire curriculum appropriate to their age, ability and aptitude and any special educational needs they may have. They are admitted to schools/academies using the same local authority criteria as applied to any other child seeking a school place. (Education Guidance for Refugee and Asylum Seekers, 2016).

This small-scale practitioner research studies INA students who use EAL (INA-EALs) at Queensway High School (pseudonym) in North-West of England. The school has a larger than average proportion of students who are INA. This study seeks to understand the learning experience of INA students (who in Queensway are all coincidentally users of EAL) through the perceptions of INAs themselves, along with the perceptions of INA specialist teaching assistants and mathematics teachers of INAs. As a result of this initial exploration and readings, the study then proceeds to investigate the impact of using home languages pedagogy of translanguaging to promote mathematics classroom discourse on INA students' learning experience

School, Regional, and National context

Article 28 of the United Nations Convention on the Rights of the Child (UNCRC) says that children and young people have the right to education no matter who they are: regardless of race, gender, or disability, if they are in detention, or if they are a refugee. And, according to the Office of National Statistics UK, in 2018, "approximately 7% of children in state-funded primary schools and 10% in state-funded secondary schools in England were born outside the UK" (ONS, 2019). After Germany, the UK hosts the largest intake of young international migrants in Europe. In fact, in 2020, we have over

9.36 million international migrants under 18 years of age (UNICEF, 2021; Appendix 1). Furthermore, 8% of students were born outside the UK in the area local to Queensway in 2018 (DfE, 2021; Appendix 2).

Statistics show that in the area local to Queensway, 25% of children have EAL, and 26% are born to non-UK mothers. However, there is no national or regional statistics on INAs who are EAL/non-EAL. This study wishes to understand in depth the learning experience of INA students, who in Queensway coincidentally also have EAL (but at different levels of language acquisition). In this assignment, they will be referred to as INAs (all INAs in Queensway are EAL). There are students with EAL in Queensway who are not INAs, and it is also important to understand this group where parents/grandparents are non-UK born and their learning experience, but that would be for a different study. The difference between INA and EAL is recognised at Queensway; there is an INA department with INA specialist teaching assistants instead of an EAL department typically found in other schools. Queensway also uses Bell Foundation's "EAL Assessment Framework for schools" to determine the English language proficiency of INA students with five proficiency bands (Bell Foundation, 2017; Appendix 3).

Furthermore, there are more than 45 languages spoken at Queensway, around 75% of students speak more than one language and about 300 INAs out of approximately 1000 students at Queensway, most of whom are involuntary migrants and arrived at the school during the past 5 years. This is because, since 2000, asylum seekers have been dispersed around Britain and the borough in which this school is in one of the dispersal areas in the North-West. The INAs include vulnerable children who have sought

international protection, and some even arrived in the UK unaccompanied and separated (UNICEF, 2021). They often face economic and social hardship alongside previously traumatic or difficult experiences. This research, hopefully, will give voice to our INA students; in order for us to appreciate and acknowledge them and their learning needs and, as a practitioner, to learn and teach from this.

Regarding the UK's research around INAs and EALs, most are completed at the primary school level (Bracken, 2017), and the secondary level is less explored (Murphy & Unthiah, 2015). Murphy and Unthiah (2015) also share that there has been "too much overlap between Special Educational Needs (SEN) provision and the teaching of pupils with EAL" (pg.2) and that more intervention research that has a direct and effective impact on EAL students is needed. This research study could potentially help understand the learning experience of students who have migrated to the UK at secondary school and help support teaching and learning in Queensway and schools of this borough and more widely.

Practitioner's personal and professional rationale (in relation to the current school)

Separating my research focus from my personal and professional interests and backgrounds is difficult (Mills, 1975); I would have been classified as INA-EAL_A (new to English) when I moved to the UK in 2000. Due to civil war, I had to leave Sri Lanka and with my family at the age of 7. I have first-hand experienced the positive and negative aspects of being an INA-EAL student in a UK state school; I was placed in bottom set for all core subjects even though I got Level 5 in maths at key stage 2 because I got level

3 in English. If I hadn't "begged" my teacher in mid-Year 11, I wouldn't have done Higher Tier in English and I wouldn't have got an A for GCSE, but I do wonder if I could have gotten A* if I was in the right set learning syllabus and skills at a higher level. Before teaching, I hadn't thought about my INA-EAL experience. From my first in PGCE until now, 6 years later, I still find INA-EAL students (again, despite their level of English or mathematical ability) placed automatically into the bottom set; this is also often the class taught by teachers with the least experience.

In a school like Queensway, where (at the beginning of this study) different sets follow 3 different curriculum paths, these INA students never get to progress up to a higher set because they would not have learnt the relevant content to do well in the assessments used for setting. Of course, there are flaws in the assessments and curriculum provision that the department is now working on. However, I feel that the students affected by this were disproportionately INA students. For example, a large proportion of low-achieving year 11 classes in the past have been filled with majority INA students (and some have been missed by the system to be put in the correct grouping). In addition, in my experience, there is a lack of understanding of the learning experiences of INA students by many teachers and teaching assistants.

Unlike my own experience, my current school has a dedicated INA department with specialist INA-TAs trained to work with INA students who are English/Non-English learners and have different EAL coding. However, new INA students are often left with an INA-TA due to language barriers. Sadly, the INA department told me in casual conversations before this research that the teacher may not have communicated with the INA student directly for weeks. Teachers must be aware of how "languages may

impact on their mathematical thinking and learning as language is necessary to facilitate mental representation and manipulation of written mathematical text," according to Rahman (2021; pg.5). "Teachers need to be aware of issues surrounding teaching mathematics to English language learners and plan accordingly," (Jourdain and Sharma, 2016, pg.12) and Celedón-Pattichis & Ramirez (2012; pg.6) state that teachers must be aware of the "emotional and cognitive needs as well as the situations that ELs encounter while learning mathematics" and that not being aware of these issues can harm all students, including non-EAL.

As a teacher and recently promoted second in my school's mathematics department, I need to understand INAs' learning experience to improve my practice and department.

To move forward with the research, the initial matters which I wanted to explore via literature reading and review were:

- The implications of being an INA student (particularly within a mathematical classroom, their academic achievements and any policies)
- Importance of mathematical discourses and how its approached in classes with multilingual learners (particularly for students who are INA-EAL)
- Any subject-specific pedagogies in mathematics to support INA

2. Literature Review

In the previous chapter, I introduced the study and its goals by discussing policies and literature. This chapter reviews the literature based on my research aims and questions. Due to COVID-19's impact on RQ2's innovative intervention and RQ1's initial data analysis, I had to do more literature review. I first examined the literature on INA-EAL students, their academic performance, and their maths learning experiences, leading to RQ1. Later, the review focuses on the importance of mathematical discourse for INA and home language use in mathematics discourse, which led to the innovative intervention within RQ2.

Implications of being an INA-EAL student

EAL students form an 'extremely diverse population'; customs, traditions, skills, values and life experiences can vary dramatically (Kaneva, 2012). It is important to acknowledge that students from migrant backgrounds are likely to experience school differently from non-migrant students and, according to Gillborn (1995), in ways which disadvantage them. The reasons for migration) can also influence their experience in school (Hall, 2018; Conteh, 2015).

Being an EAL speaker can be quite complicated, as highlighted by Anderson et al. (2016) and Hall (2018): "while EAL speakers, by their very nature, speak at least one other language at home (usually the language of their parent's country of origin), some may speak only one other language and English, others may be proficient in more than one language other than English, some may have learned the language of a previous host

country before arriving in the UK, and so forth" (Hall, 2018). Please note that therefore in this study, the phrase "home language" implies the language that they are at most comfortable communicating in, other than English and of course for some students there could be more than one. This seems more appropriate than first language, mother tongue, or native language. Hall (2018) also suggests the use of the phrase "own language", but after consideration and speaking to the Head of INA, the phrase "home language" was deliberately chosen to avoid confusion for the INA-EAL students in this study; they were told that it is whatever the language that they feel most comfortable communicating in.

EAL students can also be at a different level of proficiency in their home language literacy. Many scholars state that this could have implications for their development of English language literacy. Their previous school experience (or the lack of it) will significantly impact their learning experience in UK schools (DfES, 1999).

Baker (2006) emphasises that EAL students also diverge regarding the issues of motivation, attitudes to institutional learning (which are, in turn, often influenced by students' prior learning experience), self-esteem, anxiety, inclusion, identity and cultural heritage. These issues become more serious for secondary students, who are in their teenage years and are typically engaged in complex processes of social development and identity growth (Ushioda, 2013; Lamb and Budiyanto, 2013). This is because school is a socially, culturally, and linguistically complex environment that can impact students' well-being and sense of identity (Ward et al.,2001). This is worsened by the fact that EAL speakers must balance their home background and experiences with their school lives - both the challenges of academic study and the conventions that

surround it, as well as their relationships with non-EAL school peers who may perceive linguistic and cultural difference negatively (Hall, 2018). Researchers that looked into the experience of INA students highlighted the importance of the sense of belonging for the successful integration of INAs into schools (Baumeister and Leary, 1995). According to these scholars, a sense of belonging for INA students has been linked to feeling understood as a school community member (Cartmell and Bond, 2015) and mediating motivation and academic achievement (Sancho and Cline, 2012). Both teachers and peers are essential in promoting a sense of belonging for INA-EAL students (Baak, 2016). Moreover, like all students, INA students take on bigger challenges when they feel emotionally safe (Daloz, 1986). Students' sense of safety and support is crucial to maximising their learning, including maths problem-solving questions (Daloz 1986; Hutchinson 2003).

INA-EALs' academic performance

Demie and Strand observed different studies on the attainment of EAL students against their proficiency in English. Though this is from the inner London local authority, analysis shows that EAL students who are not fluent in English performed worse across the board, from KS1 to GCSE (including maths) than those who only spoke English. However, EAL students who were fully fluent in English outperformed their monolingual peers in all key stage tests and at GCSE (Demie and Strand, 2006). Language barriers remain one of the key factors affecting the performance of EAL students in English schools (Feyisa, 2013). According to the research carried out by Collier (1995), "EAL students with no previous schooling in their first language take 7–

11 years, and those with 2–3 years of first language schooling in their home country take at least 5–7 years, to reach typical native speaker performance". Cummins (2001) also found similar results. A more recent small-scale study by Feyisa (2011) suggests that it will take between 6-8 years to become fully fluent in English. This implies that INA-EAL students joining UK education at the secondary level are already at a disadvantage (compared to their native/fluent English peers) as they wouldn't have the 6-11 years needed to become fully fluent before their GCSE exams.

INA-EAL students in Mathematics classrooms

"Mathematics learning is a triad: language learning, procedural competence and conceptual understanding" (Stacey, 2018, pg.2). According to many scholars, EAL students try to make sense of new mathematics concepts while learning the academic and everyday language that can be used to explain their mathematical thinking (Calderon, Slavin & Sanchez, 2011; Schleppegrell, 2012). Cummins (1979) (also acknowledged by Majewska, 2019) pointed out that unlike EAL students' everyday communication, which takes about two years to develop, cognitive academic language proficiency required for academic study can take anywhere from five to eleven years to develop due to factors such as the more abstract nature of the language, the higher literacy demands of texts and textbooks, and the cultural knowledge required to understand academic concepts and content. Moschkovich (2010) shares that secondary teachers may assume that language plays a minimal role in the teaching and learning of mathematics. However, suppose we believe that the study of mathematics is less

difficult for EAL students because it is based on a 'language of numbers'. In that case, we are ignoring their diversity and cognitive academic language needs (Janzen, 2008).

Furthermore, mathematics teachers should not assume that a student who appears to communicate effectively in everyday English will also be able to communicate effectively in mathematics; this also includes native English-speaking students (Prediger et al., 2013). Mathematical English demands are greater than everyday English, and students would need assistance in developing the required proficiency. When discussing the linguistic and conceptual mathematical challenges faced by students with non-German first languages in Germany, Prediger and Wessel (2013) cited Heinze et al. (2009) and Prediger et al. (2013) to highlight that language proficiency in the language of instruction and assessment, rather than immigrant status or multilingualism, has the most impact on their mathematics achievement. This also applies to monolingual language learners, who are primarily from low socioeconomic backgrounds. They share a "social semiotic perspective by emphasising that language is more than a tool for representation and communication; it is a tool for thinking and constructing knowledge via constructing meanings" (pg.436). This construction must be consistent with the acquisition of new linguistic, graphical, and symbolic means of expressing them, which is why mathematics and language learning are inextricably linked.

Pimm (1987) also points out that learning mathematics can be likened to learning a foreign language, implying that INA students are learning two foreign languages when learning English and maths simultaneously.

EAL students face additional challenges due to language structure and content, according to Stacey (2018). Most students can follow mathematical procedures and methods, but the language barrier makes it hard to assess their conceptual understanding. Language drives mathematical learning, according to Chad (2017). Without proper mathematical language knowledge, learners cannot achieve fluency and deeper understanding. Math is like a language with subject-specific vocabulary, so "to be fluent in that language, one should be able to use and understand vocabulary" (Chad, 2017 pg.7 as cited in Rahman 2020). Mathematical terms can be used to indicate the same mathematical operation, and some (sum) words have nonmathematical homonyms. Rahman (2020) says those vocabularies' non-mathematical meanings can confuse mathematicians. Grammar and syntax also hinder "understanding mathematical instruction and being able to engage in discussions about mathematics" (Bresser, 2019; Ní Ríordáin et al, 2015).

Importance of Mathematical Discourse

The importance of social interactions as an observable space for knowledge construction is emphasised in Vygotsky's (1978) sociocultural developmental theory. Speech encourages social interactions, which leads to opportunities for learning. What is discussion? According to Pimm, "that situation certainly entails negotiation of meanings and sharing of points of view about mathematics" (Pimm, 1987, pg.46). Relations, not things, are the focus of mathematics and are intangible. "Mathematical communication is therefore dependent on linguistic means". New topics imply new vocabulary, definitions, and symbols, all of which call for mediation.

Furthermore, communication in a maths classroom is described by Bartolini Bussi as a paradox: meaning cannot be transmitted or simply negotiated. Because scientific concepts cannot be created from scratch, they must be assimilated as products of centuries of culture (Bartolii Bussi, 1998, as referenced in Adler, 2001). Students can only learn the meaning of these concepts by engaging in mathematical discourse with others (Adler 2001).

Mathematicians emphasise discussion as a means of conceptual understanding (Holland et al., 2017; National Council of Teachers of Mathematics, 2000). Participants collaborate and interact in a situated context to construct learning (Johnson, 2009, pg.124). Learning is internalising social interaction, according to Donato (1988). They say all learning happens through social interaction, where mental functions evolve into higher-order functions involving cognitive awareness and self-regulation. Most researchers believe mathematical understanding requires communication, discursive skills, and communicative practises.

Classroom discourse includes written, spoken, and discussion, according to Bergem and Klette (2010). Discourse includes representing, thinking, interpreting, expressing, reflecting, agreeing, disagreeing, debating, and arguing. Students can express their ideas, reasoning, and thinking and deepen their thinking by making conjectures and supporting them with evidence. This assignment will focus on verbal discourse, or "mathematical classroom talk," rather than mathematical discourse. “Eliciting mathematical talk focuses attention on argument and conviction using explanation, as well as on the task of finding more precise and succinct expressions which may therefore be more readily worked with and verified,” which helps students confirm their

understanding (Pimm, 1987, pg.48). Thus, classroom discourse can be a "central element of acquiring mathematical knowledge and understanding the nature of mathematics" (Bergem & Klette, 2010; pg.317). This is also supported by de Oliveira et al. (2010), who states that "one hallmark of mathematical understanding is the ability to justify, in ways appropriate to students' mathematical maturity, why a particular mathematical statement is true or where a mathematical rule comes from" (L. C. de Oliveira et al., 2010).

Furthermore, the importance of abstract understanding of mathematical reasoning and communication is also reflected in the changes to National GCSE Maths content and GCSE Mathematics examination specifications from 2015. For example, more marks are dedicated to AO2 questions "Reason, interpret and communicate mathematically" than in the past (Pearson Edexcel, 2015; Department of Education, 2014).

Nevertheless, some concerns emphasising discourse preclude the possibility of viewing learning as primarily an individual endeavour and ensuring its social situatedness (Sfard, 2000; Sfard & Kieran, 2001). Cobb et al. (1997) emphasise the importance of conversation quality in student learning. Sfard et al. (1998) express concern that, while there are many ways to turn classroom discussion or group work into a great source of learning opportunities, there are just as many ways to turn them into a waste of time or, worse, a barrier to learning. It is wrong to think that all discussions are mathematically productive and wrong to assume that discussion is always and automatically a good thing (Pimm, 1987; Michaels & O'Connor, 2012).

Finally, despite the widespread recognition of the importance of mathematical discourse in mathematics learning, research shows that students are not "trained to talk

in and about mathematics through discursive practises in mathematics classrooms" (I V S Mullis et al., 2004; pg.17). Due to secondary school's clear methods and right and wrong answers, mathematics is rarely considered discursive. Opinion may be unwarranted. This widespread thought about mathematical discussion and whether teachers value discussion based on their view of mathematics (with curriculum teaching time) may explain why mathematics classrooms do not currently provide enough opportunities for students to develop mathematical understanding through discourse/talk (Pimm, 1987).

Use of Home language- studies, theories and policies

There is a diverse opinion on using home language in classrooms by researchers, teachers, students, and policymakers. Many scholars have suggested the use of home language in classrooms. According to Holland et al. (2017), most EAL students need support during mathematical discussions. Due to their lack of English proficiency, EAL students have fewer opportunities to access mathematical instruction, including both content-specific vocabulary and conversational proficiency (Abedi & Herman, 2010). Barbu and Beal (2010) argue in their study of how working memory affects how students learn mathematics that EAL students must focus not only on learning mathematical concepts but also on learning language and decoding the lesson for understanding. They agree that EAL students' working memory is constantly bombarded with information, affecting how much brain power they have left to learn and connect to maths. They say that when EAL students “do not have to devote cognitive resources to English comprehension, their performance in maths appears to improve”. Hence, when teachers

make language accommodations for their EAL students, they are free to concentrate on learning mathematics concepts.

A UK government study on EAL student achievement (DfE, 2006) suggests using home language, speaking, and listening, and talk partners to support their learning. Since the 2012 EAL policy brief, public policy has ignored EAL. However, studies like Michael et al. (2016) and Arnot et al. (2014) recommend using home language for EAL students. According to Celedón-Pattichis and Ramirez (2012), the classroom becomes oppressive when heritage language ability is seen as a language disability and students do not have equal mathematical potential to their English-speaking peers. It raises the intriguing question of whether heritage (home) language is an ability in math class. In math, anxiety, comfort with math terminology, and class participation can make it harder to support all students, according to Moschkovich (2013). To support EAL students, Moschkovich suggests teachers view language as a resource rather than a deficit and emphasise academic achievement rather than just learning English.

Planas (2018) argues that mathematics learning develops through the processes of actualisation of meaning potential shaped by language use; there is empirically driven evidence of learners drawing on and using their languages and meanings to learn mathematics in the classrooms. Education researchers in other countries like Cook (2001) in Canada, found that when home language is used as a resource, teachers can use it to convey meaning, explain grammar, and organise the class, and for students to use as part of their collaborative learning and individual strategy use. Also, even if there is a difference in a teacher or school's acceptance or encouragement of using their home language, EAL students are still likely to use their home language in school, either in

everyday communication with peers who share their language or in support of their studies (Hall, 2012). Surveys of EAL students' strategies by Schmitt (1997) revealed that 73% of students ask classmates for meaning. According to Ryan (2019), in multilingual mathematics classrooms, the language-as-resource metaphor is operationalised as a lever; she uses Webb and Webb (2016) to state an example: "when characterising multilingual students' learning as a "journey from informal talk in their [students'] main language towards formal mathematical talk in English [the language of instruction]" (L. Webb & P. Webb, 2016, pg.198)" (Ryan 2019, pg.32). Most research on mathematics education in multilingual classrooms has argued that students' home languages should be used as resources for learning and teaching mathematics (Planas and Civil, 2013). They have argued for the use of students' home languages in mathematics learning and teaching as the support needed while students continue to develop proficiency in the language of learning and teaching at the same time.

The New Arrivals Excellence Programme Guidance (NAEP) (2007) suggests pairing EAL students with a confident home language speaker to help them understand and participate in class. When cognitive challenge is high, English proficiency is low, and oral rehearsal helps reflection, students should use their first language. However, it's important to note that in a classroom, there will be shared languages, including the teacher's, and multilingual students may be the only ones who speak their home language.

In Demie and Lewis' (2018) study on EAL student achievement, teachers must create "supportive learning environments in which students felt safe to take risks when speaking" for students to feel comfortable speaking in their home language. "If I don't

feel safe, it's putting me off speaking," one said. Mistakes are necessary." In participating schools, home languages were prioritised in classrooms as learning tools. Talk partners encouraged same-language students to support each other in class and use their first language. Students were encouraged to keep and improve their native languages to transfer their skills to English.

Some scholars have also found that communicating and developing their mother tongue improves outcomes in English and other language courses by transferring specific literacy skills across languages (Clegg and Simpson, 2016; Cook, 2001; , Lugo-Neris et al.,2010) Queensway and other schools offer GCSEs in home languages. Dayhm and De Angelis (2018) discovered that the benefits of mother tongue literacy could be extended to mathematical and language learning. To create knowledge, a student must develop and hone cognitive skills and abilities appropriate for the learning activity. When learning a second language and other academic disciplines like maths, mother tongue literacy can be seen as added value for multilingual students who appear to be at a significant advantage.

Furthermore, there are disadvantages to not recognising a student's native language in school. According to Hoque (2015) and Conteh (2015), as well as other scholars, culture, language, and identity, are intrinsically linked. According to Hoque, rejecting a language means rejecting the history and culture associated with the language, and assuming a new language entail forging new cultural identities (Hoque, 2015). According to Conteh (2015), students who arrive in England and become part of the English education system face the dilemma of being torn between cultures and

languages. Therefore, it is vital that teachers find ways to incorporate INA-EAL languages and cultures into school life and the classroom.

Furthermore, Guillemette and Nicol (2016) proposed that welcoming, getting to know, hearing, and respecting the knowledge of the "other," as well as learning to understand the "other," is an attempt to learn and teach mathematics in a socially just manner. According to Arendt (1961), "the mathematics classroom does not assign itself the role of promoting an individualistic idea of autonomy, but rather one of social engagement, where fundamental openness to the other and respect for otherness appear central and critical" (Guillemette & Nicol, 2016 pg.38). As a result, when students' identity, self-concept, and self-esteem improve, their learning performance improves (Blackledge & Creese, 2014). Students must be acknowledged for their bilingualism (and, in some cases, multilingualism) as a positive aspect of their intellectual development, and they must have opportunities to use their native language to support their English learning and development. INAs must see themselves, their languages, culture, and identity reflected not only in the classrooms, but also throughout the school and through an inclusive curriculum (The NAEP Guidance, 2007). Cook (2001b) adds that when the teacher uses the students' native language, they are treated as their true selves rather than as assumed school language personas.

According to Primary National Strategy (2007), newly arrived students may have limited English language skills, so encouraging them to use their native language may help them participate in school activities. The document notes that students with prior education may already know school topics. EAL students may need to translate curricular concepts they understand. Most new learning is based on connecting new ideas and concepts

with previous knowledge, building on previous experiences to advance learning. Activating prior knowledge lets newly arrived children use their experiences and bring their cultures and backgrounds to the classroom. Prior knowledge also aids English language learning (The NAEP Guidance, 2007). Encouraging home languages helps other students. Knowing another student's home language benefits everyone because children learn languages faster than adults. It will help them understand languages and empathise with the new student (Bresser, 2019.

Liu and Evans (2016) argue that mother language use does not hinder English learning. According to the Bullock Report (DES, 1975), using home languages helps students learn English faster and easier. However, the Swann study (DES, 1985) stressed that maintaining the home language is the community's responsibility, so English must be prioritised. The analysis suggests mother tongue support can benefit non-English-speaking students attending school for the first time, but it believes it can only delay rather than overcome the trauma of entering an English-speaking setting (Liu and Evans, 2016). Liu and Evans see the home language as a lifeline for EAL students who enter the "mainstream" before learning English. However, in the past, DES in the UK National Curriculum used the target language for communication; English is intended (DES, 1990). This is necessary because teachers often don't speak students' languages, and students often speak several home languages in one class.

Setati (2008) examines social, political, and economic power in two South African multilingual mathematics classrooms, which can be applied to English classrooms. Language can leave people out of conversations and decisions. Setati claims that ignoring language's political role in mathematics education research and practise is like

denying society's power structures. The England's bilingual/multilingual classrooms teach in English and have students who speak different languages as it is the shared language h English is shared language here. The power dynamic can explain INA-EAL students' inferiority complex and identity crisis when learning English.

In the Arnot et al. (2014) study, teachers were open to cultural and linguistic diversity but mixed about using English and home languages in the classroom. They worried using home languages would delay English learning. The study's teachers even suggested a "English only" policy and that all students in an English school should speak English well. Teachers rarely used students' home languages to achieve pedagogical goals in the two schools studied by Arnot et al due teachers' lack of knowledge of them made home language teaching impossible. Interestingly, according to Cook (2001b), student use of the home language does not necessarily imply that the teacher must know the home language because these can occur largely outside of the teacher's control, though depending on the level of use, it can be dangerous if the teacher knows nothing about the student's home language. Moreover, another reason for the lack of use of home languages, according to Demie and Strand (2005), is that there is insufficient empirical evidence to demonstrate a link between different stages of language development and academic achievement.

Adler (2001) discusses the ongoing dilemma faced by teachers in a multilingual classroom where they do speak the other language that is not the language of instruction of whether or not to switch languages in their day-to-day teaching, based on their invaluable 25-year experience working in mathematical education in South Africa including graduate courses. The teachers recognise that students frequently do

not understand if they stick to English. However, they are also very conscious if they resort to the other language, as students will be denied access to English and the ability to improve. Some also believe that learning mathematics in English is necessary, particularly at the secondary level; language is learned through use, so students need to be compelled to use English in math class. In contradiction, they also share that learners must be able to use their main (home) language in mathematics lessons; otherwise, they will not understand some concepts if only explained in English.

Furthermore, Cobb (1998, as cited in Adler 2001) distinguishes two types of mathematical discourse: calculational mathematical discourse (talking about steps in calculations) and conceptual mathematical discourse (talking about concepts). Settai (1998b), in their study, show that calculational discourse predominates in classrooms where switching is limited. However, when the teacher switches to the learners' primary language in the "public domain", conceptual discourse becomes the focus of discussion. The home language is needed for students to gain conceptual understanding and make meaning. This is also realised in the supplemented interviews conducted in their study; when asked to talk about the mathematics they had learned in this teacher's classroom, students switched languages between talking about steps in calculations and concepts (Setati, 1998b).

Home language pedagogy - Translanguaging/codeswitching

Home languages can be used in different ways in the classroom, for example, a direct translation, where words and texts are expressed in students' home language before and during the lesson using various tools like GoogleTranslate and bilingual dictionaries.

Though not commonly promoted in classrooms in England, possibly due to these classrooms being mostly monolingual and the range of backgrounds of multilingual students, another two used techniques by multilingual in a multilingual classroom across the world are translanguaging and code-switching.

Garcia (2009) and García and Wei (2014) argue that translanguaging is how bilinguals make sense of their bilingual worlds through multiple discursive practises that cannot be easily assigned to one or another traditional definition. Translanguaging seeks to assist multilingual speakers in making meaning, shaping experiences, and gaining deeper understandings and knowledge of the languages in use and even the content being taught by combining languages within the same learning activity (Park, 2013 & Williams, 2002; Wei, 2018; Rubinstein-Ávila et al., 2015). Some scholars argue that code-switching is separate from translanguaging, while others say that code-switching is a component of translanguaging (Garcia, 2009). Code-switching is switching between languages based on the speaking act, discourse conventions, and sentence structure (Cook, 1996); in other words, it is changing languages within a single conversation (Baker and Jones, 1998). According to Lewis et al. (2012), Creese and Blackledge (2015) and García and Wei (2014), code-switching is the practice of separating languages. In contrast, captures "the complexity of communication in a migrating and globalized world, as opposed to dichotomization of language use" (Ryan, 2019 pg.50) and "languages lead to an acceptance of the heterogenic coexistence of languages in the performances of speakers" (Farsani, 2016; pg.28). These scholars see translanguaging as "multilingual speakers' shuttling between languages in a natural manner" (Park, 2013, pg.50), their use of full linguistic repertoire without thinking of the fact that they have one language that is different from the other (Celic and Seltzer, 2015; Barwell 2018).

Insightfully, Ryan (2019) shares that the bilingual's two named languages exist only in the eyes of the outsider. From the speaker's insider perspective, there is only his or her full idiolect or repertoire, which belongs to the speaker alone, not to any named language.

In their study, Prediger et al. (2019) found that bilingual students in German and Turkish used code-switching to convey distinct meaning nuances but used a translanguaging connecting mode more frequently to combine languages and synthesise meanings across language nuances. Moreover, regarding translanguaging, Garcia and Otheguy (2014) argue that a person's linguistic competence is determined by their interactions with other speakers and their overall body of linguistic knowledge. Each person has a distinct linguistic repertoire or idiolect due to their individual socialisation experiences (Ryan, 2019). The internal linguistic system, considered unitary, includes all grammatical and lexical systems. As a result, the discrete systems of linguistic proficiency associated with code-switching cannot be considered a component of translanguaging. However, MacSwan (2017), on the other hand, believes that an individual's internal linguistic systems are overlapping rather than unitary and sees code-switching as a component of translanguaging alongside other multilingual activities such as translation.

Translanguaging was initiated as a pedagogical practice, where the input and output language mode in Welsh bilingual classrooms was deliberately switched (Williams, 2002). Interestingly, when it comes to the practicality of using translanguaging as a pedagogy, Williams (2002) shares that it is "receiving information in one language and then using in the other language" (pg.47), which does blur the line between

codeswitching and translanguaging. Furthermore, Williams shares that "when translanguaging, the pupil: 1) internalises the words he hears, 2) assigns his own labels to the message/concept, and then 3) switches the message/concept to the other language, 4) augments the message/concept and supplements it" (pg.40).

A pedagogical example of translanguaging is when students discuss in one language and write in another, whilst they refer to what they already know from their first language when working with the second. This helps students process the information and improve communication in their second language (Evans, 2010; Celic & Seltzer (2015). In addition, translanguaging promotes a deeper understanding of the subject matter (Lewis et al., 2012). This is because unlike in monolingual settings, where it is possible for students to provide answers or write an essay without fully comprehending the subject (Coggins, 2014), in a bilingual setting, when a subject is read and discussed in one language and then written about in another, the information must be properly digested and reconstructed it is more difficult (Baker, 2000).

Many academics, including Lin and Martin (2005) and Mazak et al. (2016), support the pedagogical potential of translanguaging/code-switching in the classroom. These include increased student inclusion, participation, and understanding in the learning process, developing less formal relationships between and among students and teachers, and communicating ideas more easily and succeeding in lessons. Translanguaging promotes a more complete and in-depth understanding of the subject matter (Baker, 2011). This is because, in a monolingual teaching environment, students may answer questions, write an essay about a subject, or follow mathematical procedures/methods in maths without fully understanding them. Processing for

meaning may not have occurred as the meanings of the concept taught is not clear to EAL students without both languages (Creese & Blackledge, 2010). Without real comprehension, entire sentences, paragraphs, or mathematics-modelled answers can be copied. This is more difficult to achieve with translanguaging. Reading and discussing a topic in one language, then in another, requires processing and digestion. Translanguaging boosts student engagement and identity formation. It also acknowledges that languages are not clear-cut entities and that all languages are needed to communicate and negotiate meanings. Translanguaging by supporting simultaneous literacies and languages to advance pedagogy. It acknowledges that teachers and students master language for narration and explanation (Creese & Blackledge, 2010). It aids in the development of weaker language and facilitates home-school communication (Baker, 2011).

Finally, translanguaging in second-language acquisition pedagogy shifts the focus from sentence-level and grammatical issues to discourse issues and communication rhetoric (Canagarajah, 2019). Canagarah advises using translanguaging in a semi-structured environment because natural translanguaging without explicit pedagogical effort can hinder academic competence.

Literature Review - Conclusion

INA-EALs have not only different cultural and language identities but also different educational backgrounds and learning experiences. Though all are classified as EAL, INAs have different levels of proficiency in the English language. Including all the complex issues all teenagers face, INA students face additional challenges, including a

sense of belonging and an identity crisis. Studies reveal that INA-EAL students joining English education at the secondary level are already at a disadvantage (compared to their native/fluent English peers) as they wouldn't have the 6-11 years needed to become fully fluent before their GCSE exams. At the same time, mathematics teachers view maths as a language of numbers and assume an INA-EAL who gained everyday English language competency can succeed fully in their classrooms.

Mathematical discourse, especially classroom talk, helps students conceptualise maths. Michaels and O'Connor (2012) also note that maths classroom talks boost memory, enrich associations, and support language development. According to Planas and Setati (2014), students' opportunities for communication and participation in mathematical activities are directly related to their ability to learn mathematics in a multilingual mathematics classroom. Recent policies encourage teachers to use students' home languages for engagement, despite previous ones emphasising English only (Primary National Strategy, 2007). Reasoning has become a language-based skill in mathematics classrooms (Leicha et al., 2016), but INA students may not be able to contribute or reason verbally due to the language barrier. Without these talks, INA may fall further behind (Bresser, 2019). INAs, especially those new to English, may not understand a lesson when a new keyword or concept is introduced (Coggins, 2014). Coggins believes students should use their home language in the beginning of class and during partner discussions. Home language can help students connect to prior knowledge and understand the lesson's fundamental concepts. INA-EAL$_{A\text{-}C}$ will also be able to confirm their understanding of new concepts if they know they can ask more complicated questions in their home language, according to Coggins. Using home languages will allow students to engage in discussions; particularly, translanguaging enables INA-EAL

students to articulate knowledge while focusing on the concept more than their use of one language or the other (Mazak, Rivera and Soto, 2016).

Contrary to most people's belief, some studies show that using the home language does not hinder the progress made in learning English; improvement in the mother tongue/home language literacy supports the development of the English language. The flexible language uses language-as-resource calls intended to extract learning opportunities for students whose home language is not the language of instruction (Ryan, 2019). It will be interesting to see the practicality, reality and impact of using home language for translanguaging in mathematical discussions in a North-West England classroom (RQ2).

Finally, my understanding of the literature, I will take forward in this assignment that translanguaging includes multilingual activities like code-switching and translation, as I agree with MacSwan (2017) that an individual's internal linguistic systems are overlapping, not unitary.

3. Research Questions

This research study will focus on exploring and answering the following two research questions and is grounded in the literature summarized in the previous chapter. The second round of literature review (as mentioned earlier), data collection and the intervention all aimed to study these questions in depth.

1. What are the aids and barriers to positive learning experiences in maths classrooms for International New Arrival students at Queensway High School? (RQ1)

2. What is the impact of using a home language pedagogy of translanguaging on mathematical discourse (verbal) on INA students' learning experience at Queensway High School? (RQ2)

RQ1 Rationale:

The understanding from this study will be valuable when teaching INA students in mathematics classrooms and may even be useful across the school. Furthermore, this understanding and adapting to respond to INA students' strengths and needs, and using and evaluating distinctive teaching approaches to engage and support them, is part of the Teacher's standard that as teaching practitioners have to meet (Teacher's Standard, Department of Education, 2012).

Understanding INA's learning experiences requires asking all classroom participants their opinions including aths teachers, INA-TAs, and INAs. Teachers' opinions and expertise can optimise learning environment design (The Design-based Research Collective, 2003). It is also vital to gain the perspectives of INA-TAs. Not only are they a

specialist in supporting INAs across the school, but it is also widely accepted that TAs, in general, are integral to inclusion into mainstream schools (though this is mainly seen for students with SEND). Many TAs also have a direct teaching role, interacting daily with students, supplementing teacher input, and providing opportunities for one-to-one and small group work (Blatchford, Webster, 2012). In addition, I believe that teaching assistants pick up things that go unnoticed by teachers, which students might struggle to articulate in interviews. Their experience and knowledge in working as an INA-TA in Queensway will help build a solid understanding of INA students' learning experience.

The student perspective on a learning environment directly affects their learning and study behaviour, thus learning quality (Entwistle and Tait, 1990). Gentilucci also believes students shape classroom learning. Hence, understanding their perspectives can help understand why they learn well or poorly. This research would allow students to speak for themselves, revealing their subjective learning meanings. Also, Barwell (2003) observes that there has been "little research which explores the participation of EAL students in school mathematics from the perspective of the student".

Finally, since this is completely different research to my part 2, I need to understand the environment to adapt my intervention idea should I need to (which I did).

RQ2 Rationale:

This RQ emerged from an interesting discussion with the INA-TA as part of RQ1, the second round of literature review on home language pedagogies, and from a Queensway Maths Department Deep Dive (DDD).

DDD, including 2019 lesson observations, raised concerns about students not being asked for explanations and reasoning (there is a lack of student discussions). Teachers avoid higher-order questions as there is concern of embarrassing SEN and INA students and slowing down the pace of the lesson. But there is also a question of do they understand the concept if they cannot explain it. "The simple lesson teachers sometimes forget is that learning to communicate is learning to think" (Roberts and Billings, 2009). For various reasons (that were revealed in the data addressing research question 1) there is a general sense that INA students also avoid participating in questions that would require them to explain. Using language and verbalising mathematics is an integral skill that needs to be developed among students in Queensway to become better mathematicians. Corey argues that mathematics is a social endeavour, meaning "teachers need first to create cultures of participation to promote meaningful and rich classroom discourse" (Corey, 2014; pg.37).

As part of RQ1, the INA-TA reported that a few years ago, the school had a rule that students could only speak in English because few students argued in Portuguese at and teachers on duty were not able understand what was being said. So for that whole academic year, there was a mantra around the school to speak in English only. She shared, "how can an INA student feel safe if they aren't able to communicate in their home language" (Appendix 4). Along with other information collected from RQ1 and the use of translanguaging work done by Williams (2002) in Welsh classrooms, I am curious to see the impact of students using home language in maths classroom discussions. It would be interesting to see how teachers, INA teaching assistants, and students respond and how it affects their learning. I'm curious how home language use in maths classrooms compares to the literature's findings. As mentioned in the COVID-

19 impact section, the year 8 intervention class is all INA-EAL. Also, Hall (2018) found that students naturally use their home language. Instead of the home language creeping in as a guilt-making necessity, this intervention emphasises their deliberate use in maths class.

4. Methodology

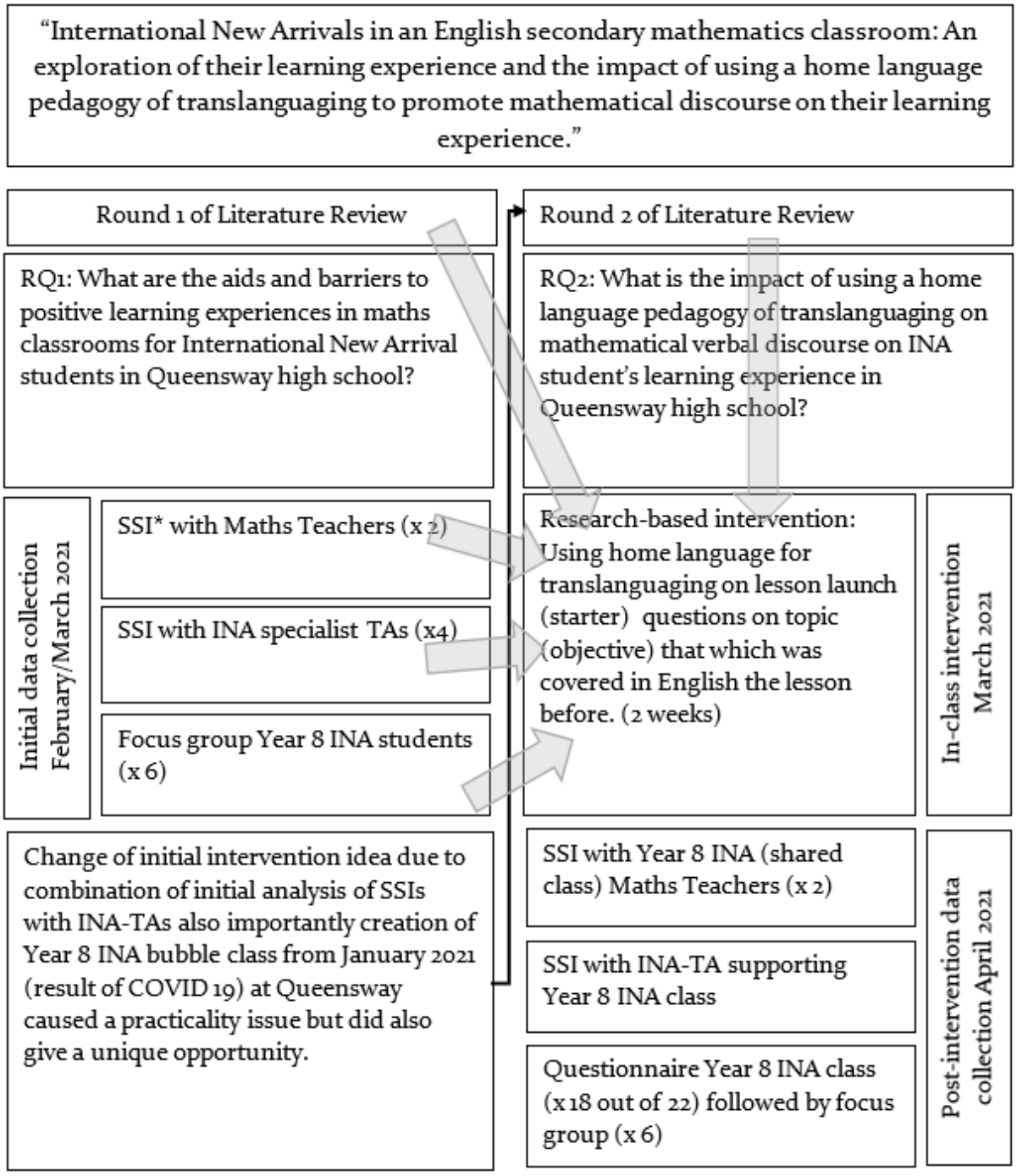
In this section, I discuss my research design: how I collected data from teachers, students, and INA-TAs, the nature and impact of the research-based intervention to address both RQs, and reliability and validity issues. Data analysis methods for both RQs will also be discussed. Methods, including their strengths and limitations, are evaluated throughout rather than in a separate section. Ethics were considered throughout and further discussed under ethical consideration. I also discuss the practitioner research and collaboration aspects of this study.

Research paradigm

“Operationalising variables" cannot fully capture the universe of meanings, motives, aspirations, beliefs, values, and attitudes because it corresponds to a deeper space of relationships, processes, and phenomena, according to Queirós et al. (2017). The study is qualitative because it seeks to understand their unquantifiable experience. The study also requires “an interpretive, naturalistic approach to its subject matter; it attempts to make sense of, or to interpret, phenomena in terms of the meaning people bring to them” (Denzin and Lincoln, 2003; pg.3). Schutz says interpreters must use a method to step outside and act as a distant observer, which requires the cognitive style of the disinterested observer (Schutz, 1962 as reference by Schwandt, 2000). In the interpretive paradigm, the interpreter must be objective and unaffected by the process. Practitioner research like this is problematic because I am an amateur researcher, inevitably a participant in this world (Queensway), and have chosen to conduct this study out of interest. As an INA myself, it's tempting as a researcher to seek evidence to confirm my

thoughts and beliefs, but it's important to remember and appreciate that the goal of this study is to understand symbolic worldmaking (Schwandt, 2000) and construct meaning from authentic voices of teachers, INA-students, and INA-TAs.

Research Method



(*SSI: Semi-structured interviews)

Research-based Intervention

As understood from the literature review, linguistic differences in students' language use can spark students' collaborative unpacking of conceptual meaning (Planas, 2014). Given that multilingual students may display translanguaging behaviour as a way of interweaving language use and meaning from more than one language in educational contexts anyway (Barwell, 2018), the intervention in this study will actively encourage the use of translanguaging in their home language in Queensway INA maths classroom as a teaching and learning strategy. This will be an adaptation of translanguaging teaching strategies done in Wales and the USA (Williams, 2002 and Jacobson, 1983)

The teaching of the topics will be done as usual in the English language, but for two weeks, INA students in Year 8 maths class were asked to discuss and give mathematical explanations to questions from the starter (lesson launch), which was based on the previous lesson in their home language. So, they will be taught in English but will discuss their understanding in their home language in the following lesson (a translanguaging pedagogy). During the lesson starters, their teachers encouraged them to explain what they have done, why they did what they have done, and any related vocabulary in their home language. Due to bubbles, at least two children spoke the same language in this classroom; students sat near someone who also spoke the same home language. Teachers were asked to give students 5 minutes to complete the starter (which consisted of 3 questions), 5 minutes to discuss with peers and 5 minutes to discuss as a whole class in their home language, followed by English. This will be done in the first 15 minutes of the lesson for two weeks (8 lessons in total). Due to bubbles being sent home and the potential "negative" impact of the intervention, it was not done any longer. This was a shared class by two maths teachers, and they both can speak in Urdu and $Teacher_2$ also speaks Hindi. According to Grosjean (2016), monolingual and even multilingual

teachers who do not share a language with the students can still use the pedagogy of translanguaging, but they have to rely on the students and technology more to support the students. Intervention plan and instructions given to teachers and students is on Appendix 5.

Data Collection Method

To address RQ1 and to gain background and understand the current situation as a starting point for my intervention (which leads to RQ2), semi-structured interviews (SSIs) were used for teachers and INA-TAs and a focus group for Year 8 INA students.

Post-intervention data were collected from teachers and INA-TA via SSI and from students via questionnaires and focus groups. Anonymity may increase participants' honesty when answering questionnaires. It's cost-effective and reliable. However, p Participants may misinterpret questions, resulting in inaccurate data. Limited English literacy can also cause language ambiguity (Cohen et al, 2011). This applies to all participants but especially to INA students. As a researcher, I would not have been present to clarify, quality control responses to meet question objectives, or ensure a complete response (Fowler, 2009). Participants may rush through questions without thinking (in fact, one of the SSI with INA-TA_3 went on for nearly one hour and a half – the participants had a wealth of knowledge and experience that they may not have shared in length in writing). Thus, authenticity and coverage questionnaires were unsuitable for RQ1 + pre-intervention data collection (Miller and Cannell, 1997; Cohen et al., 2011). *[However, questionnaires were used to gain an overall general response from*

the class post-intervention (as all students in the class took part in the intervention) before gaining more depth coverage in a focus group (I have discussed this further)].

Despite being more time-consuming and risking the interviewer influencing or leading the participant, the SSI with individual teachers and INA-TAs was chosen (Kallio et al., 2016). SSIs "powerfully produce knowledge of the human situation" (Kvale, 2007). "Open-ended and more theoretically driven questions, eliciting data grounded in the participant's experience" (Galletta & Cross, 2013; pg.45). This is better than questionnaires, (which generalise), because it gives a more accurate understanding of their perceptions. (Hammersley, 2013) says it provides witness information, which describes how I view the INA department participants in this study who will be able to give a different "witness" style perception of INA students' learning experience in Queensway maths classrooms. SSIs allow participants to propose new ideas. Interviewers can change questions, order, or ask unplanned follow-up questions to clarify participant responses (Elliot et al., 2016; Polit & Beck, 2010). SSI is better than fully unstructured interviews because the "uniqueness" of each interview makes collating of data difficult (Kallio et al., 2016). With SSI, a prepared set of questions (Appendix 6) included open-ended questions which allowed me to probe and ask follow-up questions (McIntosh and Morse, 2015; Rubin & Rubin, 2005). SSI collected more specific qualitative data in participants' own words (Kallio et al., 2016), and utilised non-verbal cues.

Focus group interview deemed to be best to gather student data for pre-intervention, including RQ1, and post-intervention after the questionnaire. Focus group is a group interview defined as a "research technique that collects data through group interaction

on a topic determined by the researcher" (Morgan, 1996; pg.130), and it is ideal when "exploring people's experiences, opinions, wishes and concerns", (Kitzinger and Barbour, 1999; p 5). Focus groups allow researchers to examine people's different perspectives as they operate within a social network and explore how accounts are articulated, censured, opposed, and changed through social interaction, including nonverbal actions, and how this relates to peer communication and group norms/social relations outside the group (Kitzinger & Barbour, 1999; Frey & Fontana, 1991). It can help explain pre-intervention classroom dynamics by helping me understand the field context and relationships of a particular setting. This research method deepens and diversifies social event responses and descriptions (Frey & Fontana, 1991; Basch, 1987).

Focus group allows students to contribute more than just answers to prepared questions by raising questions, deviating from interview questions to reflect on issues important to them, exchanging anecdotes, and commenting on each other's experiences and points of view using their own vocabulary (Kvale and Brinkman, 2009; Kitzinger & Barbour, 1999; Frey & Fontana, 1991). Focus group interviews create a safe space for difficult topics (Robson, 2002). Collecting data from young children, especially INA students, required extra thought and consideration. Since INA students have only experienced English schooling during COVID-19, they have not experienced "student voice" at Queensway, and I have not taught any of them before this research, they may find it harder to open up to me. I have had little time to build rapport. f I had done solo SSIs with them, I wouldn't be surprised if they were reserved and possibly afraid of the unknown. Also, despite what the system says, there was a student whose English was much weaker than the others, and fortunately, another student shared a common

language and "acted" as an interpreter. This would not have been possible if this had been a one-to-one interview.

However, the focus group may stifle rather than stimulate individuals, there may be a higher ratio of interpersonal conflict in interacting groups, which could drain the group's response energy, the group may produce irrelevant data, and group members' posturing may create a level of false information or awareness of the research (Frey & Fontana, 1991). Unlike SSI, students may feel pressure to conform (Isenberg, 1986; Leshem, 2012; Watts & Ebbutt, 1987), which leads to "group think" and discourages people with opposing views from speaking up in front of other group members and leads to participants giving a public response rather than a sincere and personal one. Even though I do not think this would happen, students might collude to withhold information (Arksey & Knight, 1999). The interviewer's position in the group requires coordinating and directing, which may bias the interview's outcome (Adler & Adler, 1987). “The interviewer's influence on the interviewee, while not eliminated, would be diffused by the very fact of being in a group rather than a one-on-one situation,” (Frey &Fontana, 1991; pg.180). Focus groups allow for more polyphonic responses, opinion elaboration, and validation. It would reduce the subjective nature of the data collected (Frey &Fontana, 1991; Cohen et al., 2017). In the focus group, opinions will be cross-referenced in indefinite triangulation, allowing them to bounce back and forth and be modified by the group rather than being the definitive statement of a single respondent. This adds methodological rigour to the one-to-one interpretive nature of SSIs (Cicourel, 1974). These cross-checks on different versions of events (and as students can complement each other with additional points) provide more complete and reliable information, bringing the researcher closer to the "truth" (Lofland & Lofland, 1984;

Arksey and Knight, 1999). This was crucial for RQ2's intervention impact. Finally, given the lockdown and various isolations of bands in school, including this class, I was careful not to interrupt students' learning. Focus group is faster, that SSIs and would have interrupted less (Cohen et al., 2017).

"Observation" during the intervention was ruled out, though it can be seen as learning firsthand about the impact of the intervention. First, COVID-19 restrictions made it impractical, and there was a high risk of bias, including my selective attention by me (Wilkinson, 2000), misinterpretation of intention and action, and incomplete data. If participants know they are being observed, their behaviour may change, affecting the intervention and their experience (Cohen et al., 2017). To maximise this intervention without external influence, it must be done without me.

SSIs were the best way to collect post-intervention data from teachers and INA-TA, for the same reasons (though unfortunately, due to self-isolation, INA-TA1 was not able to take part). As mentioned earlier, with students, I wanted to capture as much as I could from the student's perspective and give all students a voice and general feedback on the intervention's impact via questionnaire before diving deeper and triangulating using focus groups. The questionnaire was the fastest and most reliable way to collect data from the 18-person class. Mixed method data collection to assess intervention impact improves accuracy and reliability through triangulation, reduces bias, and lends credibility to interpretations (Creswell et al., 2011; Denscombe, 2017).

Participants (sample) and sampling method

The study focuses on one secondary school in the UK, and the sample frame here are all the maths teaching staff, INA department staff, and all the INA students in the school. Due to the nature of this intervention and restrictions/opportunities caused by COVID-19, there was only one participating Year 8 group, which consisted of 22 INA students (with a different date of entry to the UK with the majority over the past year and a half). In terms of their proficiency in English, 5 students were INA-EAL_A , 11 INA-EAL_b and 6 INA-EAL_C in their initial assessment when "starting" Queensway.

Unfortunately, I did not have their proficiency level at the time of the intervention. The students spoke Panjabi, Urdu, Spanish, Italian, Arabic, Greek and English. There were also 3 students with data not obtained or refused on the system. From the start of the study to post-intervention, the class size grew from 18 to 22, but I did not collect data from the 4 students who joined after the start of initial data collection. The class is a shared class with two maths specialist teachers teaching the group with 5-3 lessons split with $Teacher_1$ and $Teacher_2$ over two weeks. In terms of student participants, though 16/18 students were participating in the questionnaires, in terms of the focus group, a large sample size (i.e. with multiple focus group sessions) will be time-consuming, and I may not be able to dedicate the sufficient time required for adequate data collection within the time frame of this assignment. And, as there is rarely a definitive answer about how large a sample should be for any given study, it was decided that a sample must be drawn for the focus group of six (Morgan, 1993).

The school's INA department has a head and 3 teaching assistants (the head of INA also supports INA students in lessons as a TA). Only TA1, who supports the Year 8 INA

bubble class, is used for post-intervention SSI. Also, two year 8 INA maths teachers participated in RQ1 and post-intervention SSI. The teachers and INA-TAs can also be considered a boosted sample or politically significant case sample (Cohen et al., 2011). Due to the pandemic, I interviewed the two-teaching staff who were also part of the intervention group for RQ1 and RQ2, because those two teachers will have had the most interaction with INA students in the current academic year and can more easily relate to the experience. Their reflection on INA students will be fresh and current.

The six students were selected using "purposive," "maximum variation," and "boosted" sampling methods to achieve representativeness, enable comparisons, focus on specific, unique issues or cases, and generate theory through the gradual accumulation of data from different students for the focus group (Teddlie and Yu, 2007). I randomly chose one INA student from each country of birth and from students who lived in other countries before entering the UK (using information about their Nationality), different school admission dates, and different experiences to represent INAs from different countries (with the assumption that it would be close to their date of entry to the UK). I made sure one student represented each language proficiency (but as noted earlier, I did not have up-to-date information on their proficiency at the time of the study). Though it happened naturally in the random selection, I was conscious of gender equality. I intentionally excluded students who arrived in the UK and started school from January 2021 and students who were assessed as New to English in the last three months. During the focus group, it was clear that our school data was incomplete and inaccurate. For example, $FocusGroupStudent_1$ lived and studied in Italy for two years. I had to choose again from the remaining students because one of my initial focus group

students didn't return the permission to participate reply slip. I used the same students for both focus groups due to COVID-19 concerns.

Focus group and SSI structure and questions asked

Interviews were scheduled at a convenient time for participants Kvale (2007) recommends interview audio recording over all others. The interviewer can focus on the conversation and follow-up questions instead of writing down answers. The SSIs and focus groups were digitally recorded and transcribed later, so I could go back to the data and preserve it. If I had just taken notes, I would have missed details. In case of digital recording issues, I wrote down key points my participants shared

Math teachers were interviewed in conversational partnership for 15–30 minutes before and after the intervention (Rubin & Rubin, 2005). INA-TA initial interviews lasted 30–1 hour and 15 minutes. Research questions inspired the interview questions (Appendix 6). I asked "what" they did as INA-TA first because Svale (2007) suggests asking "why" and "what" before "how." Interview questions were designed to avoid bias and misrepresentation. For example, opportunities and possibilities for supporting INA in maths were questioned before what aids and hinders positive learning experience for INA students in maths, and post-intervention, I asked, "how did the intervention go?" first to allow participants to share their thoughts and impressions and get a full picture without bias. Students participated in a 40-minute classroom focus group before and after the intervention. I reviewed some rules (Appendix 7) and reminded them about confidentiality and withdrawal before the focus group (discussed in Ethical consideration). "What languages other than English can you say "hello" in?" was one of

my icebreakers. hough I wanted to answer the same RQ1, I had to phrase questions differently to the staff with students. I used simple vocabulary and asked the students, "What is a good maths lesson?" and "What helps you have a good math lesson?". With he teachers, I asked, “What makes math learning positive for INA students?”. I noticed myself instinctively repeating questions in focus groups with synonyms to ensure students understood.

Students completed the post-intervention questionnaire (Appendix 6.6) during lesson with MathsTeacher2. According to the teacher, some students struggle to understand some of the questions and write a response. The questionnaires included INA-EAL_A students, unlike the focus group, hence I am concerned about the reliability of data from some questions. I should have run a pilot test with another INA student in a different year group.

Data Analysis

Qualitative data analysis concerns how we use the data to comprehend, explain, and interpret relevant phenomena (Taylor and Gibbs, 2010). It includes, among other matters, organizing, describing, understanding, accounting for, and explaining data, making sense of data in terms of the participants’ definitions of the situation (of which the researcher is one), noting patterns, themes, categories and regularities, all of which are the task of the qualitative.” (Cohen et al., 2017, pg.643) “Coding is a way of doing this, of essentially indexing or mapping data, to provide an overview of disparate data that allows the researcher to make sense of them concerning their research questions” (Elliott, 2018; pg.2851).

This study's data, which includes SSI, focus groups and questionnaires, is tabulated by research questions and subjects and openly coded. Themes emerged organically from the coding of research questions and interview questions as I went back and forth between different data. The analysis, which relied heavily on my interpretation as a researcher, was "iterative" (Galletta, 2013; pg.199) and led to a combination of abductive and inductive inferences (Braun & Clarke, 2019). Due to the nature of the data collection, I was able to triangulate my analysis between teachers, TAs and students. I fully understand that someone else who analyses the same data may prioritise different topics in discussions and reach different conclusions.

Practitioner Research and Collaboration

In this research, I had to collaborate with the INA department, maths department, and the two maths teachers who teach the INA Year 8 class, present my findings, and discuss them with the maths, INA, and Senior Leadership Team (the presentation of my findings to SLT will do after submission of this assignment and there will be a dedicated slot in our maths department conference next term). This study has prompted many discussions outside the formal SSIs in this assignment and encourages reflection on our teaching and learning practices. One can say that the study's two maths teachers were also active research practitioners. As Roth (2007) notes, working with other teachers to conduct research helps overcome the isolation we teachers often feel and facilitates the smooth transition and implementation of successful teaching and learning tools found during the research (as these teachers have experienced the benefits) or at least sparks discussions to solve problems we identify. My PowerPoint poster with initial findings

allowed Oxford Education Department peers and professors to email their thoughts and raise important questions (unfortunately, due to medical reasons, I could not present the PowerPoint on the day). Finally, my former school's colleagues (INA-heavy school) also value research-based practise. They also shown interest in my study. I will share my findings and literature analysis with our group, which regularly shares literature.

Ethical Consideration

The study has taken measures to respect the five ethical principles for social science study by the Academy of Social Science (2015), as stated in the BERA (2018). The Head Teacher approved at the start of Part 3, where I informed them of my study's detailed plan and my research theme. The research intentions and approach were transparently communicated to participants, including information on anonymity and confidentiality before consent was gained. Parents were also informed about the study, including the intervention and additional permission for students to participate in the questionnaire and focus group (Appendix 8).

Although it is essential for a researcher to be open and honest (Cohen, Louis, et al., 2011), one can be concerned about disclosing study details. Ruane (2005) argues that it is critical for the study's integrity not to reveal its purposes or contents. This prior knowledge may influence their response, and it may not be authentic because, for example, the staff participants, if they were worried or because of professional investment, may research on teaching and learning of INA students in maths before the SSIs. This would lead to bias. However, interviews, according to Miller (1995), may be more successful if interviewees are also prepared and knowledgeable about the topic of

the interview. According to Cohan et al. (2018), some researchers "advocate informed consent because it yields better data as a result of researchers and participants establishing rapport and trust" (Cohan et al., 2018; pg.126). Both Hammersley and Traianou (2012) looked into the terms "free consent" and "informed consent." They claim that individual participants' decisions cannot be separated from the organisational and other contexts in which they find themselves, including power structures" (Hammersley, M. & Traianou, A. 2012). As a result, it is critical to remember that my participants are unlikely to have acted as "sovereign individuals." Furthermore, there was not any incentive given for their participation, nor was it coerced (Roth, 2007), but there is a chance of staff participating as they may have felt obligated to support me out of courtesy as a peer and students' willingness to participate might be rooted in wanting to be helpful and wanting to impress their teachers and maybe me; as I am overseeing year 8 maths (Pareek & Venkateswara Rao, 1992).

To help minimise power-play(as I was co-leading department) and to put participants at ease, I conducted all SSIs in the classrooms of the maths teachers and the INA department workroom rather than in the maths office, and focus groups were done in a classrooms instead of the conference room. Furthermore, to minimise any harm, I have accentuated their right to withdraw completely (or even partially retract their response) when gaining consent at the beginning and end of each interview, questionnaire, and focus group. Furthermore, with my SSI, I tried to put staff at ease (not feel threatened or fear that they may lose face in the SSI) by following McCracken's (1988) recommendation of appearing slightly dim and agreeable. I was open with all staff participants at the start of the SSIs that they are the experts and that they do have more

experience in this area than I, and that genuinely was the case. Leech (2002) does, however, highlight the danger that playing too dumb might cause participants (particularly highly educated and highly placed) to feel like they are wasting time, and they may dumb down their responses.

My study's students are vulnerable to language barriers and require additional ethical considerations (Leung & Safford, 2005). The focus group was in English, which may have disadvantaged some students and influenced the hierarchy of conceptions by emphasising the voice of better English-speaking speakers. I considered using interpreters to empower minority INA students (Murray & Wynne, 2001), but I wanted to authentically convey their experiences and perceptions. The presence of an interpreter as a third person in the interview was deemed a greater barrier to accessing their accounts and more detrimental to data-gathering (distortions due to filtering language and ethnicity) than language difficulties (Denzin & Lincoln, 2011). Some students in the focus group spoke different languages, so having multiple interpreters would disrupt the focus group's flow and make students feel uncomfortable.

Focus group research with students has further ethical issues. As mentioned earlier, all participants were informed that confidentiality and anonymity would be maintained in this study by me, but within the focus group, it is difficult to guarantee that confidences shared will be respected due to the temptation to gossip (Kitzinger & Barbour, 1999). Students could also express upsetting opinions. I had to establish trust and make students feel at ease. I shared some focus group "guidelines"/rules adapted from Krueger (2002) to minimise power play and ensure all students' voices were heard (Appendix

7). As recommended by Cohen et al. (2018), I also tried to create a relaxed and informal atmosphere by putting the classroom chairs in a circle, using their favourite number as their name tag (which they found quite jovial to use during the focus group), and telling them that I too moved to the UK at a young age from Sri Lanka, saying "hello" in Tamil as an icebreaker to reduce power-play. I was careful not to ask them why they left their country, knowing that this could be a sensitive question and put a student in an uncomfortable position in front of their peers, or they could be comfortable and open but their peer may not be ready emotionally to discuss tragic events. To protect all the children, the icebreaker questions were what's your favourite school subject and how many languages can we say "hello" in.

I also considered ethical issues for all students in the school and staff workload and well-being during COVID-19. Pseudonyms are used to protect participants' and the school's privacy. INA-TA_1 may not represent the Head of INA because the response order is jumbled to protect identification of staff and students. Data is kept strictly confidential on a password-protected laptop, voice recording device and external storage device (USB) and will be destroyed after completing this course. Briggs (2007) also reminds us that power relations are not just in the preparation or data collection, but also in the analysis, and as a researcher, I must accurately and honestly represent my participants' accounts. As per Burton and Bartlett (2008), I will make my findings accessible via emailing a OneDrive link.

5. Findings and Discussions

Findings from SSIs, focus groups and questionnaires are analysed and discussed this section about the research questions.

Research Question 1

Teachers are the most significant resource in a classroom (OECD, 2005). All adult participants shared the importance of a teacher and their contribution (or lack of) as a key factor to the learning experience of INA students. Both maths teachers believe that having a **common language** with the INA helps with communication and the, teaching and learning in the classroom. MathsTeacher$_2$ shares they are at "an advantage" as they speak a common language with some of the INAs. Even when they don't have a common language, MathsTeacher$_1$ shares that they "use my body language to communicate with them or the visuals, drawing it myself or using images from the internet".

INA-TA$_2$ shares that "the most important thing is the **relationship** between the teacher and the students". This is also seconded by INA-TA$_4$, who shares that the teacher needs to "really" get to know them and not see INAs as "someone at the back of their classroom; they've just been placed there because of the limited in English." They shared that the "the teacher should make a conscious effort to introduce themselves, introduce that new student to the class". INA-TA$_1$ add that it would help if teachers "touch base with the student" and "check with the student if they understand and if they are making progress"; an INA can go for a week or more without having their subject teacher speaking to them. INA-TA$_1$ believes that this maybe because the teacher is aware that the TA supports the INA, so "they don't get involved", but they also shared that some teachers can be like "walking on egg-shell" with the INAs. Based on what the teachers

have shared, this could potentially be a result of them not sharing a common language also, as all participants shared, the INAs are usually always put into the bottom set and often, there a huge behaviour issues; according to INA-TA_1 "managing behaviour" takes up their time and also due to the presence of the TA, the teachers focus goes onto helping other non-INAs (INA-TA_3). Despite them getting supported by TA, INA-TA_1 shares that "they are more motivated when the teachers speak to them". The participant reiterated that they are sharing their experience based primarily on before COVID as they are aware that there is a lot of restriction currently.

There is a recurring view that it is easier to teach maths (this could also be because of how the subject itself is viewed) as it is not a "language heavy subject", "the **language burden is lower**", one of the TA acknowledges that "there is still a lot of figurative languages," but they also say "it's not as significant as other subjects, and so understanding is not as tricky", "biggest reason for success is the reduced language" (INA-TA_{1-4}). Even maths teachers view that "because of the type of subject that we teach", they don't need to rely much on "GoogleTranslate" (MathsTeacher1), implying they believe that teaching and learning can occur in maths despite the language difference. Though literature (Leicha et al., 2016; Janzen, 2008) shares otherwise, this result is not surprising; it conforms with the common misconception (Moschkovich (2010).

INA-TA_2 view maths as a visual subject (based on further probing, they were implying the **procedural structure "methods"** that they believe the students can follow). They go on to share that maths "is probably the only lesson maybe apart from creative arts where they may be able to access even with very limited English." They share that this

higher chance of success (INA-$TA_{2\ \&\ 3}$) in the subject aids positive learning experience as this "can be a bit of a confidence boost" (INA-TA_{2}). All participants share that this could be due to the **familiarity with the subject**; "they generally tend to be able to do numbers", "they can excel in maths if they've come from a strong, you know, prior teaching and learning in maths" INA-$TA_{2\ \&\ 3}$. They shared that "maths is the same all around the world. So, it's the one subject that they tend to be comfortable with." $MathsTeacher_{1,}$ who currently teaches the INA Year 8 bubble group, shares that using students' prior knowledge aids positive learning experience; "for example, things like division or multiplication, they have their own methods sometimes. So, getting them to share it and showing others someone else might recognise it and feel confident that okay, see, they've done it how I do it, even when Miss didn't do it like that. It's still correct". This is also in line with the literature; when teachers recognise students' identity and value their knowledge from schooling in their country, it boosts their learning performance (Blackledge & Creese, 2014; Baker, 2006; Hoque, 2015; Conteh, 2015). INA-TA_{2} shared that there is a **transference of skills in maths,** and INA-TA_{4} shared that when AO1 **non-worded type questions** on numeracy ninjas help students to feel comfortable and show progress and success. However, they also share that "worded questions throw them off", which is one of the barriers to accessing the maths assessments.

Furthermore, INA-TA_{3} shares that in various cultures, maths is a "**high-valued subject**", though on one side it is "motivating" for students, there is also a negative aspect according to them is that "even globally, believe that they are either good at maths or not good at maths" and it is an additional barrier if INAs come in with that **mindset** that they are not good at maths based on their previous schooling experience.

But “most students want to do well in their GCSE Maths”, so they are “**keen to learn**” (INA-TA_1). During the focus group, all students expressed ambitions that require higher education, for example: “doctor”, “computer scientist”, and “engineer”, and INA-TA_4 shared that the students want to succeed and that we have some students “coming from the top of the class in their own country, they're coming here, and they've been put into the bottom set, but they still have the ambition to get to the top”.

On the other hand, the INA-TAs shared that we have some INAs with no previous education in maths, some even come from a “village in Pakistan where they’ve never seen a computer”, and “some religious schools don’t teach maths”. INA-TA_3 also shared that based on their experience and “without descending to stereotypes, it seems that **in some countries, the maths syllabus is not on a par with what they’re doing in the UK**” some students shared with them that “maths was terrible; in their school, they weren’t taught well”. All TAs shared that **lack of previous maths education** is a barrier to student's positive learning experience: “The brain is not used to thinking in maths that way” (INA-TA_3) “the basic operations are not embedded, very often, they struggle with division and subtraction, it often pops up as a barrier that even if they have got some English and they're able to read something” (INA-TA_2).

Furthermore, another barrier to their learning experience is **being placed in the wrong ability set.** Often, and even now for the bubble groupings, INAs are set in maths based on their English level. As a result, they are lost in the system (with language barriers – they may not do well in assessments to be moved up to the correct set in year 10); this would mean that “an able mathematician have in the past end up taking foundation GCSE Maths after 3-4 years in the school” (INA-TA_4). They also highlighted behaviour

issues in lower ability groups, and **that priority is not given to INAs, especially when there are SEN students**. INA-TAs believed this could be due to strong teachers not being placed in bottom sets where these INAs are usually found.

INA-TA_3 also views maths as a subject that requires self-consciousness: "you know, I think maths is a subject where you have to, you really have to be upfront about what you don't understand. And that might be more difficult for INAs, either explaining what they don't understand or being self-confident about admitting that they don't understand." Though what they were sharing applies to all students, we do tend to get a substantial number of INAs with little to no formal education in maths – it will be **difficult for INA students to communicate what they don't know.** They shared that it often means they would have taught primary-level work, **sometimes even year 1 maths**. This would be different from the curriculum the maths teachers would be expected to cover in their lessons. All INA-TAs shared that the INAs have access to "IXL", which covers all the content from year 1 to year 13 in maths that students can work through during daily lunch and weekly after-school club. They believe that different **uses of technology** (including IXL, mathswatch, YouTube and Google Translate) support students and aid their positive learning experience in maths.

In addition, one of the subject and language-specific barriers students is how we call numbers 11 and 12 "eleven" and "twelve" in English; INA-TA3 shares that "if I say to a child 11 in English, they've got no idea what that means. But if I said it in Chinese or Arabic, 11 is actually said as ten plus one. 12 is ten plus two. Even pronunciation of 13 and 30, 18 and 80…it's a minor thing, but it confuses our INAs". Also, INA-TA_1 shares that **different mathematical notations** are used in other countries; for example, right

angles are marked with a dot and not a square, ratio sign means to divide, a dot is used instead of a multiplication sign, comma instead of a decimal point is used for the opposite purpose. This can be really confusing for the INAs. Also, the language barrier means INAs "struggle to convey different mathematical approaches from their prior knowledge" (INA-TA_1).

INA-TA_3 shares that INAs are "not trained to talk about it (step by step methodology) in a way that supports them being able to do it"; they believe that though there is modelling in maths lessons, there is a lack in the articulation of each step. They then also discuss the lack of conceptual understanding ("they just follow the process") and share that "**students don't get that experience of talking like a mathematician.** They get the experience of doing mathematics." All INA-TAs shared that there is a "lack of opportunities for discussions", and INA-TA2 shares that they believe it is imperative for students not just to see modelled examples but also at least listen to if not be part of the discussion. The student focus group also confirms this; the students shared that they "copy down examples and then do loads of questions". Interestingly, INAs also shared that **they would struggle to talk** anyway: "She knew how to do it. We know how to do it in our language but in English no."

Moreover, INAs often **don't ask questions to clarify and understand due to language barriers and confidence**. INA-TA_2 shared an incident where an INA asked them, "why negative numbers and where they are?" during INA lunch club and that they didn't think the student would have asked that during their maths lessons. One of the reasons for this could be because INAs are in **shock at their new environment**: "one of the barriers is it makes them "**mute" for a couple of months**" (INA-TA_1), "when

teacher ask, **I freeze"** (QuestionnaireStudent$_5$). INAs come from different countries and different schooling, and it takes time for them to adjust. The INA-TAs also shared that INAs become more tired throughout the school day because of the new language; **their brain is working harder**, and the new environment ("they don't feel safe at the beginning) means they are constantly alert. INA-TA1 shares that as a result they "**will get tired and switch off, they're not doing it intentionally**. I've seen it many times".

Maths Teacher$_1$ shared that we need to be mindful as some of our female INAs may not have ever sat boy, and "they are not used to conversing with the opposite sex." As a result, we are putting them under additional pressure and stress.

Nevertheless, INA-TA$_3$ shared that "it's the talking that can increase their confidence can increase their understanding, you know". It was at this point (fortunately due to the benefit of this being SSI) that I could ask their thoughts on the language barrier and discourse in maths; their response changed the direction of my research, leading to further literature review and my intervention. They said maths teachers could "let students explain in their language and allow them to use mother tongue for understanding. Why wouldn't you? …. **if the teacher feels confident about not necessarily speaking the language but recognising the features of the process, you know, sequencing and explanation can be done**…**progress requires an environment of safety** and an environment where students, you know, feel able to make mistakes. And **how safe is an environment where you can't use your mother tongue**?" (Please see Appendix 4 for the full extract of this response). It was quite evident that the INA-TA felt strongly about the benefits of using students' home language and that it has the potential to aid a positive learning experience for the INAs.

In addition, INA-TA4 shared that **having a teacher who speaks the student's language aids their learning. U**sing students' home language in school is helpful because "they can associate words" **as long as the teacher repeats it in English.**

"**Praise" and "feedback on progress"** are the other key aids to positive learning identified by INA-TAs and maths teachers. MathsTeacher$_1$ "because once they get something right, it **boosts their confidence**, because I think sometimes, they probably **might be feeling inferior because they don't know the language**" and "they are actually more keen than other students to have their page physically ticked so they can see…. and **more inclined to ask for feedback** of how to change and fix the things that are wrong. I've noticed that they are more concerned about how to progress because that's what helps them feel good." INA-TA$_1$ shared that "because they need to **be reassured** and, you know, **be acknowledged** for working hard and getting it right; it's boosting their confidence". On the other hand, they also shared that **assessments with worded questions** throw them off and can be considered a barrier to a positive learning experience in maths.

When asked about any external factors that aid students' positive learning experience within maths, both student and staff participants shared **the significance of the INA department in the school**. MathsTeacher$_1$ shares that "sometimes I have a TA with INAs, and they also have a big impact on their engagement because they constantly check and make sure that INAs' are happy and understand what they're doing. That helps". INA-TA$_1$ shared how they would talk through the examples again "slowly" and explain each step to them. The **TAs model being a mathematics student** at Queensway, they write date title, underline draw margins etc., in their own book so

students can follow. The INA-TAs also use their tablet or phone to show pictures to help students understand mathematical and non-mathematical English words; this helps to overcome the barrier of students' lack of understanding of keywords and language. They check that all INAs are fully equipped, including having a calculator and protractor that contribute to their positive learning experience. They also have afterschool classes and pre-Covid timetabled interventions for Maths and English (taught by maths and English tutors and INA-TAs).

However, INA-TA_2 shared **that there is a stigma (a social shyness and discomfort experienced by INAs when having INA-TAs sit with them.** The support system (INA Department and their dedicated work area which INA students use at break/lunch and after school) for support and integration within the school can be used as social ridicule amongst their peers. TAs found a **lack of empathy amongst peer groups towards INAs** and that INAs are **often a victim of bullying**. Conflicts within the classroom could also be a barrier because "they feel embarrassed that they can't speak" (INA-TA2). But both INA-TA1 and MathsTeacher2 shared that students have more positive peer support ("a sense of belonging") due to the bubble; "they all have that very family feeling … just knowing that you've got a friend, or someone who's in the same situation" (MathsTeacher$_2$). Other key factors discussed by INA-TAs included TA's lack of own subject knowledge of maths to support students, unidentified Social Emotional Needs of INAs (there is a lack of prior data and information about INAs)

Lastly, the word "**inclusiveness**" is used by one of the TAs. From their perspectives, the more the teacher treats the INA like the rest of the students in the class, gives the student a positive learning experience to them. They identified a lack of opportunity for

INAs to read maths and answer maths questions (they need longer time to respond in class, and the wait time may not necessarily be given). From the focus group, students also shared that they have a good maths lesson when interacting with the teacher, e.g., "answering questions" or "helping miss".

Research Question 2

Confidence and engagement:

When asked about the impact of the intervention, one of the first phrases both teachers shared was regarding their confidence; "intervention has helped develop their confidence, especially the quieter and shyer ones". Students also confirmed this during the focus group. MathsTeacher$_2$ shared that the intervention increased their engagement, even though they were "already a good group and quite engaged with their learning". There was some initial shyness; "I felt that some of them they felt a bit shy, to speak in their own language" MathsTeacher$_1$, the teacher had to pick the student, but towards the end of the intervention ", they were volunteering and wanted to contribute and have more goes". MathsTeacher$_2$ shared that "they have their questioning increased in the sense that they were more confident in telling me when they needed help and asking for clarification". Both teachers attribute this to their increase comfort, and MathsTeacher$_1$ believes that "they felt safe enough to vocalise – before they might have just stayed quiet". It seems like there is a direct connection between the INA student's confidence and their engagement in maths.

Relationship with teacher:

MathsTeacher2 shared that it helps build more relationships with the students. She shared that she "got to know them a bit better through their language… they opened up through their language". She says they felt like they were sharing or teaching her something about them and that it was nice to build a bond. Maths teachers believe that this intervention not only was like an "ice breaker" and helped them to get to know them better (which shows that the intervention was useful, as it was taking place in March-April and the students have been in the bubble since January) it also made students feel more "comfortable" with teachers and "helped build rapport" through the fact that "miss doesn't know, but she trusts us, and I can trust miss and tell her when I am stuck, and she won't judge me" ($MathsTeacher_2$). The teachers shared that it helped the students see that they were "interested" and "trying to make sense of what they're saying in their own language". MathsTeacher2 would ask what certain words means in the sentences that students say. It does break the facade that teachers know everything and the inferiority complex for being in an English school for those students who have out English education compared to their country on a higher level.

Mathematical discussions, learning and progress

When I asked about how the intervention went in general, $MathsTeacher_1$ shared how to their surprise that they were able to identify some misconceptions even though they didn't understand the language. He shared, well, with Urdu and Panjabi, it was easier for him, but also, "you can tell, for example, Spanish or Italian, you can tell what they

are trying to say, their misconception or where they are stuck, partly also due to others trying to prompt them".

Students shared that this intervention has helped them to understand their work more for example: "My friends tell the work in Spanish, and it is more effective for me" when I ask why the student shared that "things that you don't understand you can talk about it with other so that person or explain more clear in Spanish."

Teachers shared that there was an increase in classroom discussion, they could see that the intervention though it was done during lesson launch, had a positive impact during the teaching of the main part of the lesson. Students were confident and less afraid of making mistakes and being corrected, so they contributed to class discussions. The intervention has "promoted classroom discussion" MathsTeacher2, "for mathematical conversation, the intervention was effective for that part" $MathsTeacher_1$. This was confirmed by students who shared that they "talk more about maths, learn more". On the questionnaire, they said that "more people are putting their hands up to answer"... "everyone's talking more". A student also shared that they were able to explain when they don't understand and seek for explanation.

$MathsTeacher_2$ saw an "active change" in the lesson format; "because before, they were very quiet; it was very teacher-led lessons, where I would just be modelling and then getting them to do the questions. But now, as the lessons progressed, while do carrying out the intervention, it did become less teacher-led. And we did have some discussion; I did promote them to do more talking and explaining rather than me just telling them, yeah, I let them explore. Let them take over. And I think it did improve, then their discussions amongst each other because they would ask each other for help sometimes.

And I can see them explaining to each other like why they thought someone else was wrong". A student even if they had understood the concept, prior to the intervention would have struggled to explain due to language barrier and would have come across mathematically incapable but they are now able to explain in their language and it gives them confidence on their mathematical capability. The teacher shared that it was nice to see that difference and that they hope it continues to build on like this.

Again, students also confirmed this – they shared that they "talk more". But one the students shared, and few students also conformed that they felt like they were doing "less work" in their book and one of them shared that they wanted to do more questions in their book. On the questionnaire one of the student said discussion is "a lost of time that we can use to do maths" It was interesting that they felt that the more questions they did, the more successful they were in maths; they didn't seem to realise that actually what they did and, of course, if it was done, the discussions of the concepts correctly were more important. So the conceptual understanding could also potentially indicate success in maths. One of the students shared that talking in the home language is like "revision" for them.

Moreover, literature and past studies suggest that INAs, especially those new to English, may not understand the lesson when a new keyword or concept is introduced (Coggins, 2014) however this intervention according to students help "understand big difficult words", and they feel that they can now "engage and understand maths" .

From what they have shared, it was clear that in most of the lessons, unintentionally (or maybe intentionally by the teacher as I was not there to observe), the intervention idea

filtered into the main part of the lesson too, where students were discussing their work main work in their home language.

Both teachers said that they would have been able to comment on the impact of the intervention on their understanding and progress if the intervention had run longer; "we also missed a lesson with assembly" MathsTeacher$_1$.

Peer support and home influence:

Both teachers also noticed that the students "made more friends", "socialising of the group improved", "they were very supportive of each other"; they were "talking to people that they might not have". One of the students during focus group shared that "I can speak with more people that I never met". They were implying students whom they've never spoke to before. MathsTeacher$_1$ shared: "it felt quite segregated before, they only felt comfortable with their friends. But by the end of this intervention, they were more confident and comfortable speaking to other peers that were outside of their friendship group". MathsTeacher$_2$ believes that this is because they are "familiar" with the ("shared") language so they "felt more comfortable", and "they grew together",

MathsTeacher$_2$ says that they can tell that the students felt like "they weren't the only ones that didn't know something" and because of the different languages "there will always be at least one student who also didn't share the language of the speaker at a given time" (One student shared that they were able to help explain in "3 languages").. She thinks it "provided like a safety net for everyone that we're not going to always know everything. And you see the strength in the other ones. So promoted them to talk to each other a bit more". This is also confirmed by students on the questionnaires who

shared that “I answer more questions in the class”, “shows that maybe I’m not the only one that has wrong the answer” and they are also able to seek support “I can ask to the people that speak my same language”.

MathsTeacher1 shares that “let’s say when the explanation was asked by me, or can you explain this in your language, there were times when they prompted each other to make a correction” He says that it felt good “seeing them help each other even though I don’t understand the language”. Students also shared that they helped each other with definition, and one of the students also described an incident where he helped a student who spoke Arabic: his peer asked him, “why seven y squared times seven y? He got 49y. Why is power of three. Why?” and he said he enjoyed explaining that to him. This is in line with what As the students collaborate and try to communicate, Yackel et al. (1991) (as shared by Planas, 2015) stated that opportunities arise naturally for them to verbalise their thinking, explain or justify their solutions, and ask for clarifications. Additionally, spoken language is one of the important means of communication in this process, at least while they are still using their native tongue before learning English.

The student shared that he liked explaining in Arabic because, at home, he helps his younger sister with maths in Arabic. As a researcher, I didn’t realise the significance of them working on maths in their home languages. They seem to be translanguaging at home when they do maths with their family members in their home language.
Another student also shared that it made them “remember like my country; yeah, my class back my country”. This would, of course, help show that we value the students’ identity and create a “safe environment” for them (assuming that they had a positive

experience back in their home country).

English language development:

MathsTeacher$_1$ noticed that initially, whilst they were conversing amongst their peers and in whole class discussion, INAs were using more of their home language, but he could see an increased use of English language and maths vocabulary used by students towards the end of the intervention. He thinks that students can "blend both languages and the weightage towards English-Maths words increased towards the end". MathsTeacher$_2$ shares that "now that we got them to be comfortable talking, they have started to try and string sentences in English to explain the maths, rather than using their own language". This supports Baker's (2000) statement that students' ability to learn the weaker language may also be improved through translanguaging.

MathsTeacher$_1$ also believed that "talking in your own language helps you understand the words, which they will be using in English". He also shared that there was one student who was slightly more fluent in English than their own language and that he actually had to help with the phrases in Urdu. This was interesting, as one of the students in the focus group shared that they felt the intervention was slightly hard, she said: "because there are many words, I don't know our language, so I have to speak. I have to try to find the word in Urdu because in Pakistan I never doing my maths in Urdu". Her peers who spoke Urdu helped her along with the teacher. It does make me wonder whether this would have brought equilibrium to students who may have felt inferior due to a lack of the English language. It is somewhat like their maths conceptual understanding can go beyond the language barrier.

In addition, though most students wanted to if given the option, continue this intervention as it is "easier" for them to communicate in their home language ", it helps to understand something we can't understand in English", two students on the questionnaire shared that they would want to speak in English because that's what she needed to "improve" and shared that she would not want to continue the intervention. It was clear from their writing skills on the questionnaire that they were slightly advanced in English compared to their peers, and this response corresponds to Arnot et al. (2014) study: those students strongly opposed the idea that communication took place in their home language. Also, Civil (2012) and Setai (2008) reached similar findings with students worried that they should be learning English. Intriguingly, another student wrote that they want to continue because they value their language and "don't want to lose my language" (the cultural dilemma pointed out by Conteh, 2015).

Other positives, issues and opportunities of intervention

MathsTeacher1 shared that the intervention has increased students' enjoyment; "they enjoyed learning each other's language, especially the keywords in maths" and "we realised that a lot of maths words sounded the same in a different language and it surprised the students and fascinated them when they were expressing in a different language, but it meant the same thing". MathsTeacher1, towards the end of two weeks, went on to ask students to figure out what the other person in a different language was trying to say and pinpoint keywords. They did so that non-speakers of that language can also take part, and it made the intervention "inclusive" (though this was their initiative as a teacher). It made sense to do that because one of the negative feedback on the

intervention from the student's perspective is that “they felt like an outsider: “miss some time when others speaking their language or others who can't speak that language it like outsider, like sometimes when _____ speak Italian I feel like outsider. I can understand it can be Spanish, I don't feel outsider, but another student in the group is outsider”

Another issue raised by the teachers was towards the end “like the most recent one, they were getting too comfortable so that their conversations I could tell started to digress on to other things, but it was it was easily controlled, but I could tell they were getting comfortable which is why that happened”. The students also shared that few students towards the end of the intervention period were saying silly things – “some people might be misusing it”. It did make some of them uncomfortable: “you're so scared that people talking about you. Are they laughing at us?”. One of the focus students shared that they can get carried away and waste time. It is clear that this intervention requires a high level of responsibility and trustworthiness of students.

Moreover, MathsTeacher2 shared that sometimes students are quick to jump and interrupt another student when they realise that it is different to what they would have done or if they’ve spotted a mistake and that they have to remind them to be patient and to let their peer finish. They did say that this is just classroom management and can be the case if they have a discussion in other classes without INAs, but they shared that they also see it as a positive student’s verbal confidence in class has grown a lot during this short intervention time frame.

Both teachers shared that they had "the fear of the unknown" apart from their common shared language, they did not know most of the languages spoken by the students. MathsTeacher2: "Urdu I can speak, which was one of the languages of the group, but the other European languages or even Arabic, Italian, Spanish. I was like, what if I don't understand what they're saying, I wonder how that's going to go. But actually, I could still tell keywords that were related to the maths and still guide them. And it was kind of putting that trust in the kids to make that judgement to help each other than giving the ownership to them." MathsTeacher1 also shared that similar testimony and that he "picked up some words from other languages, which was helpful for them and me…" From a teacher view both shared that they got more "comfortable" and that the "trust" was there. This is different to how the teachers felt in the two schools of Arnot et al. (2014) study; they would avoid home language in class due to teachers lacking knowledge of multiple languages. But the maths teachers did share also that this might be different if they had a different group of students; these students are well-behaved. Furthermore, the more support pupils get from TAs, the less they get from teachers. It is perhaps unsurprising then that these students make less progress (Blatchford & Webster, 2012). One of the key elements for the positive impact of this intervention is building rapport between teachers and, according to them, "all" INAs in the class. But in the two weeks of the intervention, INA-TA1 was self-isolating. It does raise the question of whether it would have been different if the TA had been present. Could the lack of TA remove a barrier that allowed or encouraged teachers to build rapport – "break the ice" that was there for two months before the intervention since the formation of the bubble? Maybe it made the teachers less self-conscious and more

comfortable with their class, allowing them to do this intervention, as it required them to let go of control.

6. Conclusion

The study is evaluated throughout the report. A summary of conclusions to each RQs, implications and opportunities for future research are discussed in this chapter.

Summary

For RQ1, it is evident that INAs' positive learning experience is influenced by INA-TAs, students' priors math knowledge, visual aids, and math modelling. Participants also mentioned using home language and discussing keywords and concepts are maybe underutilised. Language prevents them from answering worded questions and telling the teacher they don't understand. This study found their lack of confidence, shock of the new environment, feeling unsafe, and language barrier are barriers to their positive learning experience. Peers and students' lack of empathy, lack of opportunity to answer, need for more class time to respond, and lack of wait time were other issues. The INA-segregation TA's of INA students at the back also hinders their learning.

Most participants believed INAs find math easier because it requires less language. Subject "familiarity" helped staff rather than language. The subtle differences in mathematical symbols and number names in different countries and languages confuse students, especially later secondary school students. The study found inclusiveness is the most important factor in their positive learning experience. “Getting them to read in class,” “asking them questions,” “giving them slightly longer wait time,” “praising them,” “marking their work in class - live,” simply “interacting with them,” “teachers building a rapport with them,” and “peers treating them well” show their need for inclusivity. Also, the study found that that students' sense of safety one of the important factors contributing to their learning experience (Hutchinson, 2003) and one of the

INA-TAs, I believe, rightly asked, "how can an INA student feel safe if they aren't able to communicate in their home language?"

Regarding RQ2, the intervention that uses the home language pedagogy of translanguaging did promote mathematical discussions and has positively impacted INA students' learning experience. Further, the intervention, in a way, broke many barriers to a positive learning experience (it was an ice breaker in MathsTeacher1's words) between particularly teachers and INA students. It made them feel important, valued and heard. It allowed the teachers to show that they were "interested" in them. It helped build the important aid of their positive learning experience: rapport with their maths teachers and promoted sense of belonging (inclusivity) (Baak, 2016).

Along with making students feel comfortable (the word comfortable was used 27 times during post-intervention SSIs and focus groups), the intervention increased their confidence to have mathematical discussions. The intervention showed that students felt "safe" and "comfortable" and INAs who were generally labelled as "shy" and "mute" opened up, and it led to students conversing for conceptual understanding and making meaning (Setati, 1998b; Coggins, 2014). Students were able to help each other with misconceptions and mistakes made by their peers as they could communicate faster in their home language. Tranalangauging has helped students understand new mathematical keywords and concepts as reported by the previous studies. Also, it helped INAs build a good rapport with maths teachers, and the lessons naturally leaned towards student-led rather than teacher-led and more discursive.

However, some students did not understand the purpose of discussing maths; they just wanted to load of questions in their books to practice (I think is a perception of the

subject based on their past schooling experience and seeing subject of maths as an individual endeavour (Sfard, 2000). Teachers also said they had to trust students and be alert if the conversation veered. Students also noted that talking to their peers in their home language was helpful, but if someone spoke in a different language during class discussion, they felt like an outsider. Speaking English united them, and some students were driven by the need to become fluent in English.

The impact of translanguaging on progress is unknown due to this intervention's nature and duration. However, it addresses inclusivity (I see the irony as I write this as the students were actually in an INA bubble class). It has increased maths discussion and questions due to confidence and comfort and understanding of mathematical concepts according to both teachers and students.

Implication on professional practice and wider context

The integration of language and culture into the teaching of mathematics, according to Ernst-Slavit and Slavit (2007), is a complicated process that calls for, among other things, a self-examination of pedagogical and mathematical beliefs, a desire to draw on students' backgrounds in instructional planning and process, and understanding of a variety of knowledge sets and dispositions related to particular aspects of language and culture. As a result of this study, within my practice, I will

- ✓ ensure that I make a conscious effort to build rapport with INAs and take an interest in their background and home language

- ✓ Ensure INAs feel “included” by doing the aspects in the study that suggests aid their learning experiences, e.g., “asking them questions” and “giving them longer wait time.”
- ✓ Actively teach students how they can use their home language for translanguaging
- ✓ In a mainstream classroom, a place where appropriate INA students with non-INA or INA with more advanced English who share a language
- ✓ Actively encourage students to have mathematical conversations and allow if it requires an INA-EAL$_{A \text{ or } B}$ or any INA to do this in their home language
- ✓ Spend time discussing key mathematical terminologies, including other non-mathematical meanings of those keywords.
- ✓ Allow students to use their home language for translanguaging, including code-switching to help them “make meaning” with the discussed key term with their peers

I will first present this study's findings and the literature review's findings on Queensway INA students, INAs nationally, and INA teaching and learning to the department/school.

This study was done under a unique circumstance, but the outcomes can be used to understand INA students, and we can start building on best practices to support their learning experience in maths. For example, unless an INA needs to be taught an entirely different curriculum (I mean lower primary school work), it is clear that for their conceptual development, they are better off sitting with a peer who shares their home

language and who is willing to discuss concepts with them in both English and their home language. The INA will feel more included than they are if they are sat with INA-TA for the whole academic year. The current INA-TAs have a huge positive influence on the INAs' learning experience, but they don't speak all the variety of languages spoken by the INA.

As the maths assessment coordinator in my school, I can use arithmetic tests to place INAs in the appropriate maths class. I will ensure that my department's teachers receive relevant information about INA students from the school's admissions team so they can prepare for their arrival and potentially plan for a maths peer buddy who speaks their language. The buddy student may find speaking in the home language strange. I will share ideas with teachers on what to tell the INA buddy peer before they arrive, emphasising their role in integrating their INA peer into maths class and making sure the student is comfortable.

I will also discuss translanguaging home language pedagogy with department teachers and how we can adapt and use it in and out of class. I'll also build my and my team's confidence to use this pedagogical idea.

Implications for further study

The study revealed INA's learning experience and how translanguaging pedagogy impacted mathematical discussions. As education researchers value home language as a resource, it would be worthwhile to explore this in the mainstream without the COVID bubble and restriction. It would be interesting to do this intervention in the mainstream

with monolingual learners to see if INA students can still become "comfortable" and "confident" and increase their "mathematical talk". Both math teachers in this study were EAL, meaning they were bilingual and multilingual. It would be interesting to see how a monolingual teacher would approach this intervention and their response, as literature suggest that it can be done by monolingual teachers too.

Evaluation: Other Limitations of the study

One of the limitations was the reliability of the data from questionnaires. Though it gave some overview of the class thoughts on the impact, I could not use some of the data due to reliability issues that arose from the language barrier (particularly the multiple choice part as I feel some students ticked boxes without comprehension). In addition, the study was conducted under a unique circumstance. It may be different to replicate such intervention in a mainstream maths class without the bubble groups where INAs will be spread across different bands and sets. Also, focus group interviews require different skills to conduct, and as a teacher, it was tempting to control it like a class discussion. Also, students are used to raising their hands even in class discussions, which was also different for them. Although I tried to follow guidance from literature as an amateur researcher, it certainly was not in my comfort zone.

Moreover, in the study, I only interviewed two maths teachers who were having the INA bubble class. Therefore, their perspectives are “fresh” and “recent” but also unique to the bubble group. If I had interviewed other maths teachers, I might have got a more “normal circumstance” picture. Also, students describing and sharing their learning

experience in this study are sharing it based on an unusual situation; they have never had the experience of schooling in England pre-covid.

All data collected in this study are self-reported, as is the nature of any questionnaire or interview process, and thus may be susceptible to a social desirability bias or the tendency to respond in ways that participants perceive as favorable (Groves et al., 2009). Teachers, in this case, may have reported what they thought was appropriate practice or an appropriate outcome of the intervention. Furthermore, qualitative data analysis relies heavily on interpretation, and qualitative data frequently lends itself to multiple interpretations (Gibbs, 2007). Personally, as I have adapted and designed the intervention for this study, my interpretation and analysis could also be biased – I noticed that I was experiencing a sense of glee whilst listening to and coding the data collected whenever a participant shared a positive outcome.

Finally, the data collected in this study is unique and authentic at this small scale, specific to this school. Despite critically evaluating the study, I am confident it was carried out with full awareness for an honest and authentic exploration and analysed and interpreted accordingly.

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8. Appendices

Appendix 1: UNICEF Data on migrants under the age of 18 (2021)

Appendix 2: Data on students born outside the UK

Appendix 3: Bell's EAL Assessment Framework for schools

Appendix 4: INA-TA SSI data analysis snapshot

Appendix 5:

5.1 Intervention Plan – Teacher Instructions

5.2 Intervention Plan – Student Instructions

Appendix 6:

6.1 Maths Teachers Initial SSI questions

6.2 INA Teaching Assistants Initial SSI questions

6.3 Student Focus Group questions

6.4 Post-intervention Teacher and INA-TA SSI questions

6.5 Post-intervention Student Focus Group questions

6.6 Post-intervention student Questionnaire snapshot:

Appendix 7: Focus group interview rules (students)

Appendix 8:

8.1 Participant Information Sheet

8.2 Consent Form

8.3 Letter to Parents

Appendix 9: Post-intervention Student Questionnaire results + coding (initial analysis)

Appendix 1: UNICEF Data on migrants under the age of 18 (2021)

UNICEF GLOBAL DATABASES [data.unicef.org]

Child migrants and refugees

Downloaded from http://data.unicef.org

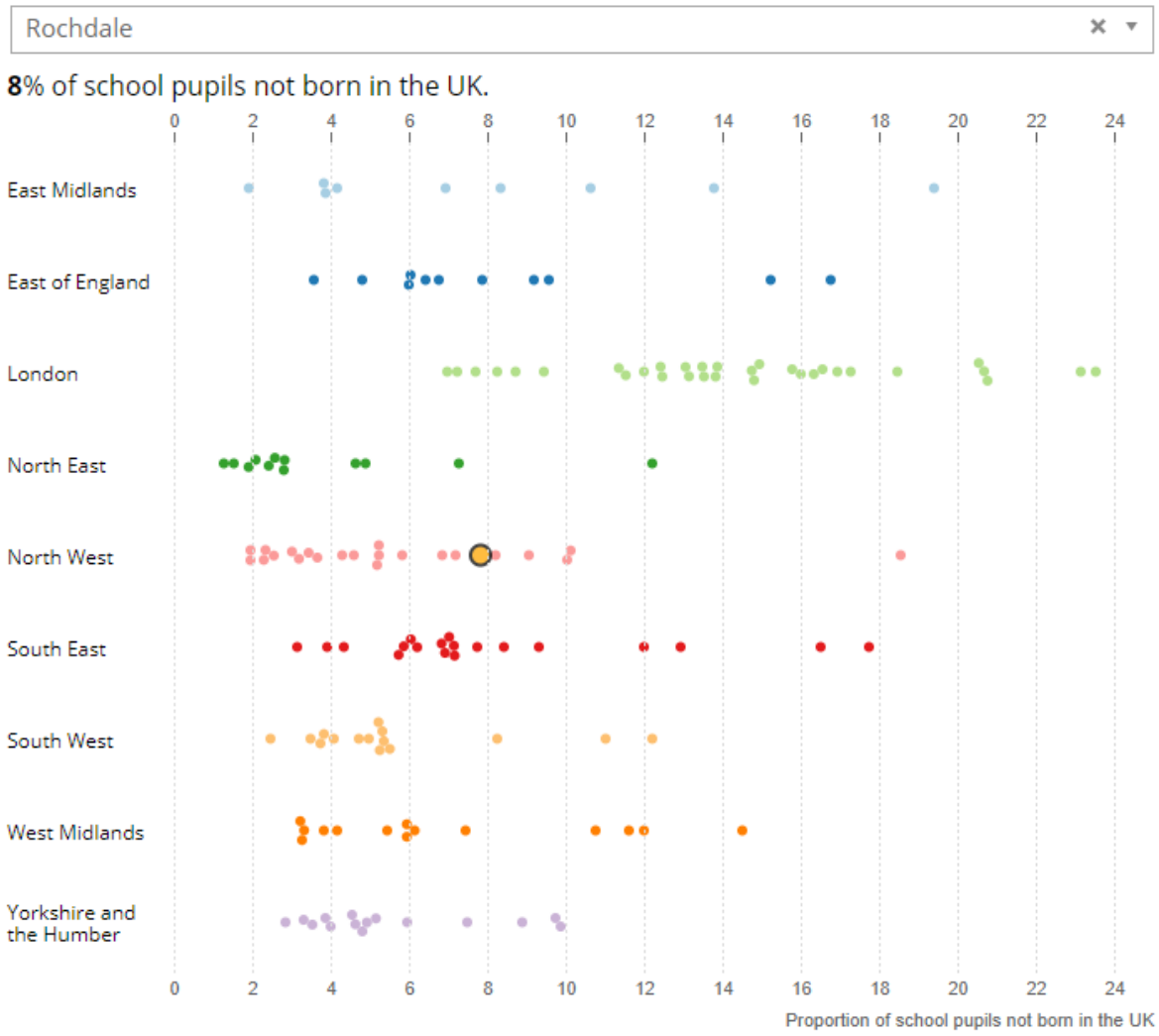
Last update: 07 February 2021

			International migrants, 2020[2]					Refugees, 2019				Asylum seekers, 2019		Internally displaced persons, 2019[3]	Ratification of key human rights instruments
			International migrants by country of destination			International migrants by country of origin		Refugees by country of asylum		Refugees by country of origin		Aylum seekers by country of asylum	Asylum seekers by country of origin		
	ISO Code	Countries and areas[1]	Total (thousands)	As percentage of total population of country/area (%)	Share of under 18 among total international migrants (%)	Total (thousands)	As percentage of total population of country/area (%)	Total (thousands)	Share of under 18 among total refugees (%)	Total (thousands)	Share of under 18 in total refugees (%)	Total (thousands)	Total (thousands)	Total (thousands)	Number of ratified instruments
5	USA	United States of Amer	50,633	15	7	2,996	<1	342	a	<1	a	848	3	-	3
6	DEU	Germany	15,762	19	7	3,855	5	1,147	31	<1	a	309	<1	-	4
7	SAU	Saudi Arabia	13,455	39	17	299	<1	<1	30	2	a	2	1	-	3
8	RUS	Russian Federation	11,637	8	5	10,757	7	42	a	62	a	1	48	2	4
9	GBR	United Kingdom	9,360	14	10	4,733	7	133	a	<1	a	62	<1	-	4
10	ARE	United Arab Emirates	8,716	88	15	203	2	1	31	<1	a	7	<1	-	2
11	FRA	France	8,525	13	8	2,342	4	408	a	<1	a	102	<1	-	4
12	CAN	Canada	8,049	21	8	1,292	3	102	a	<1	a	97	<1	-	4
13	AUS	Australia	7,686	30	8	599	2	77	a	<1	a	77	<1	-	4
14	ESP	Spain	6,842	15	8	1,490	3	58	a	<1	a	133	<1	-	4

Appendix 2: Data on students born outside the UK

Figure 3: The proportion of pupils who were born outside the UK varies across England, but is highest in London and other cities

Proportion of pupils in state-funded schools born outside the UK by local authority in England, January 2018



Source: Department for Education – School Census

Appendix 3: Bell's EAL Assessment Framework for schools

Using Bell's EAL Assessment Framework for schools, English language Proficiency of a child can be determined. Each strand is represented by five Proficiency bands and each band has a descriptive label:

A-New to English/Beginning

B-Early acquisition/Emerging

C-Developing competence/Expanding

D-Competent/Diversifying

E-Fluent.

(Bell Foundation, 2017)

Pupil Proficiency categories

Where "Proficiency in English" is required, schools will assess the position of their English as an additional language (EAL) pupils against a five-point scale of reading, writing and spoken language proficiency and make a "best fit" judgement as to the proficiency stage that a pupil corresponds most closely to.

New to English

- May use first language for learning and other purposes.
- May remain completely silent in the classroom.
- May be copying or repeating some words or phrases.
- May understand some everyday expressions in English but may have minimal or no literacy in English.
- Needs a considerable amount of EAL support.

Early acquisition

- May follow day-to-day social communication in English and participate in learning activities with support.
- Beginning to use spoken English for social purposes.
- May understand simple instructions and can follow narrative or accounts with visual support.
- May have developed some skills in reading and writing.
- May have become familiar with some subject specific vocabulary.
- Still needs a significant amount of EAL support to access the curriculum.

Developing competence

- May participate in learning activities with increasing independence.
- Able to express self orally in English, but structural inaccuracies are still apparent.
- Literacy will require ongoing support, particularly for understanding text and writing.
- May be able to follow abstract concepts and more complex written English.
- Requires ongoing EAL support to access the curriculum fully.

Competent

- Oral English will be developing well, enabling successful engagement in activities across the curriculum.
- Can read and understand a wide variety of texts.
- Written English may lack complexity and contain occasional evidence of errors in structure. Needs some support to access subtle nuances of meaning, to refine English usage, and to develop abstract vocabulary.
- Needs some or occasional EAL support to access complex curriculum material and tasks.

Fluent

- Can operate across the curriculum to a level of competence equivalent to that of a pupil who uses English as his or her first language.
- Operates without EAL support across the curriculum.

Alongside this scale, “Not Yet Assessed” [Code “N”] is available for use where the school has not yet had time to assess proficiency.

Appendix 4: INA-TA SSI data analysis snapshot

INA-TA3: let students explain in their language and allow them to use mother tongue for understanding. Why wouldn't you?"

Me: Interesting. Can you talk me through how that can be done?

INA-TA3: Right. Okay. So we're going to solve this simultaneous equation? Yeah. You know, I'm, could you explain to me in, could you explain to me in Urdu, how you would do it? I'm not saying train them so that they could tell you in Urdu; I mean, you've got a student who's not got much English, but you think there's some mathematical ability or possible prior learning, you know, use mother tongue. You can tell a student: I know you can do it, and I know your Portuguese is great. He's struggling. How would you explain this to him in Portuguese? Tell me how you would explain it. And see**, if the teacher feels confident about not necessarily speaking the language but recognising the features of the process, you know, sequencing and explanation can be done**. Even if the student doesn't speak the other language, they might be able to pick up on certain cues on the word. I mean, anything that builds self-esteem, you know, boosts confidence. Anything that does that will contribute to progress because we know that **progress requires an environment of safety** and an environment where students, you know, feel able to make mistakes. And **how safe is an environment where you can't use your mother tongue**? If anybody ever asked me, even a trainee teacher, I always say, you know, you can tell even if you don't know the language, you can tell whether it's off-task or on-task. If it's off-task language, treat it the same way you would treat somebody speaking English off task, you know, bring them back to what they're supposed to be doing. It's just furthering their conversations about maths using their languages.

Appendix 5:

5.1: Intervention Plan – Teacher Instructions

Students will be made aware of this intervention plan in advance.

Intervention Plan:

For the next two weeks, students should be given opportunity once they finish the lesson launches to discuss the mathematics involved. Students to be given opportunity to discuss the maths in their home language.

The lesson launch should include 3 questions (2 Qs from last lesson and 1 from last topic).

The discussions could start like this for example:-

"Can you explain how to simplify this expression in Spanish?"

It can be followed up by asking another Spanish student – "does that make sense? Is there anything else that needs to be involved or have they explained it fully?"

You could also ask the other Spanish speaking student, "so what word did he/she use for "add" in Spanish?"….if they say for example "no they didn't use the word add in Spanish"… then we can dive deeper and ask, "so is it possible to describe simplifying this expression without using the word add?"

Questioning should be focused also on students mathematical understand of methods as well as key terminologies. (E.g., why can't we put $3y$ and $-4y^2$ together?)

Please give them 5 minutes to complete the questions, 5 minutes to discuss with their peers who share the language (while you facilitate and prompt) and 5 minutes for whole class discussion.

5.2: Intervention Plan – Student Instructions

For the next two weeks, you will be discussing the mathematics involved on your lesson launches questions. You will be given opportunity and encouraged to discuss the maths in your home language. This is part of Mrs Raji's research study as part of her masters in Learning and Teaching at University of Oxford.

The lesson launch will have 3 questions (2 Qs from last lesson and 1 from last topic).

You can expect your teacher during lesson launch to ask you questions like; "could you explain how to do this question in Spanish/Italian/Urdu/Panjabi/Arabic?", "could you explain why this method works or what is the next step or what does this result mean in Spanish/Italian/Urdu/Panjabi/Arabic?"

You may also be asked to help you peer to explain and have discussions in your home language.

Home language in this study is the language you feel most comfortable speaking in other than English – its not necessarily your mother tongue or native language.

Appendix 6:

6.1 Maths Teachers Initial SSI questions

What enables positive learning experiences for INA students in maths?

What other opportunities/tools are available to enable a positive learning experience for them?

What external factors outside maths that can also contribute to their positive learning experience in maths?

What are the issues/barriers to a positive learning experience for INAs in maths?

What external factors outside maths are barriers to their positive learning experience in maths?

What tools/strategy do you use to support INAs? How effective are they? Why?

What other ideas/tools do you think we can try and use to support students learning in maths further?

How are you finding teaching INAs?

What aids/supports your teaching of INAs?

What issues/barriers do you face with your teaching of INAs?

What can the department/school to do to help you with your support with INAs?

Is there anything else that you wish to add?

Do you have any questions?

6.2 INA Teaching Assistants Initial SSI questions

Can you tell me a bit about your role?

What enables positive learning experiences for INA students in maths?

What other opportunities/tools are available to enable a positive learning experience for them?

What external factors outside maths that can also contribute to their positive learning experience in maths?

What are the issues/barriers to a positive learning experience for INAs in maths?

What external factors outside maths are barriers to their positive learning experience in maths?

What tools/strategy do you use to support INAs? How effective are they? Why?

What other ideas/tools do you think we can try and use to support students learning in maths further?

How are you finding supporting INA students in maths?

What aids/supports your support of INA students in maths?

What issues/barriers do you face when supporting INA students in maths?

What can the teacher/department/school to do to help you with your support with INAs in maths?

Is there anything else that you wish to add?

Do you have any questions?

6.3 Student Focus Group questions

Ice Breaker:

What languages other than English can you say hello in?

What's your favourite subject in school?

What's your ambition or goal after leaving high school? (It's okay if you are not sure yet.)

Main Questions

How are you finding maths?

What is a typical lesson like? (What do you normally do in maths?)

What is a good lesson in maths?

What helps you to have a good lesson in maths?

What issues stops you from having a good lesson in maths?

What is the teacher/TA doing that is helping you in maths?

What can the teacher/TA do to support you further in maths?

How are you finding learning maths in English language?

Do you talk about maths? (Follow up Q: how are you finding talking and listening to others talk about maths in English)?

Is there anything else that you wish to add?

Do you have any questions?

6.4 Post-intervention Teacher and INA-TA SSI questions

How did the intervention go?

How was students' response to this intervention?

What were the positive outcomes from this intervention?

What was the impact on classroom maths discussions?

What was the impact on student engagement?

What was the impact on student learning?

What were the negative outcomes from this intervention?

Overall, how effective was this intervention? Why?

Is this a sustainable tool to use? (explain)

Would you recommend teachers to try this idea with their INA students?

Is there anything else that you wish to add?

Do you have any questions?

6.5 Post-intervention Student Focus Group questions

What did you do in the intervention?

How did the intervention go?

Was the intervention useful? (good?) Why?

What are the positives from the intervention?

Any change in the level of talking about maths (discussion)? (and how?)

What are the negatives from this intervention? (any issues?)

Is there anything else that you wish to add?

Do you have any questions?

6.6 Post-intervention student Questionnaire snapshot:

1) As a result of be given the opportunity to discuss your lesson launches in your home language as well as English with your peers and your teacher, tick the appropriate boxes for these statements.

a. "I am more engaged in maths."

Strongly Agree [ ] Agree [ ] Disagree [ ] Strongly disagree [ ] Not sure [ ]

Please explain.

_____

_____

b. "I feel that having discussions in my home language has helped my learning in maths"

Strongly Agree [ ] Agree [ ] Disagree [ ] Strongly disagree [ ] Not sure [ ]

Please explain.

_____

_____

c. "I am able to discuss more about what I am learning in maths lesson"

Strongly Agree [ ] Agree [ ] Disagree [ ] Strongly disagree [ ] Not sure [ ]

Please explain.

_____

_____

d. "I am able to explain my understanding in maths more confidently".

Strongly Agree [ ] Agree [ ] Disagree [ ] Strongly disagree [ ] Not sure [ ]

Please explain.

_____

_____

e. "I am asking more questions in maths lessons".

Strongly Agree [ ] Agree [ ] Disagree [ ] Strongly disagree [ ] Not sure [ ]

Please explain.

_____

_____

f. "When my peers or I use our home language to explain, it helps my knowledge and understanding".

Strongly Agree [ ] Agree [ ] Disagree [ ] Strongly disagree [ ] Not sure [ ]

Please explain.

_____

_____

2. Would you like to continue to be given opportunity to discuss maths in home language with your peers?

Yes [ ] No [ ] Not sure [ ]

Please explain.

_____

_____

_____

4. Please write down any further thoughts you have regarding this intervention.

_____

_____

_____

_____

_____

_____

Appendix 7: Focus group interview rules (students)

1. Allow others to speak
2. There are no right or wrong answers, only different points of view
3. You don't need to agree with others, but you must listen respectfully as others share their views
4. My role as moderator will be to guide the discussion
5. You can talk to each other
6. You should share your opinions

(**Adapted from** Krueger, 2002)

Appendix 8:

8.1: Participant Information Sheet

PARTICIPANT INFORMATION SHEET

Researcher: X X
Email: X.X@education.ox.ac.uk
Department of Education - Oxford University,

15 Norham Gardens, Oxford, OX2 6PY

Supervisor: Dr X X (Associate Professor of Mathematics Education at Oxford University – Department of Education)
Email: X.X@education.ox.ac.uk
Department of Education - Oxford University,
15 Norham Gardens, Oxford, OX2 6PY

What is the purpose of the study?

This study is practitioner research on International New Arrival – English as an additional language (INA-EAL) students in maths classrooms. The study will explore students, maths teachers and teaching assistance perceptions, identify key opportunities and successful tools that enable INA-EAL students as well as potential barriers. An intervention will take place as an additional tool INA-EAL students in maths and the impact of the intervention will be discussed by maths teachers, teaching assistances and students.

This study is part of my Part 3 assignment contributing to my MSc. Learning and Teaching at Oxford University.

Participation and withdrawal

Your participation in this study is completely voluntary, and you may refuse to participate or withdraw from the study without penalty or loss of benefits to which you may otherwise be entitled.

What will be involved if you take part?

If you decide to volunteer, you will be asked to participate in one-two interviews/questionnaire. You will be asked several questions. I will be making notes through out the interview. The interview will also be audio recorded.

Confidentiality, storage and disposal of information

Your responses to interview questions will be kept confidential and anonymous. At no time will your actual identity be revealed. You will be assigned a random numerical code. The written notes from the interview will be destroyed when my assignment has been accepted. The notes, without your name, will be kept until the research is complete.

The audio recordings, pre-transcription, the files will be stored secured on an encrypted drive. Upon anonymous transcription, these files will be deleted. The recordings will not be listened to by me.

The data you give me will be used for the purpose of my research study for my masters at Oxford, and may be used as the basis for articles or presentations in the future. I won't use your name or information that would identify you in any publications or presentations.

What will the results of the study be used for?

The results of this study will contribute to my masters' part 3 assignment. A summary of the final assignment will be shared with you via email.

Contact details for further questions, or concerns

If you have questions or concerns about this research please contact: Sangary Varathan via sangary.varathan@education.ox.ac.uk

You may also contact the faculty member supervising this work: Dr X X - Associate Professor of Mathematics Education (Oxford University, Department of Education, 15 Norham Gardens, Oxford, OX2 6PY) via X.X@education.ox.ac.uk

8.2: Consent Form

CONSENT FORM

1. I have read and had explained to me by X X, the accompanying Information Sheet relating to the project on: International New Arrival – English as an additional language (INA-EAL) students in maths classrooms.

2. I have had explained to me the purposes of the project and what will be required of me, and any questions I have had have been answered to my satisfaction. I agree to the arrangements described in the Information Sheet in so far as they relate to my participation.

3. I understand who has access to all data will have provided, how the data will be stored and what will happen to the data at the end of the project.

4. I understand that participation is entirely voluntary and that I have the right to withdraw from the project any time, and that this will be without detriment.

Participants Signature: _____ Date: _____

Participant Name (in block capital letters): _____

8.3: Letter to parents

Dear Parent/Carer

I am currently reading MSc. Learning and Teaching at the University of Oxford and will be conducting Practitioner research as part of my course. The research study will focus on International New Arrivals in Maths classrooms, and your child is part of the Maths class used to conduct the study. The action research will last for two weeks, and as part of the study, your child will be invited for a short focus group interview pre and post-intervention and questionnaires. Please find further information regarding the research study below.

Purpose of the research:

The purpose of this study is to help understand the learning experience of International New Arrivals in their Maths classrooms and the impact of a research-based intervention.

Procedure:

Students will be invited to participate in a focus group interview to discuss their perceptions. Their Maths teacher will then use an additional research-supported tool in their lessons as an intervention for the following two weeks. This cycle will be completed by another focus group interview and questionnaires with participating students to review the intervention tool.

Ethical Consideration:

Central University Research Ethics Committee approved this study at the University of Oxford. Both semi-structured interviews will be voice recorded and stored safely. The recordings will be destroyed once they have been transcribed and analysed. All participants' details will be kept anonymous and confidential. Participation of this study is voluntary; students can opt-out at any time. At the time of this study, students will be reminded of this again.

Questions:

If you have any questions regarding this study, please contact xxxxxxxxxxxxxxxxxxxxx

or Dr X X (Research Supervisor), University of Oxford x.x@education.ox.ac.uk

Please complete and return the consent form below by 24th March 2021 to allow your child to participate in this study.

Yours faithfully

xxxxxxxxxxxxxxxxx
Second in Maths Department

I give permission for my child to participate in the research project conducted by XXXXXXXXX on International New Arrival students in Maths classrooms. The study has been explained to me, and my questions have been answered to my satisfaction. I understand that my child's right to withdraw from participating or refuse to participate will be respected and that his/her responses and identity will be kept confidential. I give this consent voluntarily.

Student Name _____ Tutor Group

Parent/Carer Signature _____ Date_____

Appendix 9: Post-intervention Student Questionnaire results + coding (initial analysis)

	Student 1	Student 2	Student 3	Student 4	Student 5	Student 6	Student 7	Student 8	Student 9
I am more engaged in maths.	I agree with this because I start to know more if I didn't understand it was better now than before	sometime I answer some questions	I am more engaged in maths because sometimes I can't explain in English but I can in Spanish			Because I want to help people in maths after doing that I am very happy because I helped people in 3 language.	Maybe for miss and sir its not to much when I share my answer. So idk	Because I answer more question in the class	Because maths in one of my favourite subject
I feel that having discussions in my home language has helped my learning in maths.	yes like I said before is getting better than before some thing I don't know but now its better	Because I can remember which I do in my house						Because I remember all what I do in my home.	Because some things that I don't understand my friends they explain to me in my home language
I am able to discuss more about what I am learning in maths lesson.	no I am not ready yet but I think I need to have confidence even I say bad the answer		I am able to discuss more because if I do not understand anything I can discuss it with the people that speak Spanish.						Yes I am able to explain when I don't understand

I am able to explain my understanding in maths more confidently.	well now I start to ask to the teacher and I understand more but I am not confident it can be wrong	because I am not good explaining because I don't have enough strong words to do it						Because I am not good explaining	
I am able to ask for help if I am not sure.	Yes now I ask and if I'm not sure I call the sir and he help me so its more easy		I can ask to the people that speak my same language						
When my peers or I use our home language to explain, I feel it helps confirm my knowledge and understanding.	yes when they explain in my language is more easy and I can know if I get right the answer and if they have the same answer that I get and its wrong it shows that maybe I'm not the only one that has wrong the answer	because is hard							
I am answering more							I'm not answering to much (I think)		

questions in maths lessons.							because sometimes the teachers say "you need to explain how do you make it" and I'm stay freeze		
I am more excited in maths lessons.			I'm more excited because before the lesson I know that If I cannot explain something I will can explain it in my own language (SA)						
3. Would you like to continue to be given opportunity to discuss in home language if you need to?	Yes because it would be more easy to understand	No - because it is a lost of time that we can use to do maths	Yes because I like speak in my own language because it makes me remember to my old school and also it helps me to understand more maths	Yes because I understand my home language more than English. It help understand big difficult word		Not sure because sometimes I don't understand the languages	because when you don't know a word etc the others can help you		

Question 4 - anything else		Because we lost time	I like maths lessons more because there's more language like Italian, Urdu, Arabic, Spanish and I like it			I want to have more maths lessons	Give more time to explain in own language		If I don't understand something my friends explain to me in my language

	Student 10	Student 11	Student 12	Student 13	Student 14	Student 15	Student 16	Student 17	Student 18
I am more engaged in maths.							(disagree) Its just normal, it doesn't really matter if its English, Urdu, Punjabi or whatever the thing I want understand is how to do maths		
I feel that having discussions in my home language has helped my learning in maths.									
I am able to discuss more about what I am learning in maths lesson.									

I am able to explain my understanding in maths more confidently.									
I am able to ask for help if I am not sure.									
When my peers or I use our home language to explain, I feel it helps confirm my knowledge and understanding.									
I am answering more questions in maths lessons.									

I am more excited in maths lessons.									
3. Would you like to continue to be given opportunity to discuss in home language if you need to?	Because it may help us understand somethings, we can't understand in English and maths lessons can be more fun	Yes because there is many people in my class can speak my home language so I like to and I don't want to lost my language.	Because speak and discussing about maths in own language is easier	(not sure) because some word I understand in English but not in my language and we don't do math in Urdu in Pakistan.	Not sure because its more difficult	Not sure because sometime I don't understand other language and sometime I feel good when I help my peers. And if we don't understand we can feel outsider.		No, because I understand English than my language	Not sure - I don't know its helping them or not.
	Because I can understand more topics			We wants more time for explain math and solve the maths		Sometime when other are talking or explain some people who don't speak that language can feel outsider. And sometime people use			

						bad words in their language.			
Question 4 - anything else	I am more happy than before in my maths lessons because I can engage/understand								