Masteroppgave

NTNU
Norges teknisk-naturvitenskapelige universitet
Fakultet for samfunns- og utdanningsvitenskap
Institutt for lærerutdanning

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Immigrant Korean Students Leaning Mathematics in Trondheim

A case study of five immigrant Korean students leaning mathematics in Trondheim

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Veileder: Sikunder Ali

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Abstract

This study investigates immigrant Korean students learning mathematics in Trondheim. This research aims to identify the aspects that contributed to successful transition of the immigrant Korean students learning mathematics in Trondheim. Furthermore, it will be explored whether educational opportunities with a focus on equity enable students to both overcome the challenges of learning mathematics and develop their potential. The issue to be investigated is "What challenges do the immigrant Korean students in Trondheim encounter in learning mathematics during the transition process?". In order to address the issue of this study, two research questions have been formulated: 1) How do the Korean immigrant students in Trondheim cope with the challenges associated with learning mathematics? and 2) What kind of support do the Korean immigrant students obtain to achieve a successful academic transition in learning mathematics?

The data for this study, employing case study research as the research methodology, was collected through semi-structured interviews, which were utilized to get in-depth understanding and detailed responses to the research questions from the interviewees. The interviews were conducted with five Korean students who were introduced to the Norwegian educational system through mottakklasser, reception classes for newly arrived students, offered by Trondheim Kommune. All of them were students who had previous experience with the South Korean educational system. The interviews were conducted using predetermined, open questions. The data from the interview was transcribed.

This study investigates the experiences of immigrant Korean students learning mathematics as they transition into the Norwegian educational system. The participants, who were all familiar with the South Korean educational context, faced various challenges and adjustments in their new environment. Key findings highlight several critical aspects of their experiences: difficulties in adjusting to new social and sociomathematical norms, the significant gap between the mathematics educational contexts of South Korea and Norway, and issues of equity in mathematics education. The students faced challenges such as discomfort with informal teacher-student interactions and adapting to collaborative classroom dynamics. Despite these challenges, they demonstrated flexibility and adaptability. The study underscores the importance of understanding immigrant students' diverse backgrounds to foster successful academic transitions and the need for comprehensive support systems to ensure equity in education.

Sammendrag

I studien undersøkes de koreanske innvandrerelevene som lærer matematikk i Trondheim. Denne forskningen sikter på å identifisere aspektene som bidro til vellykket overgang for de koreanske innvandrerelevene som lærer matematikk i Trondheim. Videre skal det forsøkes om undervisningsmuligheter med fokus på rettferdighet gjør elevene i stand til både å overvinne vanskelighetene med å lære matematikk og utvikle sitt potensial. Problemstillingen som skal undersøkes er «Hvilke utfordringer opplever de koreanske innvandrerelevene i Trondheim i å lære matematikk i overgangsperioden?». For å bidra til å løse problemstillingen er det formulert to forskningsspørsmål: 1) Hvordan takler de koreanske innvandrerelevene i Trondheim utfordringene med å lære matematikk? og 2) Hva slags støtte får de koreanske innvandrerelevene i Trondheim for å oppnå vellykket akademisk overgang i å lære matematikk?

Dataene for denne studien, som bruker casestudie som forskningsmetodikk, ble samlet inn gjennom semi-strukturerte intervjuer, som ble brukt for å få en dyptgående forståelse og detaljerte svar på forskningsspørsmålene fra intervjuobjektene. Intervjuene ble gjennomført med fem koreanske elever som ble introdusert til det norske utdanningssystemet gjennom mottaksklasser for nyankomne elever, tilbudt av Trondheim kommune. Alle var elever som hadde tidligere erfaring med det sør-koreanske utdanningssystemet. Intervjuene ble gjennomført ved hjelp av forhåndsbestemte, åpne spørsmål. Dataene fra intervjuene ble transkribert.

Denne studien undersøker erfaringene til koreanske innvandrerelever som lærer matematikk mens de overgår til det norske utdanningssystemet. Deltakerne, som alle var kjent med den sør-koreanske utdanningskonteksten, møtte ulike utfordringer og tilpasninger i sitt nye miljø. Nøkkelfunn fremhever flere kritiske aspekter ved deres erfaringer: vanskeligheter med å tilpasse seg nye sosiale og sosiomatematiske normer, det betydelige gapet mellom de matematiske utdanningskontekstene i Sør-Korea og Norge, og spørsmål om rettferdighet i matematikkundervisningen. Studentene opplevde utfordringer som ubehag med uformelle lærer-elev-interaksjoner og tilpasning til samarbeidsdynamikk i klasserommet. Til tross for disse utfordringene viste de fleksibilitet og tilpasningsevne. Studien understreker viktigheten av å forstå innvandringselever mangfoldige bakgrunner for å fremme vellykkede akademiske overganger og behovet for omfattende støttesystemer for å sikre rettferdighet i utdanningen.

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Challenging myself to pursue a master's degree in the unfamiliar country of Norway has allowed me to gain a deeper understanding of the difficulties faced by fellow immigrant students. Experiencing similar challenges has not only increased my empathy but has also fueled my desire to help others in similar situations. My journey has been shaped by a drive to understand and assist immigrant students in navigating their academic and personal transitions in a new country.

I would like to extend my heartfelt gratitude to my advisor, Professor Sikunder Ali, whose sincere advice and encouragement have been invaluable in the completion of this thesis. Without his guidance, this work would not have been possible.

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Trondheim, mai 2024
SunYoung Lim

Contents

1 Introduction

During a time of unprecedented global migration, educational systems worldwide are undergoing significant and fundamental changes (Chemin & Sayour, 2016; de Abreu, 2020). The field of education is seeing a growing trend towards globalization, which includes enhanced connection and cooperation among educational institutions worldwide. Internationalization tasks include several approaches, such as facilitating student exchanges, collaborating on research projects, and implementing internationally recognized curriculum and certificates. A major impact on education has been a significant change in the cultural and ethnic diversity of the student group (de Abreu, 2020). This diversification presents unique challenges and opportunities, particularly when it comes to integrating immigrant students into new educational systems. Education practices in schools are facing unexpected situations due to the varied cultural and ethnic backgrounds of the students (Hellesdatter Jacobsen & Piekut, 2022). Under unexpected and uncertain situations, immigrant students encounter significant challenges in engaging in educational practices in schools in the host country. One crucial issue for immigrant groups is assimilating into the educational systems of their new countries (Gorgorió et al., 2002). Understanding these assimilation challenges requires a closer look at the specific barriers immigrant students face, such as language and cultural differences.

To integrate into the educational systems of the host country, one must understand the cultural differences and norms, both within the classroom and in the broader social context. Competence in language is additionally crucial for immigrant students to successfully settle into their new surroundings, since they must overcome linguistic obstacles in order to actively engage in classroom activities and comprehend educational resources. Bishop (2002) highlights a significant challenge faced by immigrant students when learning mathematics in a new language. While the acquisition of a new language does not necessarily occur automatically through mathematics lessons in a different nation, the difficulty lies in grasping mathematical signs and symbols in the new language. This challenge is considered a part of the broader transition process for immigrant students. To further explore this transition, it is essential to examine how these barriers extend into specialized areas of education, such as mathematics. This chapter will explore the transition process encountered by immigrant students and provide a definition of equity in the context of mathematics education.

1.1 Mathematics Education for Immigrant students: Challenges & Opportunities

The majority of young immigrant students, who are generally defined as individuals who have moved from one country to another with the intention of settling there, are placed in a new environment due to factors such as their parents' profession or marriage, or due to political or sociological circumstances, rather than by their own choice (Civil, 2020). They could be undergoing the transitions related to immigrating to a new country and moving from one cultural environment to another, particularly from their previous school culture to their new school culture. These transitions are particularly evident in the mathematics classroom, where differences in educational background and language proficiency converge.

Because of differences in educational backgrounds and linguistic limitations, it is possible for students to have challenges when they are introduced to a new school setting. Bauersfeld et al. (1998) and Bishop (2002) argue that immigrant students encounter considerable challenges in adapting to the social dynamics inherent in mathematics classrooms. These challenges extend beyond mere comprehension of mathematical concepts; they encompass the acquisition of social interaction skills, understanding of social dynamics, and mastery of social language within an environment where students collectively shape expectations and interpretations. Immigrant students are confronted with the challenging task of understanding a complex environment where social norms and academic expectations are closely connected, often changing together (Gorgorió et al., 2002). Consequently, the transition process for immigrant students involves not only grasping mathematical content but also negotiating a complex social context that significantly impacts their learning experiences.

> We understand the construct 'transition' not as a moment of change but as the experience of changing, of living the discontinuities between the different contexts, and in particular between different school cultures and different mathematics classroom cultures. Transitions include the process of adapting to new social and cultural experiences, and students need to be helped to understand the meanings of the new experiences and to reinterpret them and construct new ones based on their own individual meanings and values(Guida De Abreu et al., 2002, p. 24).

To comprehensively understand these multifaceted transitions, this study employs theoretical frameworks that illuminate the roles of negotiation and co-construction in educational settings. This study focuses on the transition process of immigrant students, which is crucial for understanding the experiences they confront in their new educational setting. Gorgorió et al. (2002) defines "co-construction the transitions" refers to a collaborative process in which all participants engage in the negotiation and sharing of meanings related to various mathematical situations. Gorgorió et al.'s concept of 'co-construction of transitions' is central to understanding the adaptive challenges faced by immigrant students in new educational environments. This study will apply this concept to examine how immigrant students and their teachers co-construct the educational experience in mathematics classrooms. Specifically, the focus will be on how negotiation and sharing of cultural and mathematical meanings affect students' transition to a new educational system. This theoretical framework will be used to analyze interaction data, looking for ways that students and teachers jointly navigate and resolve conflicts of

understanding that arise from cultural and linguistic differences. According to Bruner (1990), the benefits of the meanings individuals bring to a situation are not completely realized until they are shared with others. In the context of this study, Bruner's theory of social constructivism underscores the collaborative nature of learning in mathematics classrooms. This theory posits that learning is a social process, where knowledge is constructed through interaction. My research explores how immigrant Korean students in Trondheim construct mathematical knowledge through interactions with peers and teachers. By observing and analyzing classroom interactions, this study will investigate how shared meanings and understandings emerge and how they aid or hinder the immigrant students' learning processes. The theory guides both the collection and analysis of qualitative data, helping identify patterns of interaction that are critical for the students' mathematical learning and integration. Therefore, it is important for everyone involved in the dynamics of the mathematics classroom to actively participate in this process of negotiation and sharing. Each individual's unique perspectives, experiences, and insights contribute to the richness of the collective understanding of mathematical concepts and problems (Vygotsky, 1978). With this theoretical background, the study concentrates on the specific experiences of immigrant Korean students in Trondheim, focusing on their unique challenges and the support systems available to them.

1.2 Significance of Studying Immigrant Students in Mathematics Education for Equity

The importance of studying immigrant students in mathematics education stems from the recognition of their distinct educational trajectories and the implications for equitable access to mathematical knowledge. Mathematics, often considered a universal language, can simultaneously serve as a significant challenge for immigrant students, emphasizing disparities in academic achievement and perpetuating inequities in educational outcomes. Hence, it is crucial to comprehend the complexities of immigrant students' encounters in mathematics education in order to cultivate inclusive educational settings and advance educational equity. Gutiérrez (2011) focuses on the definition of equity including four dimensions: access, achievement, identity and power. She suggests that equity means fairness, not sameness.

> 'Access' to tangible resources dominated equity discussions in the 1980s and continues in 'opportunity to learn' research. 'Achievement' refers to participation in quality mathematics classes and success in them. It is paramount in standardized tests and 'achievement gap' discourses. 'Identity' refers to supporting students in becoming better persons in their own eyes, which requires attention to their roots and a balance between attention to self and others. The 'power' dimension takes up issues of social transformation at many levels. Access and achievement are positioned as the dominant axis of equity. Identity and power form the critical axis (Gutiérrez, 2011).

Gutiérrez's framework on equity in education, encompassing access, achievement, identity, and power, provides a multifaceted lens through which to view the experiences of immigrant Korean students in Trondheim. This study will utilize these dimensions to assess how equitable the students' experiences in mathematics education are. For instance, I will investigate the access immigrant students have to resources like bilingual assistance and advanced mathematical coursework, and how this affects their academic achievement. Additionally, this research will explore how these students' identities as learners are shaped by their experiences and how they navigate the power dynamics within the classroom. This theoretical approach not only frames the data collection—focusing on interviews—but also deeply influences the analysis, enabling a nuanced understanding of equity in educational outcomes. Equity in mathematics learning can significantly affect the mathematics achievement of students. When students have equitable access to resources, opportunities, and support in their mathematics education, they are more likely to achieve better outcomes. Equity ensures that all students, regardless of their background or circumstances, have the chance to excel in mathematics. It can help address disparities in achievement among different groups of students and promote overall academic success. By fostering an equitable learning environment, educators can help maximize the potential of all students and enhance their mathematics achievement.

1.3 The Purpose and Issue of the study

Some municipalities in Norway have their own designated reception schools and/or reception classes for newly arrived students. This offer provides an opportunity for students to be introduced to the Norwegian language for the first time. The aim is to guarantee that students acquire sufficient proficiency in Norwegian to be able to participate in normal classroom instruction. Mottaksklasser for immigrant students are also conducted by different elementary and middle schools in Trondheim kommune. Immigrant Korean students participated in these classes immediately after immigrating, where they first encountered a mathematics class in Norway. In the mottakklasser, where immigrant students are grouped together, they meet a dynamic mixture of diverse backgrounds and cultures. Inevitably, this dynamic environment creates the conditions for many different kinds of cultural conflicts to occur (de Abreu, 2020). With students from diverse backgrounds, each with their own traditions and perspectives, conflicts are likely when they interact in the same educational environment. With a specific focus on their experiences of the educational environment, this study investigates the experiences of immigrant Korean students in mathematics education in Trondheim. To effectively capture these experiences, the methodology section outlines the use of semi-structured interviews, providing the necessary depth and detail. The issue of this study is “What challenges do the immigrant Korean students in Trondheim encounter in learning mathematics during the transition process?”. To address the issue of the study, two research questions have been formulated:

1) How do immigrant Korean students in Trondheim cope with the challenges associated with learning mathematics?
2) What kind of support do immigrant Korean students obtain to achieve a successful academic transition in learning mathematics?

This study employs qualitative research methods to delve deeper into the experiences of immigrant Korean students in Trondheim. Specifically, I conducted semi-structured interviews with five students, designed to capture detailed insights into their personal experiences, the challenges they encounter, and the support systems available in their mathematics education. These interviews allow for a flexible exploration of complex issues and adaptability to new themes that emerge during discussions, thereby providing a rich, nuanced understanding of the students' transition processes.

The insights gained from these interviews will inform the development of effective strategies to support immigrant students in mathematics classrooms and enhance educational equity. This study specifically aims to explore the transition experiences of immigrant Korean students, focusing on the challenges they face and the support systems available to them in learning mathematics. Through this qualitative approach, the research seeks to identify strategies that facilitate a successful transition in mathematics education for these students, while also examining the role of educational opportunities in fostering equity and enabling students to overcome learning challenges and realize their full potential.

2. Theoretical Background

The concept of the transition process is centered as the core idea of this study. Guida de Abreu and Presmeg (2002) highlight four essential aspects of the transition experience: historical, cultural, social, and linguistic transitions. However, this study will focus specifically on two of these aspects they emphasize: cultural and linguistic transitions.

- Cultural transition – where the individuals or groups experienced a change in the cultural context, and thus other values, customs and practices became significant. This we can think of as the 'acculturation' process, with its accompanying cultural conflicts and transitions. This aspect of transition became more salient in situations where there is not one homogeneous culture. For instance, when the parents emigrated after being at school in their home country, the child might be exposed to one set of mathematical practices and representations at home and another set at school.
- Linguistic transition – where there was a significant shift in language structure, vocabulary and practice, resulting in language conflicts and transitions. Needless to say, language issues became more salient for learners instructed in a language different from their home one. However, monolingual speakers also had to move between everyday and mathematical discourse (Guda de Abreu and Presmeg, 2002, p. 235).

The transition process between different cultures in schools and mathematics classrooms often gives rise to cultural conflicts (Bishop, 2002; Gorgorió et al., 2002). In a multicultural classroom, students come from various cultural backgrounds with different perspectives, values, and ways of learning. This diversity can lead to conflicts when mono-cultural teaching methods fail to be inclusive of all cultural experiences (Bishop, 1994; Bishop, 2002b). Bishop (1994) challenges the assumption of cultural consonance in mathematics education, highlighting that recognizing mathematics as culturally influenced knowledge reveals diverse mathematical forms beyond Western standards. This recognition undermines the notion of a conflict-free, culture-free education. Many young people worldwide face a distinct dissonance between the cultural traditions of their home or community and those represented within the school environment. These conflicts can emerge due to various factors, including differences in values, beliefs, communication styles, and norms (Bishop, 2002a; Guida de Abreu et al., 2002). We understand the process by which students adjust to changes while negotiating the cultural conflicts that arise in mathematics classrooms and acclimate to new social and sociocultural norms. Social and sociocultural norms have a substantial impact on social dynamics and interactions within mathematics classrooms (Gorgorió et al., 2002). In this chapter, we get an understanding of the social dynamics and social interactions that occur within mathematics classrooms in which immigrant Korean students participated by approaching the topic from a sociocultural perspective, drawing on Vygotsky's (1978) theory. In the context of immigrant Korean students studying mathematics in Trondheim, social representation theory would investigate the ways in which concepts of mathematics, education, and immigrant identity are created and challenged within the setting of Norwegian mathematics education.

2.1 Mathematical Learning from Sociocultural Perspective

Mathematics learning is a multifaceted process influenced by various factors, including cultural, social, and psychological aspects (Gerdes, 1988). Shedding light on the complexities of mathematics learning through a sociocultural lens recognizes the dynamic interaction between individuals, their socio-cultural context and mathematical practices (Gorgorió et al., 2002). This perspective highlights how these interactions shape learners' mathematical understanding and skills. The sociocultural perspective of mathematics learning draws heavily from the work of Lev Vygotsky, a prominent psychologist in the early 20th century. Vygotsky (1978) proposed the sociocultural theory of cognitive development, which emphasizes the critical role of social interactions, cultural tools, and historical context in shaping individuals' learning and cognitive processes. According to Vygotsky, learning is inherently a social process that occurs within specific cultural and historical contexts. Central to Vygotsky's theory is the concept of the zone of proximal development (ZPD), which refers to the range of tasks that learners can perform with the assistance of a more knowledgeable individual but cannot yet accomplish independently.

> The zone of proximal development(ZPD) means the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers (Vygotsky, 1978).

Vygotsky argued that cognitive development is facilitated through guided interactions within the ZPD, where learners engage in collaborative activities with teachers, peers, or other knowledgeable individuals. These interactions help learners internalize new knowledge and skills, progressively moving them towards independent problem-solving and understanding. In the case of immigrant Korean students learning mathematics in Trondheim, this sociocultural perspective becomes particularly relevant. Mathematics education involves more than the acquisition of abstract ideas and algorithms. It additionally requires understanding and negotiating the cultural and social norms inherent in the field of mathematics education. The learning of mathematics for immigrant students, who have their own cultural values and education backgrounds, is a complex process in a new sociocultural context, offering both challenges and opportunities (Gorgorió et al., 2002; Hjörne et al., 2012).

2.1.1 Cultural Tools and Mathematics Learning

A key aspect of the sociocultural perspective is the concept of cultural tools. These tools encompass both physical resources, such as textbooks and manipulatives, and abstract resources, such as language and symbols, that individuals use to facilitate their interactions with the environment. In the context of mathematics education, cultural tools include mathematical knowledge, language competence, social norms, and cultural practices. Gorgorió et al. (2002) employed the constructs of social norms, norms of the classroom

mathematical practice and sociomathematical norms to gain a deeper understanding of the normative aspects of action and interaction within the mathematics classroom, drawing inspiration from the work of Yackel & Cobb (1996). Social norms in the mathematics classroom encompass both implicit and explicit rules that dictate the structure of interactions between teachers and students, as well as the organization of work, use of materials, discipline, and allocation of talking time. The norms of the classroom's mathematical practice include both implicit and explicit rules that regulate the various mathematical behaviors of both teachers and students, including the legitimacy of different strategies, processes, knowledge, and solutions to mathematical tasks. Sociomathematical norms in the mathematics classroom refer to the set of rules that arise from a combination of social norms, norms related to mathematical practices, and individuals' values, expectations, emotions, attitudes, and beliefs, including those governing knowledge ownership and the valuation of alternative mathematical approaches (Gorgorió et al., 2002). For immigrant Korean students in Trondheim, these cultural tools include not just mathematical knowledge and skills, but also language competence, social norms, and cultural practices. In the theoretical framework of examining immigrant students' educational experiences, it is imperative to delve into the influence of cultural instruments. Understanding how these instruments impact immigrant Korean students' learning journeys is paramount for educators and policymakers dedicated to fostering their academic success. Central to this exploration is the sociocultural perspective, which underscores the importance of collaboration and interaction in knowledge acquisition. Through leveraging their cultural assets, immigrant students possess the potential to engage in collaborative problem-solving and learning with peers. Such interactions not only enhance their understanding of mathematics but also enrich their overall educational experience.

2.1.2 The Zone of Proximal Development in Mathematics Learning

The sociocultural perspective encompasses the concept of the zone of proximal development (ZPD), which refers to the gap between a learner's independent capabilities and their potential achievements with guidance from someone more knowledgeable (Munter, 2014). This concept holds particular significance for immigrant students in multicultural settings, such as Korean immigrants, who rely on support from peers, teachers, and family members to scaffold their mathematical understanding. In navigating their new environment, these students depend on direction and acceptance from individuals within the host culture, including teachers and peers, to develop perspectives and successfully integrate into their educational journey (Gorgorió et al., 2002). Immigrant students experience acceptance and support from both their teachers and peers from the host culture are more inclined to engage actively in their learning and social interactions, leading to a smoother transition and integration into their new environment. Additionally, fostering a welcoming and inclusive environment in schools can enhance cross-cultural understanding and compassion among all students, promoting a sense of belonging and mutual respect. Within the specific context of immigrant Korean students studying mathematics in Trondheim, the Zone of Proximal Development (ZPD) can be defined as the educational environment where these students can leverage their Korean cultural backgrounds to bridge their existing

mathematical knowledge with the new concepts, methods and representations they encounter in the Norwegian educational system. In this context, the Zone of Proximal Development (ZPD) serves as the bridge between the students' current mathematical knowledge based on their Korean cultural background and the new mathematical concepts presented in the Norwegian curriculum (Civil & Andrade, 2002; Gorgorió et al., 2002). Immigrant Korean students in Trondheim can leverage their cultural experiences and perspectives to support their learning in the Zone of Proximal Development (ZPD), enabling them to gradually move from what they already know towards mastery of the unfamiliar mathematical content. Teachers in Trondheim have a vital role in supporting and guiding immigrant Korean students' learning within the ZPD, taking into account the cultural and linguistic diversity these students bring to the classroom.

2.1.3 The Role of Language in a Multicultural Setting

Language plays a vital role in the journey of immigrant students as they navigate learning mathematics in their new host country. When confronted with mathematical concepts in a different language, students must surmount language barriers that can impede their comprehension and active participation. Cummins' theory (2021) of language acquisition distinguishes between basic interpersonal communicative skills (BICS) and cognitive/academic language proficiency (CALP). While immigrant students, such as those from Korea, may possess conversational fluency in the host country's language, they may encounter challenges in understanding and utilizing the specific vocabulary and discourse structures necessary for mathematical reasoning (CALP). For instance, a Korean student might be able to communicate basic needs and participate in everyday conversations in Norwegian but struggle to understand word problems in mathematics that require a deeper comprehension of academic language and specific terminology. This challenge is compounded in subjects like mathematics, where precise language and specialized vocabulary are crucial for understanding and solving problems. In mathematics classrooms where immigrant students are present, interactions between teachers and learners unfold within a complex framework shaped by various factors, including cultural, linguistic, and educational backgrounds (Cummins, 2021). These frames consist of cultural, linguistic, and educational backgrounds, which influence the dynamics of teaching and learning. Within the multicultural setting of mathematics classrooms in Trondheim, the interactions between immigrant Korean students and teachers are enriched by the diverse perspectives stemming from their cultural, linguistic, and educational backgrounds. Understanding and acknowledging these multiple frames facilitate effective communication, instructional strategies, and the creation of inclusive learning environments that cater to the diverse needs and experiences of all learners. Gaining a comprehensive understanding of this complexity is essential for teachers to successfully interact with varied student groups. In this setting, educators must navigate not only the mathematical problems but also the cultural nuances and communication skills that impact student engagement and understanding. The study will analyze the impact of cultural factors on the mathematics learning experiences of immigrant Korean students in Trondheim, focusing on their attitudes, beliefs, and learning approaches.

2.2 Social Representation in Mathematics Education

Social Representation Theory, first formulated by Serge Moscovici in the 1960s, suggests that individuals construct shared understandings of reality through social interaction and communication. These representations serve as cognitive frameworks that guide perception, interpretation, and action within a particular social group.

> Social representations [...] concern the contents of everyday thinking and the stock of ideas that gives coherence to our religious beliefs, political ideas and the connections we create as spontaneously as we breathe. They make it possible for us to classify persons and objects, to compare and explain behaviours and to objectify them as parts of our social setting (Moscovici, 1988, p.214).

In a context of mathematics education, social representation theory underscores the pivotal role of cultural norms, attitudes, and practices in shaping the mathematical understanding and performance of immigrant students.

2.2.1 Social Context of Mathematics Education in South Korea

South Korea's mathematics education is closely connected to societal values, historical customs, and educational expectations, creating a rich cultural environment. South Korean society lays a great deal on academic performance, with mathematics considered an essential aspect of intellectual development and social status. This cultural value is deeply rooted in Confucian philosophy, which highly values education (Ryu & Cervero, 2010). Ryu & Cervero (2010) argued that many researchers have emphasized that "Confucianism has been most influential in shaping Korean culture and its political and social landscape." Yao (2000) specifically stated that "Korea was perhaps the first country in which Confucianism exerted a sweeping influence, and this influence was not only present in the past but is also still evident today" (p.115). Since Korea's ancient times, many ancient Korean scholars have claimed that Confucianism has influenced Korean culture and education.

> The penetration of Confucianism into Korean culture enabled a great Confucian scholar of the Silla period, Choi Chi-won (858–951), to say that Korean native religion was a composite of Confucianism, Buddhism and Daoism.
> Taking its lead from Tang China, the Koryo Dynasty (918–1392) established the Kwako (Civil Service Examination System), and the Kukjakam (in Chinese guozi jian, the National University). During the reign of King Munjong (1047–82) private Confucian schools (sowon, in Chinese shuyuan) flourished, and one of their founders, Choi Chung (974– 1068), was named 'the Confucius of the East' for his contribution to Korean education and learning (Yao, 2000, p.115).

Confucian ideals emphasize the importance of education as a means of self-cultivation, moral development, and social harmony (Yao, 2000). In traditional Confucian Korean education, there is a strong emphasis on respect for authority, hierarchical relationships

between teachers and students, rigorous academic standards, and the transmission of cultural values through education (Ryu &Cervero, 2010). In this context, South Korean children are exposed to a demanding and competitive school setting from a young age, which prioritizes discipline, diligence, and persistence. Mathematics is not only seen as a topic to acquire knowledge in, but also as a representation of intellectual ability and status in society.

The South Korean educational system places a high value on mathematics, as seen by its emphasis on mastering mathematical concepts and problem-solving abilities through intensive practice, memorization, and standardized assessments. Moreover, the impact of technical progress and economic globalization has intensified the focus on STEM (Science, Technology, Engineering, and Mathematics) education, establishing mathematics as a key driver for national competitiveness and innovation. In addition to the classroom, South Korean society imposes significant pressure on students to achieve outstanding academic performance, with parental and community expectations often producing a culture characterized by academic stress and competition. Nevertheless, this cultural environment also cultivates a strong feeling of collective responsibility and support for education, with parents, educators, and communities actively engaged in students' academic efforts. Although South Korea's education system has been criticized for its inflexible and exam-oriented approach, the cultural environment of the country emphasizes the lasting importance of mathematics as a fundamental aspect of intellectual development, social progress, and individual success.

2.2.2 The Mathematics Educational Context in Norway

In the context of mathematics education, Norway stands out as a prime example of adopting the Nordic approach, characterized by its commitment to equity, student-centered learning, and holistic development. Drawing on the insights provided by Stedøy (2004), this study delves into the unique features of mathematics education in Norway, which emphasize inclusivity and support for all students, regardless of background or ability. One of the characteristics of the Nordic way is its unwavering commitment to equity in education. In Norway, this translates into efforts to ensure that all students have access to high-quality mathematics education. Policies and practices are designed to minimize achievement gaps and promote inclusivity, with a focus on providing support to students who may face barriers to learning mathematics. Norwegian mathematics classrooms prioritize student-centered learning environments, where learners are actively engaged in constructing mathematical knowledge. Inspired by constructivist principles, teachers act as facilitators, guiding students through exploratory activities, problem-solving tasks, and collaborative projects. This approach fosters deep understanding, critical thinking, and a sense of ownership over one's learning journey. The Norwegian curriculum emphasizes the application of mathematical concepts to real-world contexts, encouraging students to make connections between mathematics and other disciplines such as science, technology, and social studies. This interdisciplinary approach not only enhances the relevance of

mathematics but also nurtures students' ability to apply mathematical reasoning in diverse contexts. In line with the Nordic approach, assessment in Norwegian mathematics education is viewed as a tool for learning rather than simply a measure of achievement. Continuous assessment practices, including formative feedback and self-assessment, are integrated into teaching and learning processes to support students' progress and development. Mathematics education in Norway reflects the principles of the Nordic way, characterized by its commitment to equity, student-centered learning, interdisciplinary connections, practical applications, and formative assessment practices.

2.2.3 Impact on the Learning and Teaching of Mathematics for Social Representation

As defined by the social representation theory mentioned above, the dynamics of learning and teaching mathematics are significantly influenced by social representation theory, which shapes the methods of teachers and the experiences of students (Boaler, 2002; Guida De Abreu et al., 2002). Common beliefs, attitudes, and perceptions regarding mathematics have a substantial influence on the learning process within this framework. Students' attitudes, motivation, and self-efficacy in approaching mathematical problems may be influenced by social representations (Moscovici, 1988). Students' positive perceptions of mathematics has a profound impact on their engagement, motivation, and ultimately, their proficiency in the subject (Ruttenberg-Rozen & Jacobs, 2022). When students have a positive view of mathematics, they are more likely to engage in learning with enthusiasm, confidence and a mentality that embraces personal development. This positive perspective encourages an awareness of interest and intrinsic motivation, driving them to explore mathematical concepts more deeply and persist in the face of challenges (Grootenboer & Marshman, 2015). Positive perceptions also contribute to a supportive learning environment where students feel comfortable taking risks, asking questions, and cooperating with peers. Furthermore, students with positive attitudes of mathematics are more likely to perceive themselves as competent learners, leading to enhanced self-efficacy and academic achievement. On the other hand, students' negative perceptions of mathematics may significantly hinder their educational experiences and achievement. When students hold negative views of mathematics, such as perceiving it as difficult, boring, or irrelevant, they may approach learning with anxiety, disinterest, or avoidance behaviors (Hembree, 1990; Pajares, 2002). This way of thinking can create obstacles to engagement and hinder their desire to actively participate in classroom activities or seek support when necessary. Negative perceptions can also impact students' confidence in their mathematical abilities, resulting in a self-fulfilling expectation where they anticipate to perform poorly and consequently struggle to master mathematical concepts. Moreover, these negative attitudes towards mathematics have the potential to diminish students' motivation, leading to disengagement from the subject and a lack of persistence when confronted with challenges. Teachers, recognizing the impact of social representations, have a critical responsibility in dealing with misunderstandings, promoting positive attitudes, and making mathematics meaningful and accessible to all learners (Boaler, 2002). Building on Boaler's (2002) insights, educators are tasked with fostering a classroom culture that values diverse

perspectives and actively addresses misconceptions surrounding mathematics. Social representation theory intersects with broader discussions on equity in education. In chapter 2.3, I will continue to examine the intersections between equity in education and social representation theory.

2.2.4 The Role of Language and Communication for the Transition Process

Language and communication have a critical role in influencing the experiences of immigrant students in mathematics education during the transition process (Presmeg, 2002). As these students transition from their native language to the new language used for teaching, they confront substantial difficulties that affect their access to mathematics content, interactions with teachers and peers, and maintain interest in the subject (Gorgorió et al., 2002). Language barriers present formidable obstacles, impeding students' capacity to understand mathematical concepts, articulate their ideas effectively, and engage actively in classroom activities. Additionally, the process of learning mathematics in a new language can cause feelings of frustration, anxiety, and lack of self-efficacy, hindering students' belief in themselves and motivation to actively participate in learning mathematics. In this context, the role of language support strategies is essential to facilitate effective communication and ensure equitable access to mathematics learning opportunities. In the transition process, there are aspects that can cause confusion for Korean students, such as differences in the use of symbols between Norwegian and Korean mathematics. For instance, while Korea employs '×' for multiplication, Norway uses '·'. Similarly, the division symbol differs, with Korea using '÷' and Norway using ':'. However, the ':' symbol in Korea is often reserved for ratio calculations, leading to some confusion among Korean students. Additionally, there's a distinction in reading fractions; Korean convention prioritizes reading the denominator first, whereas in Norway, the numerator is read first. This discrepancy can pose challenges for students in understanding both numerator and denominator.

Teachers have a pivotal part in this process, employing teaching practices that scaffold language development while also encouraging mathematics understanding. Teachers may enhance their learning by including visual aids, manipulatives, and real-world contexts (Durmus & Karakirik, 2006). This approach allows students to engage with mathematical concepts from multiple perspectives and better understand mathematical language. In addition, cultivating a supportive and inclusive classroom environment where students are motivated to ask questions, seek clarification, and articulate their mathematical thinking without apprehension is crucial for promoting constructive language and communication experiences. Furthermore, applying the linguistic diversity within the mathematics classroom can enrich mathematical discussions and promote a sense of community among students (Bishop, 2002a). This enables them to use their distinct language backgrounds and cultural perspectives to deepen their understanding of mathematical ideas. By recognizing and addressing the impact of language and communication on the experiences of immigrant Korean students during the transition process in mathematics education, teachers can create more equitable and inclusive learning environments that empower all students to succeed academically and develop in mathematics.

2.3 Equity in Mathematics Education

Equity in mathematics education is a critical issue that encompasses ensuring all students, irrespective of their background or identity, have equitable access to high-quality mathematics instruction and opportunities for learning. This involves recognizing and addressing the unique challenges and needs that different student groups may face. In Munter's (2014) study, three related dimensions of high-quality mathematics instruction were defined: role of the teacher, classroom discourse, and mathematical tasks. According to Munter (2014), Engle and Conant (2002) recommend that teachers actively engage in mathematical arguments (Lampert, 1990), support student discussions (Fraivillig et al., 1999), and utilize students' explanations and questions as teaching content (Hiebert, 1997). Additionally, they suggest empowering students to collectively determine the validity of ideas (Simon, 1994), fostering their engagement as thinkers and decision-makers (Staples, 2007) in guiding their understanding of key mathematical concepts (Ball, 1993).

Munter (2014) highlighted that effective classroom discourse communities center around discussions focused on mathematical concepts, driven by teachers' questions and enriched by student interactions that generate questions and clarify misunderstandings (Engle & Conant, 2012). The success of these communities hinges on engaging participants in challenging mathematical tasks that foster discussion and exploration. Munter (2014) discussed Hiebert (1997) four characteristics of high-quality mathematical instruction, highlighting tasks that present problems for exploration, focus on mathematics, utilize students' skills, and are suitable for available tools. These tasks support problem-solving strategies and offer insights into mathematical structures. From a sociocultural perspective, equity in mathematics education involves recognizing the diverse cultural, linguistic, and social contexts in which learning occurs. It also means tackling the structural obstacles that affect students' experiences and achievements in mathematics learning. Equity is especially relevant for immigrant Korean students who face the challenges of cultural assimilation and language acquisition while participating in mathematics education.

2.3.1 Understanding Equity in Mathematics Education

Equity, in its essence, acknowledges and addresses the structural obstacles and disparities that are present in educational systems, with the goal of establishing inclusive learning environments that enable every student to achieve their full potential. An important distinction in understanding equity lies in the contrast between equity and equality. The difference between equity and equality is fundamental to efforts aimed at ensuring fairness and justice in education. Equality is the concept of treating all persons in the same manner, by offering them equal resources, opportunities, and support, regardless of their circumstances (Frønes et al., 2020). Although equality is a significant value, it does not directly tackle the fundamental institutional imbalances that sustain differences in educational achievement. Equity, on the other hand, acknowledges that individuals have

diverse needs and situations that may require different levels of support to achieve equitable outcomes. It recognizes the existence of structural barriers and disparities that have a greater impact on marginalized groups, including students from low-income households, racial and ethnic minorities, individuals who are learning English, and students with disabilities.

Equality aims to ensure that all students have identical resources or opportunities, whereas equity focuses on eliminating these barriers and providing customized support to address the specific needs of students, ensuring that all learners have the required resources, opportunities, and support to achieve academic success. It involves implementing specific interventions and allocating resources to tackle systemic inequities. Nevertheless, the interplay between equality and equity becomes intricate as measures aimed at achieving equality may necessitate unequal resource distribution or treatment, particularly when prioritizing disadvantaged groups, thereby highlighting their interdependence amidst a spectrum of conflicting notions (Frønes et al., 2020). Frameworks for conceptualizing and measuring equity in mathematics education often rely on sociocultural theories of learning, which highlights the significance of taking into account the cultural, linguistic, and social contexts in which learning takes place. It can be said that equity, from a social constructivist perspective, is not a concrete property, but rather the connections and interactions between individuals and their environment (Walshaw, 2010; Ruttenberg-Rozen & Jacobs, 2022). These frameworks emphasize the impact of factors such as cultural capital, language diversity, and community involvement on students' access to equitable mathematics education. In addition, equity frameworks may incorporate principles of social justice, advocating for policies and practices that address historical and structural disparities in educational systems. Measurement of equity in mathematics education entails evaluating students' access to resources, opportunities, and results, while also examining disparities based on demographic factors such as race, ethnicity, gender, and socioeconomic status. This approach acknowledges the significance of establishing inclusive and supportive learning settings that enable each student to achieve their full potential and make significant contributions to society.

2.3.2 Equity Challenges and Opportunities for Immigrant Students

Immigrant students encounter complex and significant hurdles as they undergo the process of cultural adaptation and language transition in mathematics learning. Cultural adaptation involves the process of not just acclimating to a new educational system but also integrating cultural norms, values, and expectations that may differ from those of their home country. Immigrant Korean students often face the challenge of adapting to two different educational cultures. On one hand, they have to navigate the educational system in South Korea, which focuses on excessive competition and academic success. On the other hand, they need to adjust to the new educational system in Norway, which emphasizes collaborative activities with peers and critical thinking. The cultural contradiction may lead to experiences of

confusion and uncertainty, as students struggle with new pedagogical practices, assessment methods, and social norms in the mathematics classroom (Gorgorió et al., 2002).

According to Jorgensen (2011), the acquisition of school mathematics is constrained by linguistic, social, and cultural routine. For students who are not fluent in the language of instruction, learning mathematics can be particularly challenging. Mathematical concepts often require understanding complex vocabulary and sentence structures. Jorgensen (2011) also claimed that socioeconomic status, family support, and peer interactions can all influence students' attitudes and beliefs about mathematics. Students from disadvantaged backgrounds may lack access to resources such as tutoring, educational materials, or technology that could support their mathematical learning. Additionally, stereotypes and biases about who is "good" at math can create self-doubt and undermine students' confidence in their mathematical abilities.
Cultural beliefs and practices can shape students' approaches to learning mathematics. Different cultures may have distinct mathematical traditions, problem-solving strategies, and perspectives on the relevance of mathematics in everyday life. If the mathematics curriculum does not reflect students' cultural backgrounds or experiences, they may struggle to see the relevance and meaning of the concepts being taught. According to Bourdieu (1994), the concept of habitus refers to the deeply ingrained habits, dispositions, and social structures that shape individuals' perceptions and behaviors. Students' habitus, influenced by their linguistic, social, and cultural contexts, can impact how they engage with mathematics and their sense of belonging in the mathematical community. For example, students from marginalized communities may internalize societal messages that math is not for them, leading to disengagement and underachievement.

Immigrant students bring invaluable diversity to educational settings, offering unique perspectives, experiences, and talents that enrich the learning environment for all students (Hilburn, 2015). With roots in various cultural backgrounds, they serve as cultural ambassadors, sharing rich insights into their heritage, traditions, and customs. For example, a student recently arrived from South Korea might illuminate South Korean holidays, cuisine, and family practices during cultural heritage celebrations or class discussions. These exchanges foster mutual understanding and appreciation for cultural diversity among peers, nurturing essential cultural competence in an increasingly globalized world. Moreover, immigrant students often possess multilingual abilities, serving as valuable resources for language acquisition within the classroom. A student fluent in Spanish and English, for instance, can provide language support to fellow English language learners, facilitating better comprehension and communication of academic concepts. Through such collaborative efforts, immigrant students not only enhance their own linguistic skills but also foster peer learning and collaboration, contributing to a more inclusive and supportive educational environment. In this context, I will investigate the academic transition success of immigrant Korean students, examining the factors that influenced their transition process through their experiences, and whether they received equitable educational opportunities. This investigation aims to provide insights into how educational systems can better support immigrant students and promote equity in mathematics education.

3. Methods

This research project employs a case study approach to get a deeper understanding of the experiences that immigrant Korean students in Trondheim have encountered throughout their transition process. Trondheim has a limited population of Korean immigrants. Due to this factor, there are just a handful of immigrant Korean students who may be recruited for research purposes. We conducted interviews with five Korean students who immigrated to Norway, following the completion of the fifth grade of elementary school or middle school. In the section on research analysis, it will discuss the impact of ages when immigrating on changes that take place in several aspects, such as students' experiences, attitudes, and perceptions of students towards mathematics during the transition process.

3.1 Research Design

In "Practical Research: Planning and Design" by Leedy and Ormrod (2019), research design is defined as:

> The research design provides the overall structure for the procedures the researcher follows, the data the researcher collects, and the data analyses the researcher conducts (p.92).

This definition emphasizes the purposeful and systematic nature of research design, highlighting its role in guiding the investigation process, addressing research questions, and managing variability in the data collected. Yin (2018) proposed the definition of research design as: Research design encompasses more than just a work plan; it constitutes a structured framework aimed at ensuring that collected evidence effectively addresses the research questions posed. Research design is the systematic arrangement of components aimed at structuring inquiry in a manner that ensures the evidence collected effectively addresses the research questions while guarding against biases or logical shortcomings (Yin, 2018). It outlines the framework within which the research will be conducted, providing a roadmap for data collection and analysis. A well-designed research study ensures that the research objectives are met effectively and efficiently.

3.1.1 Case Study

The method applied to this article is based on the case study approach, which was derived from the research conducted by Yin (2018). Prior to delving into the reasons for choosing a case study approach in this research, it is essential to provide a clear definition of what a

case study entails. Yin (2018) provided definitions for case study based on its scope and features.

1. A case study is an empirical method that
    - Investigates a contemporary phenomenon (the "case") in depth and within its real-world context, especially when
    - The boundaries between phenomenon and context may not be clearly evident.
2. A case study
    - Copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result
    - Benefits from the prior development of theoretical propositions to guide design, data collection, and analysis, and as another result
    - Relies on multiple sources of evidence, with data needing to converge in a triangulating fashion. (Yin, 2018, p. 15)

The study was not appropriate for quantitative research due to the limited population of immigrant Korean students in Trondheim, which was the subject of the inquiry. Hence, qualitative research was deemed appropriate, and specifically, case studies with interviews were chosen to provide an in-depth exploration of contemporary phenomena in Norwegian educational settings in which they participated. He provided that key components of case study research are: a case study's questions (formulating specific inquiries that guide the investigation); its propositions (establishing the theoretical perspective or philosophical framework guiding the case study); its case; the logic linking the data to the propositions; and the criteria for interpreting the findings. Given that case study research questions are most appropriate for "how" and "why" questions (Yin, 2018), I developed research questions of this study to align with the case study by focusing on "what" and "how" aspects. Through this process, my research question and two sub questions are formulated as:

> What challenges do the immigrant Korean students in Trondheim encounter in learning mathematics during the transition process?
>
> 1. How do immigrant Korean students in Trondheim cope with the challenges associated with learning mathematics?
> 2. What kind of support do immigrant Korean students obtain to achieve a successful academic transition in learning mathematics?

3.2 Data Collection

3.2.1 Sampling

In selecting cases, it is decided whether to study a single case or multiple cases, considering the research purpose, questions, and available resources. When selecting cases or participants for a case study, it's essential to follow Yin (2018)’s approach outlined in his work. This involves considering the specific research questions, the purpose of the study, and the nature of the phenomenon being investigated. Yin (2018) emphasizes the importance of selecting cases strategically to ensure they provide valuable insights and allow for rigorous analysis. Additionally, Yin (2018) advises researchers to consider the unique characteristics of each case and how they contribute to the overall understanding of the research topic. In the work of Punch (2005), the concept of purposive sampling is elucidated as a method for selecting cases or participants based on specific criteria relevant to the research objectives. Punch (2005) emphasizes the deliberate selection of cases that possess characteristics or attributes deemed essential for addressing the research questions effectively. This approach contrasts with random sampling methods and is particularly advantageous in qualitative research contexts where depth and richness of information are prioritized over statistical representativeness. Purposive sampling allows researchers to target individuals, groups, or settings that can provide unique perspectives, diverse experiences, or critical insights pertinent to the research question. Punch (2005) underscores the importance of thoughtful consideration in selecting cases, ensuring alignment with the research objectives and facilitating in-depth exploration of the phenomenon under investigation. This methodological approach enables researchers to maximize the relevance and richness of data obtained, thereby enhancing the validity and comprehensiveness of their findings in qualitative social research. The study selected participants from Trondheim who were students engaged in mathematics classes that were directly related to the research issue and purpose. The research focus was narrowed down to only include children who immigrated to Norway during the latter stages of their elementary school education. This methodology was used to investigate the students' encounters throughout the transition process, including both positive and negative events, as well as their strategies for overcoming these situations. This analysis deliberately excluded individuals who were either born in Norway or who relocated before completing the early years of elementary school. The reason for this is the anticipation that, in comparison to students who moved during the higher years of elementary school, they would have less obstacles due to differences in language or culture.

3.2.2 Participants

This study involved five Korean students who were introduced to the Norwegian educational system through mottakklasser, reception classes for newly arrived students, offered by Trondheim Kommune. At the time of immigration, two of the five students were 12 years old. One began their Norwegian education in the 8th grade of middle school, while the other started in the 6th grade of elementary school, based on their residence permit approval. The remaining three students immigrated at the age of 9; two initially entered the 5th grade, while one started in the 4th grade but soon moved up to the 5th grade. Two initially entered the fifth grade transitioned from the reception class program to regular classes after just two weeks due to harassment by another immigrant student in their previous

environment. This swift transition underscores the challenges and social dynamics immigrant students often face in new educational settings. The motives for immigration within the group varied significantly: two individuals migrated due to their mothers' marriages to Norwegians, while the other three relocated because of their fathers' employment changes. These differing reasons for relocation reflect the varied socio-economic and personal backgrounds of the students.

Despite comprising a small cohort of five students, each member exhibited unique immigration circumstances that influenced their academic journeys. The participants' varied ages at immigration, coupled with different academic placements and experiences within the Norwegian education system, underscore the diversity of their educational pathways. While some students had to adjust to middle school or upper elementary school curricula, others had the challenge of integrating into a completely new school environment from a younger age. These differences highlight the importance of considering individual backgrounds and experiences when addressing the educational needs of immigrant students.

3.2.3 Interview

Interviews have a crucial role as a primary source of method in case study research, as underlined by Yin (2018). Interviews provide researchers a chance to directly interact with crucial participants, including people, groups, or organizations, who are active in or possess information about the issue being investigated. Researchers may get comprehensive and intricate understandings, perspectives, and encounters that would not be attainable through other data collection methods. Yin (2018) underscores the significance of interviews in facilitating in-depth exploration, clarification, and validation of information relevant to the research questions and objectives. Interviews allow researchers to probe into nuanced aspects of the case, uncovering underlying motivations, decision-making processes, and contextual factors shaping the phenomenon under investigation. Moreover, interviews enable researchers to establish rapport with participants, fostering trust and openness conducive to eliciting candid responses. This study used semi-structured interviews to collect data, which provided an in-depth understanding of the interviewees' perspectives, experiences, challenges, and strategies related to learning mathematics.

> Semi-structured interviews are the preferred data collection method when the researcher's goal is to better understand the participant's unique perspective rather than a general-ized understanding of a phenomenon (Adeoye-Olatunde & Olenik, 2021, p. 1360).

These semi-structured interviews were conducted using predetermined, open questions. The interviews were conducted in a comfortable and confidential setting, allowing participants to express their thoughts and experiences as freely as possible. The interview was carried out in Korean. The rationale for this decision was that Korean facilitated communication between the interviewer, I, and the participants due to its relative ease. In advance of starting the interview, I presented to the participants the purpose of the research and the

specific questions that would be asked during the interview with an interview guide. The interview material was categorized into five distinct sections: student background information, student experiences throughout the transition process, the transition to mathematics education in Norway, support for achieving academic transition success, and a concluding section. Interview questions will be succinctly presented:

- Background information of student
    - Introduce yourself to me.
        - How are you?
        - What education do you have?
        - Which grade are you in?
        - What age were you when you immigrated to Norway?
            - Which grade were you in when you immigrated to Norway?
            - What made you immigrate to Norway?
        - How long have you lived in Norway?

- Student's experiences during the transition process in Norway
    - How do you recall your early mathematics classes in Norway?
    - What experiences have you had in learning mathematics in Norway?
    - What opportunities have you experienced in learning mathematics in Norway?
    - What challenges have you experienced in learning mathematics in Norway?
    - What activities have you experienced in mathematics classes in Norway?
    - What differences are there in learning mathematics between Norway and South Korea?

- Transition to mathematics education in Norway
    - How did you feel when you encountered challenges in mathematics classes?
    - What was it like to participate in mathematics class activities?
    - What opportunities in learning mathematics have helped you develop your mathematical potential?
    - What challenges in learning mathematics have helped you develop your mathematical potential?
    - What were your thoughts on mathematics in South Korea?
    - How has your attitude toward mathematics changed since you studied mathematics in Norway?
        - What do you think are the reasons?

- Support for achieving academic transition success
    - What support did you get when you faced challenges in learning mathematics?
    - Who has helped you develop your mathematical potential?
        - How much has your math teacher contributed to developing your mathematical potential?
    - What was the difference between support from home and school in overcoming your challenges in learning mathematics?

        - What are equitable educational opportunities in mathematics education for you?
            - Describe equitable educational opportunities you received in mathematics classes.

- A concluding
    - Oral summary of interviews in which the main points that emerged during the interview are discussed.
    - Any questions that the participant has.
    - Ask if there is anything more the participant would like to add.

The interview concluded by reiterating the participant of their rights and expressing gratitude for their participation. The questions that included students' background information were formulated to ascertain the impact of variables such as age at immigration, grade level at which students started their involvement in mathematics classes, and reasons for immigrating on the students' transition process. In the second section, questions were created to elicit more information about the participants' diverse experiences and interactions in mathematics lessons, including both opportunities and challenges. In the third part, the primary goal was to determine the initial emotional response of students upon their first participation in a Norwegian mathematics education, and subsequently, to examine the impact of these emotions on their mathematical potential. In addition, the intention was to discover whether there were any alterations in students' attitudes of mathematics when shifting to a Norwegian mathematics education, and how these changes were connected to the social and educational contexts in Norway and South Korea. The fourth element pertains to eliciting a response to the second research sub-question: What kind of support do immigrant Korean students obtain to achieve success in learning mathematics? From a sociocultural perspective, it was intended to determine if investigating support for mathematics education within both home and school environments can serve as a lens through which to explore the maintenance of cultural continuity. This approach was expected to provide valuable insights for addressing cultural conflicts that may occur in multicultural mathematics classes. By emphasizing the alignment between home cultural values and school mathematics practices, it was also intended to discover if it could help foster an environment that nurtures the mathematical potential of all students, including those from diverse cultural backgrounds. In addition, examining the impact of this inclusive approach, which not only supports the academic development of immigrant students but also promotes cultural understanding and appreciation among all students, is created to determine whether they can contribute to richer and more equitable learning experiences. It will thoroughly analyze the data in order to assess whether the interview questions designed for this purpose were effective in eliciting responses that address the study issues.

3. 3 Data Analysis

In a case study, the subjects of analysis can range from tangible entities like individuals, groups, organizations, and neighborhoods to more abstract concepts such as decisions, processes, social interactions, or sequences of events like political campaigns (Yin, 2018). This flexibility allows researchers to explore complex phenomena within their real-life contexts, providing a deeper understanding of the underlying dynamics and contributing factors. By employing various data collection methods, such as interviews, observations, and document analysis, case studies can capture the nuances and contextual factors that influence the subject of study.

3.3.1 Analysis Plan

The interviews, conducted in Korean, were transcribed into both Korean and English languages. The analysis plan comprises several stages aimed at comprehensively understanding the experiences of immigrant Korean students in Norwegian mathematics education.

1. Description of Participant Characteristics
   The initial stage involves providing a detailed description of the fundamental characteristics of the participants. This includes demographic information such as age, gender, educational background, length of residence in Norway, and other pertinent factors.

2. Examination of Experiences in Norwegian Mathematics Classes
   The subsequent stage delves into a thorough examination of participants' experiences within Norwegian mathematics classrooms. Through qualitative analysis, themes, patterns, and significant insights regarding classroom experiences are identified. This encompasses challenges, successes, and perceptions related to teaching and learning dynamics.

3. Exploration of Changes in Attitudes, Perceptions, and Performance
   Following the examination of classroom experiences, attention shifts to exploring the changes participants undergo in their attitudes, perceptions, and performance in mathematics during the transition process. This involves comparing experiences before and after transitioning to Norwegian mathematics classes, discerning any shifts or developments over time.

4. Identification of Factors Contributing to Successful Academic Transition
   The final stage aims to identify the myriad factors contributing to participants' successful academic transition in mathematics. This comprehensive analysis encompasses personal attributes, socio-cultural influences, institutional support

mechanisms, and contextual factors that either facilitate or hinder the transition process.

3.3.2 Validity & Reliability

The quality of a case study can be assessed by applying certain logical tests to ensure that the research design was properly designed (Yin, 2018). Validity refers to the extent to which the findings and conclusions drawn from the study accurately represent the phenomenon being studied. Validity in a case study is essential for ensuring that the findings are credible, trustworthy, and applicable to the broader context of the research question or problem being investigated. It assesses whether the methods used to collect and analyze data are appropriate and whether the results reflect the reality of the situation under investigation. There are several types of validity that researchers consider when evaluating the validity of a case study (Yin, 2018, p. 42):

- ***Construct validity***: identifying correct operational measures for the concepts being studied
- ***Internal validity*** (for explanatory or causal studies only and not for descriptive or exploratory studies): seeking to establish a causal relationship, whereby certain conditions are believed to lead to other conditions, as distinguished from spurious relationships
- ***External validity***: showing whether and how a case study's findings can be generalized
- ***Reliability***: demonstrating that the operations of a study—such as its data collection procedures—can be repeated, with the same results

Construct validity applies to the extent to which the operational measures used in a study adequately represent the theoretical constructs being studied. In the case of this research on immigrant students' experiences in mathematics classes, one of key constructs is the "transition process". The definition of the transition process is clearly provided in the introduction section of this study. Following the framework proposed by Guida De Abreu et al. (2002), I define the construct of 'transition' not as a singular moment of change, but rather as the ongoing experience of adapting to and navigating the discontinuities between different contexts, particularly between various school cultures and mathematics classroom cultures. This perspective emphasizes the dynamic nature of transitions, highlighting the importance of understanding and interpreting new social and cultural experiences, and constructing new meanings based on individual perspectives and values (Guida De Abreu et al., 2002, p. 24). Interviews were conducted with a protocol designed to assess students' experiences of cultural adaptation in the mathematics classroom during the transition process, their perceptions of social support, and their strategies for overcoming cultural differences. By assessing the alignment between the interview questions and the conceptual definition of the transition process, you can ensure that your interviews effectively capture students' experiences during the transition and contribute to a robust understanding of this phenomenon within the context of your study.

Internal validity concerns whether the findings of the study are a result of the variables being investigated and not due to other factors. To establish strong internal validity, researchers might use rigorous research methods, such as controlled experiments or longitudinal studies, and carefully design their studies to minimize the influence of confounding variables. They might also employ techniques like randomization, blinding, and controlling extraneous variables to ensure that any observed effects can be confidently attributed to the variables under investigation. Applying this approach to explanatory and exploratory research, such as case studies, which do not focus on causal situations, is challenging (Yin, 2018) The internal validity of the study was ensured through the careful design and execution of the interview protocol. By systematically addressing key aspects of the transition process, including students' experiences of cultural adaptation, perceptions of social support, and strategies for overcoming cultural differences, the interview protocol aimed to capture the underlying constructs of interest with accuracy and reliability. Additionally, efforts were made to minimize potential sources of bias or confounding variables during the data collection process, such as through the use of standardized interview procedures and clear guidelines for interviewer training. These measures enhanced the internal validity of the study, allowing for confident interpretation of the findings in relation to the research questions and objectives.

External validity in the context of "Immigrant Korean students learning mathematics in Trondheim" refers to the extent to which the findings and conclusions drawn from the study can be generalized beyond the specific context of the study. The findings from the interviews offer valuable insights into the experiences of immigrant Korean students during the transition process in mathematics classrooms. While the study focused specifically on students in a particular context, namely, immigrant Korean students in Trondheim, Norway, the themes and issues identified in the interviews may have broader relevance beyond this specific population and setting. For instance, the challenges faced by students in adapting to a new school culture, their perceptions of social support, and their strategies for overcoming cultural differences may resonate with immigrant student populations in other contexts. Additionally, the insights gained from this study can inform educators and policymakers about the unique needs and challenges of immigrant students, potentially guiding the development of more effective support strategies. Furthermore, comparative studies in different geographical and cultural contexts could help to identify commonalities and differences, thus enhancing the overall understanding of immigrant students' experiences in mathematics education. Therefore, while the generalizability of the findings to different populations and settings requires further investigation, the study provides a foundation for understanding the dynamics of immigrant students' experiences in mathematics education during the transition process.

To ensure reliability in data collection, a standardized interview protocol was developed and utilized for conducting interviews with participants. The interview protocol consisted of a set of predetermined questions and prompts designed to elicit information on students' experiences during the transition process in mathematics classrooms. The interview protocol was consistently applied across all participants to ensure uniformity in data collection

procedures. Detailed documentation was maintained throughout the interview process, including records of interview dates, locations, and durations, as well as any deviations from the standardized protocol. Additionally, all interviews were recorded and transcribed verbatim to preserve the accuracy and integrity of the participants' responses.

3.3.3 Ethical Consideration

Before initiating any data collection activities, written consent was obtained from the parents of the participants. The consent form provided detailed information about the purpose of the study, the procedures involved, potential risks and benefits, confidentiality measures, and the voluntary nature of participation. Participants were assured that they could withdraw from the study at any time without consequence. During the interviews, participants were fully informed about the research objectives, procedures, and potential outcomes. They were provided with a comprehensive overview of the study's purpose, the nature of their involvement, and any potential risks or benefits associated with participation. This information was conveyed in a language and format accessible to the participants, ensuring their understanding and informed decision-making. Participants were assured of the confidentiality and anonymity of their responses throughout the study. Personal identifiers were removed or replaced with pseudonyms to protect participant privacy. All data collected were securely stored and accessible only to the researcher, with strict adherence to data protection regulations and institutional guidelines. Given the cultural diversity of the participant population, cultural sensitivity was prioritized throughout the research process. Interview protocols and procedures were adapted to accommodate cultural differences and preferences, ensuring that participants felt respected and understood. Participants were encouraged to voice any concerns or questions they may have had.

4. Findings

4.1 Participants' Characteristics

Ga-eun and Ga-in are sisters who immigrated to Norway six years ago. Ga-eun, aged 19, is currently in her 2nd year of high school, while her 16-year-old sister, Ga-in, is in her final year of middle school. The two sisters said that they had not been allocated a school for a period of three months subsequent to their arrival in Norway. Ga-eun first joined the Norwegian education system in the 6th grade of Mottakklasse, a reception class for new arriving students, even though other students her age were attending the 7th grade in elementary school when she immigrated. Ga-in started her educational journey in Norway by entering Mottakklasse in the 4th grade of elementary school, but she moved on to the fifth grade. They chose to relocate to Norway after their mother married a Norwegian because they believed that the level of competition in Norway was less fierce compared to South Korea. They anticipated that learning in Norway would be more enjoyable and less stressful. Ga-eun and Ga-in have gradually adapted to Norwegian culture while maintaining aspects of their Korean heritage. They are now fluent in Norwegian, achieving proficiency after intensive language learning, and they remain bilingual, speaking both Korean and Norwegian at home. Academically, both sisters have adjusted well, with Ga-eun developing a keen interest in science and Ga-in excelling in mathematics. Socially, they have formed a diverse circle of friends, including both Norwegian peers and other immigrants, which has helped them feel more integrated. Their relationship with their Norwegian stepfather has been supportive, aiding their adaptation. They have a harmonious family life and enjoy participating in both Norwegian and Korean cultural activities. Looking forward, Ga-eun aspires to pursue a career in engineering, while Ga-in is interested in medicine. They both envision their future in Norway, appreciating the balance of opportunities and quality of life the country offers.

The other three participants are siblings named Min-seo, Jeong-min, and Jeong-hoon. Minseo is now 19 years old and is currently in her last year of high school. On the other hand, Jeong-min and Jeong-hoon, who are twins, are 15 years old and are in their 10th year of primary school. Min-seo immigrated at the age of 12, but she quickly reached the age of 13. While students her age were in the 7th grade of elementary school, she participated in Mottakklasse in the 8th grade of middle school due to the imminent conclusion of the spring semester. Jeong-min and Jeong-hoon were 9 years old when they arrived in Norway and joined the Mottakklasse in the 5th grade of elementary school. Within a week of beginning their lessons, they experienced bullying from one of their classmates. They said their inability to engage in any activity, both inside the classroom as well as outside it, was a direct result of their classmate's interference. The class they attended was Mottakklasse, and the bully was also an immigrant who had just immigrated to Norway. Consequently, their parents had to choose one of the two alternatives after seeking advice from Jeong-min and Jeong-hoon's teacher. They had the option of either transferring to Mottakklasse at a different primary school or joining a normal class at an elementary school

close to their residence. After careful deliberation, they made the decision to relocate Jeong-min and Jeong-hoon to a regular class at an elementary school nearby their home. Within a mere two weeks of entering the Norwegian school system, Jeong-min and Jeong-hoon started learning in new educational settings. The three children, Min-seo, Jeong-min, and Jeong-hoon, moved to Norway when their father, who was working at a branch office in Seoul, South Korea, transferred to the headquarters in Trondheim. Since that time, they have been in Trondheim for about six years. Their mother was a mathematics teacher in South Korea and continues to support their development in mathematics. Jeong-min and Jeong-hoon have exceptional mathematics proficiency and have achieved success by winning awards in several mathematics competitions in South Korea. Min-seo, Jeong-min, and Jeong-hoon have gradually adapted to Norwegian culture while maintaining their Korean heritage. They are fluent in Norwegian and continue to use Korean at home. Min-seo has developed a strong interest in studying biology, while Jeong-min and Jeong-hoon are planning to focus on realfag (natural sciences and mathematics) but are still undecided about their specific future career paths. Socially, they have built a network of friends, both Norwegian and from various backgrounds, which has supported their integration into their new environment. The siblings have a close-knit family dynamic, which has been crucial in their adaptation process. Looking forward, Min-seo aspires to pursue a career related to biology, while Jeong-min and Jeong-hoon are exploring their options within realfag. Despite the challenges they faced, such as language barriers and cultural adjustments, the support from their family, school, and the broader community has been pivotal in their successful integration into Norwegian society.

4.2 Participants' Experience in Norwegian Mathematics Classes during Transition Process

In Norway, the standard duration for primary and secondary school is typically 13 years. This includes primary (years 1-7), lower secondary education (years 8–10) and upper secondary education (years 11–13). Despite initially starting in the 4th grade, Ga–in, Jeong-min, and Jeong-hoon quickly progressed to the 5th grade without lingering in the previous grade for long. When I inquired about their memories of the first mathematics lesson they attended, Jeongmin's recall was exceptional.

> Interviewer (I) : Can you tell me your first impression of the new school you transferred to?
> Jeong-min : The Norwegian school environment was strange to me. The most embarrassing moment was when the children called the teacher by his/her name. The Norwegian teachers were warmer than Korean ones, but that made me feel even more uneasy. I was not sure what to do in class since I did not understand Norwegian. So I went beneath the desk to hide. I did not want my classmates or teacher to see me.
> Interviewer (I) : How did you feel in the early math lessons?

Jeong-min : Compared to other subjects, math class was quite good. But it was boring because it was so easy. The mathematics of 5th grade in Norway was only multiplication. I could solve those problems by just mental calculation.

Jeong-min mentioned feeling uneasy when students called the teacher by his/her first name. This unfamiliar practice added to his initial discomfort and sense of alienation. Jeong-min's remarks shed light on the complex emotional experiences of immigrant students navigating unfamiliar educational environments, marked by feelings of unfamiliarity, anxiety, and isolation. Both Jeong-min and Jeong-hoon also expressed boredom with the 5th-grade mathematics curriculum in Norway, finding it much easier compared to the rigorous standards of South Korean education. This disparity underscores a significant gap in mathematics curricula between the two countries, a sentiment echoed unanimously by all participants.

Jeong-hoon's experience highlights the transfer of mathematical knowledge from South Korea to the Norwegian educational context. Having mastered division in South Korea, Jeong-hoon found the Norwegian curriculum too easy, reflecting the rigorous and advanced nature of South Korean education compared to the more flexible and inclusive Norwegian system. His familiarity with division allowed him to confidently solve problems using methods he had learned previously. The positive reception from his Norwegian teacher not only validated his abilities but also strengthened their connection. The teacher's commendable understanding of the cultural and educational differences between South Korea and Norway helped create a supportive learning environment. By acknowledging and accepting diverse approaches to mathematical concepts, the teacher bolstered the students' mathematical confidence.

Specifically, Min-seo highlighted the stark contrast between the 8th-grade mathematics curriculum in Norway and the equivalent level in South Korea, equating the former to a middle-grade elementary level in the latter's system. All participants in this study reported no significant communication challenges during their early math education in Norway, as they effectively communicated with their teachers in English. In South Korea, where job attainment often hinges on possessing exemplary qualifications, including proficiency in multiple foreign languages, many children undergo pre-elementary education to acquire proficiency in Korean (Hangul) and English. This early exposure to language learning reflects the high value placed on linguistic skills in Korean society.

All participants reported having fully learned the material covered in their early Norwegian math classes in South Korea. They found the assigned tasks to be easy and completed them quickly as a result. While other students requested the teacher for various tasks, Ga-eun's behavior was a little different.

I : Do you remember anything about the early math class you attended?

Ga-eun : Could I say this? The concepts I acquired in my early math lesson were simple. I learnt everything from South Korea. So I did nothing.
I : Did your math teacher know that the concepts were too easy and you would not learn anything new?
Ga-eun : She did not know. I was not sure whether I could say it to the teacher, so when I completed doing all of the tasks the teacher assigned me, I simply sat silently.
I : How did the teacher react while you sat still and did nothing?
Ga-eun : She just assessed the problems that I solved and then moved on to the other students. Because some students were struggling, the teacher focused more on them.

Ga-eun was used to the passive learning style of South Korean classrooms and found it challenging to speak up or express her difficulties to the teacher in Norway. This led to her silently completing tasks without seeking help, even when she found the material too easy. In South Korean classrooms, a prevailing passive atmosphere often inhibits students, like Ga-eun, from freely expressing their opinions to teachers, hindering effective communication. Ga-eun, accustomed to this environment, struggled to articulate her thoughts effectively. She recounted her experience of primarily completing tasks and drawing pictures during elementary school mathematics lessons, indicating a lack of meaningful interaction with her teacher. Meanwhile, students such as Ga-in, Jeong-min, and Jeong-hoon, who had engaged with math since the 4th and 5th grades, appeared to excel in the elementary curriculum with relative ease. However, Ga-in faced challenges upon encountering fractions during her middle school mathematics education.

I : Did you ever feel like you were still good at math in 8th grade?
Ga-in : I had confidence that I was good at math until 7th grade, but I could not maintain that after 8th grade. I first learned the concept of fractions when I came to Norway, but it seemed like I did not learn it properly. So I thought I did not know anything about fractions until I was in 10th grade.

Ga-in's early immigration experience was relatively smooth, as she had already learned algebra in elementary school in South Korea. However, as she progressed to higher grades in Norway, she encountered significant difficulties. Despite believing she had acquired sufficient language proficiency, she found herself unable to effectively comprehend new mathematical concepts. Ga-in struggled with fractions in middle school, even though she had already learned algebra in elementary school in South Korea. This indicates that while she possessed advanced mathematical skills, the differences in teaching methods and conceptual explanations between the two educational systems impacted her understanding and confidence. The specific struggle highlighted in the text revolves around fractions. Despite her math teacher's efforts to explain the concept repeatedly, Ga-in still could not grasp it. She sought help from her family, but even her mother's explanations, rooted in South Korean educational methods and terminology, did not fully bridge the gap for her. This narrative reflects the intersection of language, cultural, and educational differences that immigrants often face when adapting to a new educational system. Ga-in's experience

underscores the importance of not only language proficiency but also the cultural and educational context in understanding and mastering academic subjects.

> I : What challenges have you experienced in learning mathematics in Norway?
> Min-seo : It was in the 10th grade. The assignments given in math class were too easy, so I was getting bored. I asked the teacher if I could learn the 1T course. The teacher said it was too early for me to take 1T because my Norwegian was insufficient. She suggested that I try solving more word problems instead.
> I : Was your Norwegian proficiency really lacking?
> Min-seo : No way. I was getting a 6 in my Norwegian subject.
> I : So, what did you do?
> Min-seo : After discussing it with my parents, I consulted with my math teacher. Then, I got permission to solve 1T on my own once I finished all the assignments given during math class. And I took the privatisteksamen, a Norwegian arrangement where a pupil or student (a privatist) takes an exam without having student status or study rights, in 10th grade.

Min-seo found the Norwegian assignments too easy and was bored due to the less rigorous academic expectations. Her request to take a more advanced course (1T) was initially denied, highlighting the difference in academic expectations and the emphasis on a well-rounded education in Norway. Min-seo's remarkable integration into the Norwegian educational system stands out among immigrant children, who typically anticipate a similar trajectory. Her swift adaptation and exceptional academic performance facilitated her transition from the Mottakklasse to a regular class within just three months. Notably, she excelled across various subjects, demonstrating her academic prowess. Min-seo's proactive approach to her education was evident when she expressed optimism regarding her academic prospects and requested permission from her 10th-grade math teacher to enroll in the 1T course, designed for first-year high school students, to accelerate her mastery of the arithmetic curriculum. Despite her earnest request, her teacher's refusal led her to pursue the course independently. This lack of understanding from her teacher regarding Min-seo's drive for academic excellence resulted in limited interaction between them. Upon entering high school, Min-seo's aspirations aligned with the pursuit of admission to prestigious colleges worldwide. Recognizing the pivotal role of mathematics in achieving her goals, she opted for an intense mathematics program and dedicated herself to its study, striving for academic success.

> I : Did you gain more confidence in mathematics after coming to Norway and participating in math classes?
> Ga-eun: Yes, indeed.
> I : Was there a specific moment or aspect that made you feel more confident?
> Ga-eun : In the 7th grade, I went on an overnight trip where each group was given missions to solve problems. One of the missions happened to involve mathematics. None of my friends could solve the mathematical problems, but I managed to calculate and solve them all mentally. It was not a big deal for me. Thanks to that, my team I was in overwhelmingly came in first place. I solved what others could not even start very easily. It was not a text-based problem. My teammates praised me,

saying I was amazing for solving it mentally. Some other teams could not even finish it. That was when I realized, "I am pretty good at math. I do have something I am good at." I had not felt that way before because I usually solved problems alone during class and never noticed. It was the first time I felt that way while working with my friends. I realized that I was much better at math compared to others.
I : Then, on the contrary, have you ever thought, "Math is too difficult for me" or "Am I not good at math" because of something?
Ga-eun : I felt that way when I entered high school, but not really before that. In high school, while taking the 1T course, I started encountering language barriers. Because of that, I had trouble understanding the conceptual explanations. Until middle school, I managed well enough with what I had learned in Korea, but when new concepts started appearing in 1T, I began to struggle with understanding. I thought, "Is this as far as I can go?" Before that, everything was fine.

Ga-eun's academic journey in mathematics presents a nuanced narrative that reveals both her strengths and challenges in mathematics. Prior to her high school years, Ga-eun exhibited a strong aptitude for mathematics, as evidenced by her effortless completion of mathematics assignments up until the 10th grade. Notably, during a 7th-grade class trip, she demonstrated her natural talent and confidence in mathematical tasks by solving problems that her peers struggled with, earning their recognition and bolstering her self-assurance. However, upon entering high school and enrolling in the rigorous math course 1T, Ga-eun encountered significant difficulties. Despite her previous success, she struggled to efficiently grasp new mathematical concepts and adapt to the instructional methods employed by her teacher. This transition marked a notable departure from her prior experience, where she had demonstrated proficiency in completing assignments and tests without heavy reliance on teacher guidance. Ga-eun's challenges in 1T were multifaceted. Firstly, her unfamiliarity with the teacher's explanations hindered her comprehension of the course material, resulting in a decline in academic performance. This suggests a potential mismatch between her learning style and the instructional approach employed in the course. Additionally, Ga-eun's pessimistic perspective on math class activities, particularly her struggle to showcase originality in problem-solving exercises, indicates a disconnect between her understanding of educational objectives and the pedagogical strategies employed by her teacher.

Jeong-min mentioned feeling uneasy about the informal way Norwegian students addressed their teachers by their first names. This discomfort hints at initial difficulties in adjusting to the new social norms and forming peer relationships. Ga-eun, accustomed to the passive learning environment in South Korea, initially struggled to communicate her thoughts and feelings to her Norwegian teacher. This likely extended to her interactions with peers, as she was not used to a collaborative classroom environment. The informal and egalitarian culture in Norwegian schools might have posed a challenge for South Korean students, who were used to more hierarchical social interactions. These differences in social norms and classroom dynamics could have made it difficult for them to connect with their peers initially. However, as they adapted, they likely found ways to navigate these social dynamics and form relationships. This adaptation process underscores the resilience and

flexibility of immigrant students as they learn to bridge cultural gaps and thrive in new educational settings.

Jeong-min's account of hiding under the desk during his first mathematics lesson indicates a high level of anxiety and a lack of initial emotional support. This reflects the emotional turmoil and feelings of isolation that can accompany such a significant transition. Ga-in struggled with understanding fractions despite repeated explanations from her teacher and help from her family. This ongoing struggle suggests a persistent feeling of frustration and possibly diminished self-esteem, impacting her emotional well-being. Min-seo's experience in the 10th grade, where she was initially denied the opportunity to take a more advanced course, shows how a lack of understanding from teachers regarding her capabilities might have affected her confidence and motivation. However, her proactive approach, with support from her parents, eventually led to a positive outcome. These examples illustrate the varied emotional experiences of immigrant students. While some students faced significant anxiety and isolation, others found ways to seek support and advocate for themselves. The presence of supportive family members and proactive communication with teachers played a crucial role in mitigating some of the emotional challenges.

In the case of Min-seo, Jeong-min, and Jeong-hoon, the gap between the mathematics curricula of Norway and South Korea accelerated their mathematical potential within the Norwegian educational system. Conversely, for Ga-eun, this gap not only hindered her self-directed learning but also, compounded by language barriers, led to difficulties when encountering advanced mathematics. The informal and equal culture in Norwegian schools might have posed a challenge for South Korean students, who were used to more hierarchical social interactions. This could have made it difficult for them to connect with their peers initially. However, as they adapted, they likely found ways to navigate these social dynamics and form relationships.

4.3 Transition in Learning Mathematics in Norway

In her first year of high school, Ga-eun diligently sought help from her teacher to overcome the challenges she faced in her mathematics class. However, despite her persistent efforts, the assistance she received proved to be ineffective.

> Ga-eun : I feel like I understood about 60% of the concepts explained by the math teacher. I wished that the teacher would have explained things to me at my level, but it seemed like they were assuming I was on the same page as them, the teachers. Plus, there were language barriers that made it even more challenging. There were many parts that were really hard to grasp.
> I : Nevertheless, why did you choose R-matte?

Ga-eun : Even though I struggled with math, I managed compared to other subjects. Plus, I heard that R-matte helps with physics subjects, so I decided to take it.

Ga-eun found mathematics manageable despite encountering some difficulties. She felt capable of handling 1T, the first-year high school mathematics course, although there were some gaps in her understanding. This self-assessment was influenced by her previous experience with mathematics in South Korea, where she had developed a strong foundational understanding. In Norway, she encountered new teaching methods and conceptual explanations that initially posed challenges. Despite her determination to overcome these obstacles, the assistance she received from her teacher often proved ineffective.

Ga-eun mentioned considering a path in realfag (a Norwegian term for natural sciences) and had heard advice that taking a physics course required completing R1, the second-year high school mathematics course. Understanding the importance of a solid mathematical background for her future studies in science, she decided to take on the challenge of enrolling in R1 while still in her first year. This decision was driven by her long-term academic and career goals, as she aspired to excel in subjects essential for a future in science.

However, the additional workload presented significant challenges. Ga-eun attempted to seek extra help from her teachers, but their explanations often assumed a level of prior knowledge she did not have, making it difficult for her to follow along. Language barriers further compounded this issue, as she struggled to understand the nuanced mathematical terminology in Norwegian. Her peers, while well-meaning, were also unable to provide the support she needed, as their approaches and methods did not align with her learning style developed in South Korea.

Despite the lack of effective support from her immediate educational environment, Ga-eun's determination was fueled by her understanding of the broader implications of her education. She knew that success in mathematics and sciences was crucial for accessing higher education and career opportunities in fields she was passionate about. Her strategic approach to course selection and her willingness to seek out resources and support underscored her resilience and dedication. Therefore, she opted to take R1 alongside her current mathematics course, thinking it would be sufficient for her goals. Ga-eun is determined to pursue a path in science and is making strategic decisions regarding her course selections to align with that goal.

I : How do you think the difficulties you've encountered while studying mathematics in Norway so far will influence your future mathematical development?
Ga-eun : What I felt while doing R1 is that it doesn't seem to require as much creativity as before. During 1T, there was a lot of brainstorming and creativity required, with various calculation methods needed. That was really challenging for

me. But now, there's a bit more emphasis on understanding predetermined formulas, applying them to solve problems, and the proportion of problems requiring creativity has decreased. So, it feels easier for me to solve problems when I can plug them into established formulas. Apart from the abundance of text-based questions, I find calculation problems more comfortable for me.

In Ga-eun's experience, the transition from 1T to R1 in mathematics education marked a notable shift in the nature of problem-solving approaches. In 1T, she encountered challenges where creativity played a pivotal role, necessitating brainstorming and the application of diverse calculation methods. However, with the progression to R1, Ga-eun observed a departure from this creative emphasis towards a more formula-centric methodology. The curriculum placed less emphasis on innovative problem-solving strategies, focusing instead on understanding and applying predetermined formulas to address mathematical challenges. Consequently, Ga-eun found it more manageable to tackle problems within the framework of established formulas. She noted a preference for calculation-based problems in R1, highlighting their comparative ease in contrast to the abundance of text-based questions. This suggests a perceptible difference in the cognitive demands between the two courses, with R1 leaning towards a more formula-focused approach and exhibiting reduced requirements for creative problem-solving.

I : Which math education style do you think is more suitable for you, Korean or Norwegian?
Ga-eun : I think the Korean math education system is more suitable for me. Even though I am Korean, I only studied up to elementary school in Korea. I feel like I am someone who is right sometimes and wrong sometimes. So when Norwegian teachers suddenly cut my score saying, "You did it this way, so your score is reduced," I did not understand a lot. I did everything correctly, and the solution process could be like this, so why arbitrarily reduce it? I have had experiences where I got angry about that. And they keep giving harsh evaluations to the students they like or are close to.
I : Do teachers give good scores to the students they like? Have you ever felt that you could not get something because you are an immigrant student or because you are a Korean student?
Ga-eun : I felt that more in other subjects, but I did not feel it much in math.

Ga-eun's preference for the Korean math education system over the Norwegian one is evident in her expressed frustration with the latter's practices. She articulates a sense of dissatisfaction with the Norwegian system's tendency to arbitrarily reduce scores, which she perceives as detracting from a fair assessment of her work. Her sentiment underscores a perceived lack of recognition for her understanding of solution processes, raising concerns about the efficacy of assessment methods within the Norwegian context. Moreover, Ga-eun's accounts suggest a broader issue of potential favoritism within the Norwegian educational environment. While she acknowledges experiencing unfair treatment in other subjects, she notes a relatively lesser extent of bias in math. This observation hints at the possibility of subject-specific variations in the prevalence of favoritism, with math appearing comparatively less affected. Nonetheless, the implication of favoritism poses a significant

concern for equitable educational practices. Ga-eun's perspective sheds light on challenges inherent in the Norwegian math education system, particularly regarding the fairness of assessment practices and the recognition of correct solutions. These insights prompt critical reflection on the alignment between educational methodologies and the principles of equity and objectivity within the Norwegian educational framework.

Ga-in's interview provides valuable insights into her perspective on mathematics and its significance in her academic and career pursuits.

> I : What was your favorite subject when you were in Korea?
> Ga-in : I think I liked social studies a little bit, and um... physical education.
> I: What about mathematics?
> Ga-in : Mathematics was occasionally interesting, but there was pressure because of the competition. It made me anxious. So, because of this feeling that I needed to do better than others, mathematics did not feel comfortable.
> I : In Korea, sometimes mathematics is a subject you feel proud of when you're better than others, but sometimes it feels burdensome because of the competition. So, is mathematics still a burdensome subject for you now?
> Ga-in : It is not burdensome, but I do have a desire to do better than others in mathematics. Especially, I want to do well in realfag subjects, like science and mathematics.

Her preferences for subjects like social studies and physical education suggest a predilection for disciplines perceived as less demanding or more enjoyable than mathematics. This preference underscores the subjective nature of academic interests and the varying levels of comfort students may have with different subjects. Despite occasionally finding mathematics interesting, Ga-in reveals the significant pressure she experienced due to the competitive environment in South Korea. The academic culture in South Korea is known for its high levels of competition, particularly in subjects like mathematics, which are critical for university entrance exams and future career opportunities. This competitive pressure can create a high-stress environment, leading to anxiety and discomfort, as Ga-in described. The need to excel compared to her peers made mathematics a source of stress rather than a purely academic challenge or interest. This highlights the dual-edged nature of competition in education—it can drive excellence but also create substantial psychological burdens.

Ga-in's anxiety about mathematics due to competitive pressures illustrates a common experience among students in rigorous educational systems. This pressure to outperform peers often leads to a feeling of constant comparison, where one's self-worth and academic success are closely tied to their ranking among classmates. For Ga-in, this environment made mathematics less enjoyable and more of a burdensome task, detracting from any potential interest she might have had in the subject.

However, Ga-in's perspective on mathematics shifted after moving to Norway. When asked if mathematics was still burdensome, she responded that it was not, although she retained a strong desire to perform well, particularly in realfag subjects, which include science and mathematics. This indicates a nuanced change in her relationship with the subject. In the Norwegian educational context, where competition is less intense and the focus is more on individual progress and understanding, Ga-in seems to feel less burdened by external pressures. Instead, her motivation is now more intrinsic, driven by a personal desire to excel in subjects that are crucial for her future aspirations in science.

Ga-in's continued desire to excel in mathematics, especially in realfag subjects, highlights her intrinsic motivation and long-term academic goals. Unlike the external pressure she felt in Korea, her current drive appears to stem from a genuine interest in the subject and a recognition of its importance for her future career plans. This shift suggests that the educational environment plays a significant role in shaping students' attitudes towards challenging subjects. In a less competitive and more supportive setting, students like Ga-in can transform their anxiety into motivation, focusing on personal growth and mastery rather than just outperforming peers.

> I : Why did you want to choose realfag?
> Ga-in: I want to become a doctor.
> I : If becoming a doctor doesn't require mathematics, if you don't need high math scores, do you still want to excel in mathematics?
> Ga-in : I guess I would do it less. Rather than focusing on mathematics, I would concentrate on the subjects that are more helpful for my future. But personally, I still think mathematics is an interesting subject.
> I : So, you think mathematics is one of the subjects that can help you achieve your dream?
> Ga-in : Yes, a bit more, definitely.
> I : If you're not good at mathematics, do you think it will hinder you from achieving your dream?
> Ga-in : There's that too, but also because even now, being good at mathematics shows how smart I am.

Ga-in's career aspirations, particularly in the field of medicine, highlight the crucial role mathematics plays in her professional ambitions. She recognizes mathematics as a foundational subject essential for success in her chosen career path. This acknowledgement underscores the practical relevance of mathematics beyond the classroom, emphasizing its instrumental value in achieving career goals. Ga-in's desire to become a doctor motivates her to excel in realfag subjects, which are integral to medical studies. Her decision to focus on these subjects reflects her understanding of the rigorous academic preparation required for a career in medicine. Ga-in's response to whether she would still pursue excellence in mathematics if it were not required for her career reveals a pragmatic approach to her studies. While she admits that she might focus less on mathematics if it were not necessary for her future goals, she also expresses a personal interest in the subject. This indicates that, despite the pressures and challenges, Ga-in finds intrinsic value in mathematics. Her

continued interest in mathematics, despite its difficulties, suggests a genuine curiosity and intellectual engagement with the subject. This intellectual curiosity is crucial for sustained academic motivation and success, particularly in challenging fields like medicine. Moreover, Ga-in's enduring interest in mathematics, despite its challenges, suggests a genuine curiosity and intellectual engagement with the subject. Her enjoyment of the intellectual challenges posed by mathematics demonstrates a deeper appreciation for the discipline beyond its practical aspects. Ga-in's association of proficiency in mathematics with intelligence reflects broader societal perceptions regarding academic achievement and intellectual capability. This perception reinforces her motivation to excel in mathematics, driven by the desire to demonstrate her intellectual capacity and competence in the subject. Ga-in's perspective on mathematics highlights the complex interaction between personal interests, academic pressures, and career aspirations. Ga-in's recognition of the importance of mathematics in achieving her dream of becoming a doctor also underscores the subject's role in building critical thinking and problem-solving skills. These skills are essential in the medical field, where professionals must analyze complex data, make informed decisions, and solve intricate problems. By excelling in mathematics, Ga-in is not only preparing herself for the academic demands of medical school but also developing the analytical skills necessary for her future profession.

4.4 Factors Contributing for a Successful Academic Transition

It is likely that immigrant students, whenever they encountered difficulties in mathematics, would have desperately needed help from someone. As previously mentioned, Ga-eun also sought assistance from her teacher when she encountered difficulties upon entering high school, but it did not prove to be of much help.

> I : Did you have any family members at home who could help you when you struggled with math?
> Ga-eun : I occasionally asked my mom. But only up to 1T level. Beyond that, even my mom is not very good at math, so there was a limit to asking her. So, I received private tutoring from a Norwegian person, but even that teacher found it a bit difficult. Their explanations were a bit lacking, and because of language barriers, I did not get much from it.
> I : How much do you think your math teacher at school helped develop your mathematical potential?
> Ga-eun : Um, 10%. 5%? It did not really work for me. The teacher's approach just did not click with me, and I am not someone who easily accepts nice words and such from people. I only stick close to people I like, and I am not the type to do that with just anyone. In Norway, it is important to get along well with others, so I am not as good at that as other friends. They might get better grades than me, like if I could get a 4, they'd get a 5, and there were some tasks that required creativity, which I

> am not good at, and they emphasized programming too much, like Python, which I am not good at either.

From this conversation, it seemed that Ga-eun faced challenges in mathematics both at home and at school. Despite occasionally seeking help from her mother, she found limitations in her mother's ability to assist beyond a certain level of mathematics. Private tutoring from a Norwegian teacher was also not entirely effective due to language barriers and perhaps a lack of clarity in explanations. Regarding the impact of her mathematics teacher at school, Ga-eun expresses dissatisfaction, attributing a very low percentage of her mathematical development to the teacher's help. She felt that the teacher's approach did not align with her learning style, and she struggled to connect with the teacher personally. Ga-eun also mentioned that she tends to gravitate towards people she likes, which might affect her relationship with her teacher and her overall social dynamics in the classroom. Additionally, Ga-eun emphasized the importance of social skills in Norwegian culture and how she felt less adept at it compared to her peers. She compares herself unfavorably to her friends who seem to excel both academically and socially, which may contribute to her feelings of inadequacy. Ga-eun's experience underscores the importance of personalized teaching approaches and supportive learning environments tailored to individual students' needs and preferences. It also highlights the intersection between academic performance, personal relationships, and cultural influences on education. Jung-hoon's response to the question of how much the school math teacher helped in developing students' mathematical potential was also noteworthy.

> Jeong-hoon : Well, not at all. I never received any helpful answers, not only for mathematical concepts but also for questions about the given assignments.

The dissatisfaction with the lack of clarity in the explanations of the Norwegian math teacher was also mentioned by Jeong-hoon in a similar manner. From the accounts of both Jeong-hoon and Ga-eun, it's evident that they experienced similar frustrations with their mathematics teachers. They both expressed dissatisfaction with the clarity and effectiveness of their teachers' explanations, feeling that the core concepts were not effectively communicated. This lack of clarity likely hindered their understanding and progress in mathematics. Furthermore, Jeong-hoon felt that their teachers' contributions to their mathematical development were minimal or even negligible. He perceived their teachers as merely assigning tasks without providing meaningful guidance or support for comprehension and improvement. This perception suggests a disconnect between the teaching methods employed by the teachers and the learning needs of Jeong-hoon. It's worth noting that their experiences highlight the importance of effective communication and pedagogical strategies in teaching mathematics. Teachers play a critical role not only in delivering content but also in facilitating understanding and fostering students' mathematical skills. When teachers fail to effectively convey concepts and engage students in the learning process, it can impede students' progress and contribute to their dissatisfaction with the subject. Jeong-hoon and Ga-eun underscored the need for teachers to employ clear, engaging, and student-centered teaching approaches that cater to the diverse learning styles and needs of their students. Effective teaching practices can significantly impact students' learning experiences and academic outcomes.

I : Have you received any help from school regarding math?
Ga-eun : We did it at school. We had this thing called "ekstra mattehjelp" (extra math help) for students who were doing "realfag" (natural sciences). But the teachers who came for "ekstra mattehjelp" were not R1 teachers; they were physics, chemistry, or 1P teachers, teachers from various subjects. So, we didn't get help from our math teacher; we got help from teachers of other subjects. I participated for a while, but then stopped because those teachers weren't explaining well. For example, the 1P teacher couldn't explain the content from R1 properly. Our own teacher didn't come much to "ekstra mattehjelp." And, um, how should I put it? The environment was poor, I guess? There weren't many students participating, and so the number of teachers coming also decreased gradually. So, with only one teacher rotating around, it took too much time.
Me: It's supposed to be "mattehjelp" (math help), but physics or chemistry teachers came, not math teachers for R-math?
Student: Yes, our R-math teacher came only once.
Me: Other than that, have you received any help from other schools?
Student: No.

Ga-eun's description of her experience with the extra math help program ("ekstra mattehjelp") highlights several significant issues that affected her ability to benefit from the support offered. Her frustration and dissatisfaction with the program are evident, reflecting broader challenges in providing effective supplementary mathematics support within the school system. Ga-eun noted that the teachers providing the extra help were not specialized in R1 mathematics but were instead teachers of other subjects like physics, chemistry, or 1P (a different level of mathematics). This mismatch in expertise meant that the support she received was not tailored to the specific content and challenges of the R1 course. For example, the 1P teacher struggled to explain R1 content effectively, leading to confusion and a lack of meaningful assistance for Ga-eun. The infrequent presence of her own R-math teacher further compounded this issue, as the teacher best equipped to help was rarely available. The quality of instruction during the extra help sessions was a significant concern for Ga-eun. The teachers who were present often could not provide the depth of explanation needed for R1 mathematics. This inadequate support left her feeling frustrated and hindered her ability to grasp complex mathematical concepts. Effective supplementary support requires teachers who are not only knowledgeable in the subject matter but also skilled in explaining it to students at varying levels of understanding. Ga-eun mentioned that the environment of the extra help sessions was poor, with few students participating. This low participation likely discouraged teachers from continuing to attend, leading to a gradual decrease in the number of available teachers. With only one teacher rotating among the remaining students, the sessions became inefficient and time-consuming, reducing their overall effectiveness. A sustainable program requires consistent teacher participation and a supportive environment that encourages more students to attend regularly. The lack of effective support from the extra help program had a detrimental impact on Ga-eun's confidence and performance in mathematics. Without adequate assistance, she struggled to keep up with the demands of the R1 course. This experience likely contributed to feelings of isolation and frustration, as she felt unsupported in her academic journey. Confidence in

mathematics is crucial for continued engagement and success, and the failure of the support program to meet her needs could undermine her long-term academic goals.

Ga-in transferred to a different school during her 10th grade due to issues of bullying from classmates in the same class.

> I : How was the atmosphere during math class at the school you transferred to in 10th grade?
> Ga-in : There were also two groups there, where one group didn't pay any attention to learning at all, and the other group consisted of students who did pay attention. I hung out with the ones who focused on studying and worked hard, so I was influenced more by them, and most of my friends were also in 1T, during 10th grade. So, I started working hard, wanting to do well in math too. I worked even harder, thinking about going to high school. But, math class was quite noisy.

Ga-in's account reveals the significant influence of peer dynamics on academic attitudes and behaviors. She indicates being positively influenced by peers who demonstrated dedication to studying and working hard. This underscores the pivotal role of peer influence in shaping students' academic trajectories. However, despite Ga-in's personal commitment to learning, her description of a noisy classroom environment raises pertinent questions regarding the efficacy of classroom management strategies and the overall learning environment in the new school. This observation prompts critical inquiry into the effectiveness of pedagogical practices and their impact on student engagement and academic performance. Furthermore, Ga-in's narrative offers valuable insights into the complexities of transitioning between educational settings. Her experiences illuminate both the challenges and opportunities inherent in adapting to a new academic and social milieu. By contextualizing Ga-in's transition within broader discussions of educational transitions, this analysis sheds light on the multifaceted nature of student experiences and the factors that shape their educational outcomes. By examining the interplay between social dynamics, peer influence, academic motivation, and classroom environment as elucidated through Ga-in's narrative, this analysis contributes to a deeper understanding of the complexities inherent in educational contexts. Such insights are invaluable for informing educational practices and policies aimed at enhancing student engagement, learning outcomes, and overall well-being within diverse educational settings.

Initially, Korean students studying in Trondheim did not encounter significant difficulties in adapting to the new educational environment. However, as they progressed to higher grades, some students exhibited challenges in adapting, albeit belatedly.

> Ga-eun : First of all, I hope people realize that support within the school isn't as abundant as they think. It's been really tough for me. It's important to help those who struggle to do better, but it's not enough to just leave those who excel to their own abilities. Even though they might be doing well for a year, if you leave them alone for three or four years, there's not much potential for growth. My friends used

> to say, "You are really good at math, so smart, you can get a 6 without studying." So even if something new came up suddenly, and I didn't study, my grades were still good. During math classes, the teacher would say, "You're doing well, so do what you want." But suddenly, if I didn't understand something in math class, I'd think, "What do I do about this?" When I hit this wall, it's really disheartening and difficult. I have lost the will to do what I want. I have lost confidence too. So, I thought it would be good to provide support not only for students who struggle, but also for those who are talented or get good grades in math, so they can continue to improve. I think it's important to support them so they can keep improving without giving up.

Ga-eun's statement reveals critical insights into the dynamics of educational support within the school environment. Their assertion regarding the perceived inadequacy of support underscores a systemic issue that may impede student success. Ga-eun's experience highlights the importance of equitable support systems that cater to both struggling students and high achievers. Failure to address the needs of high-performing students poses the possibilities of hindering their academic development, as highlighted by Ga-eun's assessment that sustained success without adequate support can inhibit growth over time. In addition, Ga-eun's account about her own academic journey exposes the psychological toll of encountering challenges in the mathematics field where she was previously successful. The experience of hitting a wall in understanding, despite prior proficiency, illuminates the vulnerability of student confidence and motivation in the face of unexpected difficulties. This underscores the need for proactive intervention and tailored support mechanisms to address the multifaceted needs of students at all levels of proficiency.

In shedding light on the multifaceted challenges encountered by immigrant students navigating the Norwegian education system, particularly in the realm of mathematics, the narratives of Ga-eun, Jeong-hoon, and Ga-in underscore the paramount importance of tailored instruction, nurturing learning environments, and fair support structures in nurturing academic achievement and social integration. These accounts also demonstrate the imperative of clear communication, effective teaching methods, and proactive measures to cater to the varied needs of students and uphold their confidence and motivation amid cultural, linguistic, and pedagogical disparities. By acknowledging and tackling these hurdles, educators and policymakers can strive to cultivate more inclusive and empowering educational settings where every student can flourish and unlock their full potential.

5. Discussion

This study aimed to explore the experiences of immigrant Korean students in Trondheim as they participated in mathematics education. Specifically, it examined the challenges they encountered during the transition process, how they overcame these difficulties, and what kind of support they received to achieve academic success. This section discusses the meaning and relevance of the findings from this study, which explored the experiences of immigrant Korean students in Trondheim's mathematics education system. It also examines how these findings relate to my literature review.

5.1 Cultural Conflicts in Educational Practices

The experiences of Ga-eun and other immigrant Korean students in Trondheim provide a vivid illustration of the cultural transition and acculturation process described by Guida de Abreu & Presmeg (2002). Ga-eun's struggle with the extra mathematics help program, where the support she received was inadequate due to teachers' lack of specialization in R1 mathematics, highlights a significant cultural conflict. This conflict is rooted in the differing educational practices and expectations between South Korea and Norway. In South Korea, Ga-eun was accustomed to highly specialized and focused instruction, whereas in Norway, the generalized support structure did not meet her specific needs. Her frustration with the lack of specialized support aligns with Bishop's (1994; 2002b) argument that mono-cultural teaching methods can fail to accommodate the diverse cultural experiences of students. Ga-eun's cultural conflict was significantly exacerbated by the incorrect assumption that teachers from various subjects would be capable of adequately supporting her advanced mathematical needs. Unfortunately, these teachers lacked the specialized expertise required, leading to inadequate support and increased frustration for Ga-eun. This situation highlights the need for educational systems to recognize and address the specific cultural and academic backgrounds of immigrant students to provide effective support.

The values and beliefs of South Korean and Norwegian educational systems are markedly different, and these differences have a profound impact on the experiences of immigrant Korean students. In South Korea, education is highly valued, with a strong emphasis on academic excellence and competitive success. This cultural belief is deeply rooted in Confucian ideals, which prioritize hard work, discipline, and respect for authority. Consequently, students like Ga-eun and Ga-in were accustomed to a rigorous academic environment where high performance in subjects like mathematics was both expected and celebrated. Upon transitioning to the Norwegian educational system, the sisters encountered a different set of values. Norway emphasizes a more balanced approach to education, prioritizing student well-being, inclusivity, and holistic development over intense competition. This shift in values impacted Ga-eun and Ga-in significantly. While they

appreciated the less stressful and more enjoyable learning environment in Norway, they also faced challenges adapting to a system that was less focused on the high-stakes academic achievement they were used to in South Korea.
Communication styles and norms in the classroom also differed significantly between South Korea and Norway, influencing how students interacted with teachers and peers (Bishop, 2002a; Guida de Abreu et al., 2002). In South Korea, communication in the classroom is often formal, with clear hierarchical relationships between teachers and students. Students are expected to show deference to their teachers and are less likely to question or engage in open dialogue with them. This communication style fosters a structured and disciplined learning environment but can also inhibit free expression and critical thinking. In contrast, Norwegian classrooms encourage open communication and equitable relationships. Students address teachers by their first names and are encouraged to participate in discussions, ask questions, and express their opinions freely. This informal and interactive communication style aims to create a more inclusive and engaging learning environment but can be initially disorienting for students like Jeong-min, who were used to the formality and hierarchy of South Korean classrooms. Jeong-min's discomfort with calling teachers by their first names highlights the initial cultural conflict he experienced, reflecting the broader challenge of adjusting to different classroom communication norms.

The process of adapting to new educational norms in Norway posed both challenges and opportunities for immigrant Korean students (Gorgorió et al., 2002; Hjörne et al., 2012). Ga-eun and Ga-in had to navigate a new set of educational norms that emphasized student-centered learning and self-directed study. In South Korea, their education was characterized by teacher-led instruction and a focus on rote memorization and standardized testing. The Norwegian system's emphasis on independent learning and critical thinking required them to adjust their study habits and learning strategies. For Ga-eun, the transition was particularly challenging when she encountered advanced mathematical concepts in high school. The expectation to understand and apply predetermined formulas without the structured guidance she was accustomed to in South Korea led to difficulties in grasping new material. Her struggles with the R1 mathematics course, the second-year high school mathematics course, underscore the need for tailored support that considers the prior educational experiences and learning styles of immigrant students.

Both Ga-eun and Jeong-hoon highlighted the need for continuous support for high-achieving students to prevent stagnation and ensure continued academic growth. Ga-eun's reflection on the lack of support for students who excel in mathematics points to a critical gap in the Norwegian education system. While the system effectively supports students who struggle, it often assumes that high achievers can continue to succeed independently, neglecting the principles of the Zone of Proximal Development (ZPD) which suggest that all students, regardless of their current performance level, benefit from targeted guidance to reach their full potential. Ga-eun's experience reveals that even top-performing students need encouragement, guidance, and opportunities to further develop their skills. Without such support, they risk losing motivation and confidence, as Ga-eun did when she encountered unexpected challenges. Jeong-hoon's dissatisfaction with the lack of helpful responses from

his mathematics teacher highlights a similar issue. Effective teaching practices should not only address the needs of struggling students but also challenge and engage high achievers, ensuring that all students receive the support necessary to reach their full potential.
By integrating the values, beliefs, communication styles, and norms of both South Korean and Norwegian educational systems, this discussion highlights the cultural conflicts and adaptation challenges faced by immigrant Korean students. Addressing these conflicts through tailored teacher training, specialized academic support, inclusive classroom practices, and comprehensive language programs can enhance the educational experiences of immigrant students and promote equity in mathematics education. These insights provide valuable guidance for educators and policymakers striving to create more inclusive and effective learning environments for all students.

5.2 Sociomathematical Norms in South Korean and Norwegian Classrooms

Sociomathematical norms, as defined by Yackel & Cobb (1996), are the norms that regulate the mathematical behavior of both teachers and students in the classroom. These norms determine what is considered mathematically valid and acceptable in terms of explanations, solutions, and reasoning processes. Understanding these norms is crucial for analyzing the cultural conflicts and adaptation challenges faced by immigrant Korean students in Norwegian mathematics classrooms. Sociomathematical norms in the mathematics classroom refer to the set of rules that arise from a combination of social norms, norms related to mathematical practices, and individuals' values, expectations, emotions, attitudes, and beliefs, including those governing knowledge ownership and the valuation of alternative mathematical approaches (Gorgorió et al., 2002). This comprehensive view highlights the multifaceted nature of these norms and their impact on classroom dynamics.

In South Korea, the sociomathematical norms are characterized by a strong emphasis on procedural fluency, accuracy, and the ability to solve standardized test problems quickly and correctly. The educational system values precise calculations and memorization of formulas, and teachers often guide students through well-defined solution methods. This approach fosters a rigorous and disciplined mathematical environment but may limit opportunities for creative problem-solving and exploratory learning. In contrast, Norwegian classrooms emphasize a more conceptual understanding of mathematics, encouraging students to explore multiple solution methods, engage in mathematical discussions, and justify their reasoning. Sociomathematical norms in Norway prioritize critical thinking, creativity, and the ability to connect mathematical concepts to real-world applications. This approach aims to develop a deeper understanding of mathematics but may pose challenges for students who are accustomed to more structured and procedural learning methods.

The transition from South Korean to Norwegian sociomathematical norms can create significant challenges for immigrant Korean students. These students must adapt not only to new mathematical content but also to different expectations regarding how they engage with and demonstrate their understanding of mathematics. Ga-eun's experience highlights the difficulty of adapting to Norwegian sociomathematical norms. In South Korea, she excelled in a system that valued procedural accuracy and speed. However, upon entering the Norwegian education system, she encountered a learning environment that required her to justify her solutions and engage in mathematical discussions. This shift in norms was challenging for Ga-eun, who struggled with the more open-ended and exploratory nature of Norwegian mathematics education. Her difficulty in adapting to these new norms was compounded by language barriers and a lack of effective support from teachers. Jeong-hoon also faced challenges with Norwegian sociomathematical norms. Despite his strong mathematical background, he found it difficult to receive meaningful feedback from his teachers. The emphasis on student-centered learning and peer discussions in Norway contrasted with the more teacher-directed instruction he was used to in South Korea. This discrepancy in teaching methods and sociomathematical norms hindered his ability to fully engage with the material and benefit from the classroom environment.

To support the successful adaptation of immigrant Korean students to Norwegian sociomathematical norms, several strategies can be implemented. Teachers should receive training on the cultural and educational backgrounds of immigrant students. This training should include an understanding of different sociomathematical norms and strategies to bridge the gap between these norms and the expectations in Norwegian classrooms. Provide scaffolded support that gradually introduces students to the sociomathematical norms of the Norwegian education system. This can include explicit instruction on the expectations for mathematical explanations, reasoning, and discussions, as well as opportunities for students to practice and receive feedback in a supportive environment. Encourage collaborative learning experiences that allow immigrant students to engage with their peers and learn from different perspectives. Group work and peer discussions can help students become more comfortable with the sociomathematical norms of their new educational context. Ga-eun's struggle with the shift from procedural to conceptual mathematics highlights the importance of scaffolded support. Teachers can help students like Ga-eun by explicitly teaching the norms of mathematical reasoning and justification expected in Norwegian classrooms. Providing clear examples and opportunities for practice can help students build confidence and competence in these new norms. Integrating the concept of sociomathematical norms into the analysis of immigrant Korean students' experiences provides a nuanced understanding of the cultural conflicts and adaptation challenges they face. By addressing these challenges through professional development, culturally responsive teaching, scaffolded support, and collaborative learning, educators can create more inclusive and effective learning environments. This approach not only supports the academic success of immigrant students but also enriches the educational experience for all students by fostering a diverse and dynamic mathematical community.

5.3 Linguistic Transition and Challenges

The process of linguistic transition involves significant shifts in language structure, vocabulary, and practices. For immigrant Korean students, adapting to a new language environment in Norwegian schools presents numerous challenges that can impact their academic performance and social integration. These challenges are particularly evident in the context of learning mathematics, where precise language and terminology are crucial for understanding complex concepts. Language barriers are a major challenge for immigrant students, affecting their ability to comprehend and engage with mathematical content. In mathematics, understanding specific terminology, instructions, and word problems is essential for success. Korean students transitioning to Norwegian schools must navigate not only the general language barrier but also the specialized language of mathematics. Ga-eun's experience highlights the impact of language barriers on her understanding of mathematical concepts. Despite her proficiency in conversational Norwegian, she struggled with the academic language required in her R1 mathematics course. The nuanced terminology and complex explanations in Norwegian posed significant challenges, making it difficult for her to grasp new concepts. This struggle was further compounded by the inadequacy of the explanations provided by her teachers and tutors, who were not specialized in R1 mathematics.

Cummins' (2021) distinction between Basic Interpersonal Communicative Skills (BICS) and Cognitive Academic Language Proficiency (CALP) is particularly relevant in this context. While immigrant Korean students like Ga-eun and Jeong-hoon may quickly acquire conversational fluency (BICS), achieving proficiency in the academic language of mathematics (CALP) is a more complex and prolonged process. This gap can hinder their ability to fully participate in and benefit from mathematics instruction. Jeong-min and Jeong-hoon's initial difficulties in engaging with the Norwegian education system can be partly attributed to this gap. Although they became conversationally fluent in Norwegian, their academic language skills lagged behind, affecting their performance in subjects like mathematics. This distinction underscores the importance of providing targeted language support that goes beyond basic conversational skills to include academic language proficiency.

The inability to fully understand classroom instruction can lead to significant emotional distress for immigrant students. Feelings of frustration, isolation, and anxiety are common as students struggle to keep up with their peers and meet academic expectations. Ga-eun's account of feeling lost when she encountered difficult mathematical concepts illustrates the emotional toll of linguistic challenges. Despite her previous success in mathematics, the language barrier in Norway led to a decline in her confidence and motivation. This experience highlights the need for emotional support and effective communication strategies to help students navigate these challenges.

Language barriers also affect social interactions and the ability to form meaningful relationships with peers. In a classroom setting, effective communication is essential for collaborative learning and social integration. Immigrant students who struggle with the language may feel excluded or marginalized, impacting their overall school experience. Ga-eun's difficulty in forming close relationships with her teachers and peers due to language barriers and cultural differences further exacerbated her feelings of isolation. The informal and interactive communication style in Norwegian classrooms contrasted sharply with the more formal and hierarchical communication norms she was used to in South Korea. This cultural and linguistic disconnect made it challenging for her to fully integrate into the new educational environment. The linguistic transition and challenges faced by immigrant Korean students in Norwegian schools highlight the need for targeted support and effective teaching strategies. By providing comprehensive language support programs, professional development for teachers, and opportunities for peer collaboration, schools can help immigrant students overcome language barriers and succeed academically. These measures not only enhance students' mathematical proficiency but also support their overall well-being and social integration, fostering a more inclusive and equitable educational environment.

The linguistic transition and challenges faced by immigrant Korean students in Norwegian schools highlight the need for targeted support and effective teaching strategies. Teachers may enhance their learning by including visual aids, manipulatives, and real-world contexts (Durmus & Karakirik, 2006). By providing comprehensive language support programs, professional development for teachers, and opportunities for peer collaboration, schools can help immigrant students overcome language barriers and succeed academically. These measures not only enhance students' mathematical proficiency but also support their overall well-being and social integration, fostering a more inclusive and equitable educational environment.

By addressing these linguistic challenges with targeted support, educators can create a more supportive and effective learning environment for immigrant students. This includes training teachers to be aware of the specific needs of immigrant students, incorporating visual aids and manipulatives to help bridge language gaps, and fostering a classroom environment that encourages collaborative learning and peer support. Such approaches can help mitigate the negative impacts of language barriers, ensuring that all students have the opportunity to succeed in mathematics and feel integrated into their school community.

5.4 Cultural and Educational Contexts: A Comparative Analysis through Social Representation Theory

5.4.1 Social Context of Education in South Korea and Norway

The educational experiences of immigrant Korean students in this study reflect the profound influence of the social contexts of South Korea and Norway on their academic trajectories, particularly in mathematics education. Social Representation Theory provides a useful framework for understanding how these different cultural environments shape students' perceptions, attitudes, and performances (Moscovici, 1988). South Korea's educational system is deeply rooted in Confucian ideals, which emphasize education as a means of self-cultivation, moral development, and social harmony (Yao, 2000). This cultural background fosters a highly competitive academic environment where mathematics is regarded as a key indicator of intellectual ability and social status. The intense focus on academic performance is reinforced by societal expectations and the high stakes associated with standardized testing and university entrance exams. For immigrant Korean students in Trondheim, their social perceptions of mathematics are profoundly influenced by cultural factors such as the emphasis on high academic achievement, intense competition, and the challenges of adapting to a new educational system and cultural setting (Kim, 2022). Consequently, students often experience significant pressure to excel in mathematics, as illustrated by Ga-eun’s and Ga-in’s initial perceptions of the subject. In South Korea, the social representation of mathematics is shaped by a collective belief in the importance of academic excellence and the pursuit of high educational standards. This results in a rigorous curriculum that emphasizes memorization, intensive practice, and mastery of complex concepts from an early age. The participants' prior education in South Korea equipped them with a strong foundation in mathematics, but also instilled a sense of anxiety and competition, as noted by Ga-in’s reflections on the pressure to outperform peers.

In contrast, the Norwegian education system is characterized by its commitment to equity, inclusivity, and student-centered learning. The cultural context in Norway prioritizes holistic development and the well-being of students over competitive academic achievement (Stedøy, 2004). This approach is reflected in the less hierarchical and more egalitarian classroom environments, where teachers are addressed by their first names and students are encouraged to participate actively in their learning. Norwegian society’s emphasis on equality and support for all students is evident in the educational practices that prioritize continuous assessment, formative feedback, and the application of mathematical concepts to real-world contexts. This is designed to minimize achievement gaps and foster a sense of belonging and confidence among students. However, as the participants’ experiences reveal, the transition to this educational context can be challenging for immigrant students accustomed to the South Korean system.

A prominent distinction between the mathematics education systems in Korea and Norway is evident in the nature of classroom activities. In Norwegian mathematics lessons, students are encouraged to engage in collaborative problem-solving and group discussions, fostering a dynamic learning environment. This was exemplified in the 10th-grade mathematics lesson focused on personal finances, where students collaborated in pairs to develop budgets and make financial decisions. Such activities promote critical thinking, communication skills, and a deeper understanding of mathematical concepts. In contrast, South Korean mathematics classrooms typically follow a more traditional approach, characterized by instructor-led instruction and minimal student interaction. The focus is primarily on solving problems assigned by the teacher, with limited opportunities for student debates or group work. While instances of student-led discussions or collaborative activities may occur, they are less common compared to the Norwegian system. The perspectives of Korean students participating in mathematics activities within the Norwegian educational framework varied significantly. Ga-in and Min-seo, two participants in the study, provided contrasting viewpoints on the same activity. Ga-in's response exemplified the positive impact of collaborative learning, as she expressed heightened curiosity in personal finance topics such as house loans and interest rates. Additionally, Ga-in found the opportunity to learn Excel skills during the activity to be intriguing, highlighting the multifaceted benefits of collaborative math tasks. In contrast, Min-seo's experience revealed challenges associated with disinterest in the topic and passive partner involvement. Despite the praiseworthy goal of the activity, Min-seo struggled due to a lack of engagement with personal economics and her partner's passive behavior. The teacher's neglect to examine the outcomes of the task further compounded the difficulties encountered by Min-seo, highlighting the importance of teacher guidance and feedback in facilitating effective collaborative learning experiences.

5.4.2 Impact on Students' Academic and Social Experiences

The transition from the South Korean to the Norwegian education system brought about significant changes in the participants' academic and social experiences. The differences in social representations of mathematics and educational practices between the two countries created both opportunities and obstacles.

Initially, the participants found Norwegian mathematics education less challenging compared to their prior experiences in South Korea. Jeong-min and Jeong-hoon's accounts of boredom in 5th-grade mathematics classes highlight the disparity in curricular demands. This perceived ease can be linked to the social representation theory, which posits that common beliefs, attitudes, and perceptions regarding mathematics significantly influence learning processes (Boaler, 2002; Guida De Abreu et al., 2002). In South Korea, a rigorous and competitive academic culture often promotes high achievement in mathematics, shaping students' expectations and attitudes towards the subject. Conversely, the Norwegian system's more relaxed approach initially led to disengagement among the participants. Despite the easier content, the unfamiliar teaching methods and the language barrier posed significant challenges, particularly in higher grades where advanced concepts

required deeper understanding and effective communication. Ga-eun and Min-seo's struggles with receiving adequate support in mathematics courses of high school underscore the need for differentiated instruction that recognizes the prior knowledge and learning styles of immigrant students. The lack of effective supplementary support, as described in Ga-eun's experience with "ekstra mattehjelp," points to systemic gaps in addressing the diverse needs of students in the Norwegian educational context.

Social integration was another critical aspect influenced by the contrasting educational contexts. The informal and equitable nature of Norwegian classrooms, which initially caused discomfort for students like Jeong-min, eventually facilitated the development of a supportive peer network. The positive influence of diligent peers, as seen in Ga-in's case, underscores the importance of a conducive social environment in fostering academic motivation and success. The social representation theory, which highlights the influence of common beliefs and perceptions on learning, can further explain these experiences. According to Moscovici (1988), students' attitudes, motivation, and self-efficacy in approaching mathematical problems are shaped by the social representations within their learning environment. In Norway, the more relaxed and equitable approach to education might initially conflict with the students' previous experiences in South Korea, where high achievement and competitiveness are emphasized. However, the initial experiences of bullying and social isolation highlight the challenges immigrant students face in navigating new social dynamics. The participants' gradual adaptation and the formation of diverse friendships illustrate the potential for successful social integration when schools provide a welcoming and inclusive environment. This aligns with the findings of Ruttenberg-Rozen and Jacobs (2022), who emphasized that positive perceptions of mathematics profoundly impact students' engagement, motivation, and ultimately, their proficiency in the subject. The transition from the South Korean to the Norwegian education system had profound impacts on the participants' academic and social experiences. The differences in social representations of mathematics and educational practices played a significant role in shaping these experiences, creating both challenges and opportunities. The participants' stories illustrate the importance of recognizing and addressing the diverse needs of immigrant students to foster their academic success and social integration.

5.5 Equity in Mathematics Education

The discussion on equity in mathematics education requires an understanding of the diverse challenges and opportunities faced by students in different educational systems. South Korea's educational system is characterized by a high level of competition and a strong emphasis on academic excellence. While this environment can drive high achievement, it also tends to exacerbate inequities. Students from well-resourced backgrounds often have access to additional support, such as private tutoring, which can enhance their performance and widen the achievement gap. The participants' prior experiences in South Korea reflect this competitive culture, where academic success in mathematics is closely tied to social

status and future opportunities. For instance, Jeong-min and Jeong-hoon’s participation in mathematics competitions in South Korea highlights their advanced skills but also points to the pressures and resources required to excel in such an environment. This competitive context can marginalize students who do not have access to similar resources, thereby perpetuating educational inequities.

In contrast, the Norwegian education system places a strong emphasis on equity, aiming to provide all students with equal opportunities to succeed. This is achieved through inclusive practices, continuous assessment, and a focus on student-centered learning. The Norwegian approach to equity is evident in the policies designed to minimize achievement gaps and support diverse learners. However, the participants' experiences reveal that, despite these equitable intentions, there are still challenges in implementation. For example, Min-seo’s struggle to receive adequate support in higher-level mathematics classes suggests that the one-size-fits-all approach may not sufficiently address the needs of all students, particularly those who are high achievers or come from different educational backgrounds.

Ga-eun and Jeong-hoon's dissatisfaction with their mathematics teachers underscores the need for personalized teaching approaches that cater to the diverse learning styles of students. Munter (2014) emphasizes the importance of engaging students in mathematical arguments, supporting discussions, and utilizing student-generated content in teaching. However, the experiences of these students reveal a gap between these ideal practices and their actual classroom experiences. Their teachers' failure to effectively communicate and engage students in meaningful mathematical discourse suggests a disconnect that can hinder academic progress. Effective teaching in mathematics involves more than just delivering content; it requires creating an environment where students feel supported and understood. Engle and Conant (2012) advocate for classroom discourse communities that focus on deep mathematical understanding through student interactions and teacher facilitation. Ga-eun's and Jeong-hoon's experiences reflect a lack of such supportive environments, highlighting the need for professional development for teachers to adopt more effective and inclusive pedagogical strategies.

Ga-in's narrative about her transition to a new school and the influence of peer groups illustrates the significant impact of social dynamics on academic motivation and performance. Her positive shift in attitude towards mathematics upon associating with dedicated peers highlights the importance of a supportive peer environment. This aligns with the sociocultural perspective on equity in mathematics education, which emphasizes the influence of cultural and social contexts on learning (Ruttenberg-Rozen & Jacobs, 2022). However, Ga-in's description of a noisy classroom environment also raises concerns about the effectiveness of classroom management and its impact on learning. A conducive learning environment is essential for student engagement and academic success, and Ga-in's experience suggests that schools need to implement better strategies to maintain an optimal learning atmosphere.

The challenges faced by immigrant students, as highlighted in this study, reflect broader issues of equity in mathematics education. Ga-eun's remarks about the inadequacy of school support, even for high-achieving students, point to systemic inequities that need to be addressed. Equity in education involves recognizing and addressing these disparities to provide all students with the resources and opportunities they need to succeed (Frønes et al., 2020). Gutiérrez (2011) focuses on the definition of equity in four dimensions: access, achievement, identity, and power. This lens provides a comprehensive understanding of the multifaceted challenges and support mechanisms experienced by immigrant Korean students in Trondheim.

- ***Access***: The transition to a new language environment posed significant challenges for immigrant Korean students. Ga-eun's difficulty in understanding advanced mathematical concepts due to the nuanced terminology and complex explanations in Norwegian highlights the access issues related to language. The generalized support structures in Norwegian schools, such as the "ekstra mattehjelp" program, often lacked the specialized assistance required by high-achieving students like Ga-eun.

- ***Achievement***: The transition from a highly competitive South Korean education system to a more balanced Norwegian system impacted students' perceptions of achievement. The emphasis on high academic performance in South Korea created significant pressure for students like Ga-in to excel. Min-seo, Jeong-min, and Jeong-hoon showed high mathematical achievement in South Korea, reflecting their skills but also the competitive pressures and resources available to them. However, the more relaxed and inclusive Norwegian approach allowed them to explore their interests and strengths in mathematics without the intense pressure to constantly outperform their peers.

- ***Identity***: The shift in educational values and norms between South Korea and Norway impacted students' identities as learners. Ga-eun's experience of being encouraged to take on leadership roles in group projects in an overnight trip helped him build confidence and a sense of belonging, balancing his attention to self and others. In South Korea, the formal and hierarchical classroom structure made Ga-in feel pressured to conform and excel, impacting his self-identity as a serious and competitive student. Upon moving to Norway, she initially struggled with the informal and collaborative classroom environment, feeling uncertain about his place and role in this new setting. However, as Ga-in adjusted, she began to appreciate the emphasis on student voice and participation, which helped him develop a more confident and engaged learner identity. This transformation illustrates how educational environments and cultural norms can shape students' academic identities, either reinforcing or challenging their self-concepts.

- ***Power***: The power dimension in equity addresses social transformation at multiple levels. For instance, in the context of classroom voice, students in Norway were encouraged to participate actively in discussions, allowing them to influence the curriculum and classroom decisions, which contrasts with the top-down approach in South Korea. This shift empowered Korean students in this study to feel more valued

and engaged in their learning process. Additionally, Norwegian classrooms provided opportunities for students to use mathematics to critique societal issues, such as analyzing risks in environmental studies, fostering critical thinking and social awareness. Teachers in Norway also embraced alternative notions of knowledge by incorporating diverse cultural perspectives into mathematics lessons, making the subject more relevant and inclusive. By creating an environment where students have a voice, can use math to analyze societal issues, and see their cultural knowledge reflected in the curriculum, the power dynamics shift to support a more equitable and transformative educational experience.

The cultural and linguistic challenges encountered by immigrant Korean students in adapting to the Norwegian educational system further complicate their academic journey. Ga-eun's and Jeong-hoon's struggles with language barriers and different educational practices highlight the need for culturally responsive teaching methods. Jorgensen (2011) emphasizes that linguistic, social, and cultural routines can constrain the acquisition of school mathematics, and students from diverse backgrounds may require additional support to bridge these gaps.

Equity in mathematics education also involves the role of teachers and their pedagogical practices. Teachers are crucial in creating an inclusive classroom environment that supports all students. The participants' experiences highlight the variability in teacher effectiveness and the impact on their learning. For example, Ga-eun's dissatisfaction with the supplementary mathematics help she received points to a gap in the provision of equitable support. Effective teacher support requires not only subject knowledge but also the ability to address diverse learning needs. This includes understanding the cultural and educational backgrounds of immigrant students and adapting teaching methods accordingly.

Peer dynamics significantly influence the promotion or hindrance of equity in the classroom. Positive peer interactions can facilitate both academic and social integration, while negative dynamics, such as bullying, can exacerbate feelings of isolation and inequity. The experiences of Jeong-min, Jeong-hoon, and Ga-in illustrate the profound impact of peer relationships on their educational journeys. Jeong-min and Jeong-hoon initially faced bullying from another immigrant student, which hindered their academic and social integration. Similarly, Ga-in experienced bullying in middle school, which ultimately led her to transfer to a different school. These negative experiences highlight the critical need for schools to proactively address bullying and create a safe, inclusive environment for all students. To promote social equity, schools must implement strategies that encourage inclusive peer interactions and support students facing social challenges. This can include anti-bullying programs, peer mentoring, and opportunities for collaborative learning that value diverse perspectives. Such initiatives can help foster a positive school culture where all students feel respected and supported. By addressing bullying and promoting inclusivity, schools can create environments that enhance both academic achievement and social well-being for all students.

5.6 The Role of Habitus in Mathematics Education: A Comparative Analysis

In addition to social representation theory, the concept of habitus, introduced by Pierre Bourdieu, provides valuable insights into understanding the educational experiences of immigrant students in mathematics. Habitus refers to the deeply ingrained habits, skills, and dispositions that individuals acquire through their life experiences, particularly within their cultural and social environments. This section explores how habitus influences the learning and teaching of mathematics for the participants, particularly in the contrasting educational contexts of South Korea and Norway.

The South Korean education system instills a specific habitus characterized by rigorous academic discipline, a competitive spirit, and a strong emphasis on rote memorization and high performance in standardized tests. This habitus is shaped by the cultural and social values that prioritize educational success as a pathway to social mobility and prestige. For instance, Ga-eun and Ga-in's early educational experiences in South Korea embedded a habitus that valued diligence, perseverance, and excellence in mathematics. These dispositions were evident in their initial confidence and advanced mathematical skills when they transitioned to the Norwegian education system. However, the competitive and high-pressure environment also contributed to a sense of anxiety and stress, as seen in Ga-in's reflections on the pressure to outperform her peers in South Korea. In contrast, the Norwegian educational system fosters a habitus that emphasizes equity, student well-being, and holistic development. The educational practices encourage collaborative learning, critical thinking, and the practical application of knowledge, which align with the broader cultural values of equity and social support. The transition to this new habitus posed challenges for the participants. For example, Ga-eun’s initial passivity and reluctance to seek help from teachers in Norway reflect the deeply ingrained habits from her South Korean education, where students typically adopt a more passive role and rarely question authority. Over time, however, the participants began to adapt to the Norwegian habitus, developing new dispositions that valued collaborative learning and active participation.

The concept of habitus provides a framework for understanding the complex dynamics of how students adapt to new educational environments. The deeply ingrained dispositions from their previous educational experiences in South Korea initially influenced how the participants approached learning in Norway. For example, Jeong-min and Jeong-hoon's initial boredom and frustration with the less challenging Norwegian curriculum can be seen as a clash between their South Korean habitus of high academic rigor and the Norwegian emphasis on inclusivity and gradual learning progress. However, as the participants adjusted to the new educational context, their habitus began to evolve. Ga-eun and Ga-in’s gradual adaptation to the Norwegian classroom environment, including their growing confidence in seeking help and participating in class, demonstrates the dynamic nature of

habitus. This evolution was facilitated by supportive peer relationships and the inclusive pedagogical practices of the Norwegian education system.

Teachers play a crucial role in mediating the transition of habitus for immigrant students. Effective teaching practices that acknowledge and bridge the gap between different educational dispositions are essential for facilitating a smoother adaptation process. For instance, Min-seo's proactive approach to her education, including seeking advanced coursework and taking the privatisteksamen, highlights the importance of teacher support and recognition of students' prior knowledge and skills. However, the participants' experiences also reveal gaps in teacher support. Ga-eun's dissatisfaction with the supplementary mathematics help and the lack of effective explanations from her teachers suggest a need for professional development in adaptive teaching strategies that can address the diverse learning needs of students. Teachers need to be equipped with the skills to recognize and address the diverse habitus that immigrant students bring to the classroom, ensuring that their teaching methods are inclusive and supportive.

5.7 Implications for Further Research

The experiences of Ga-eun, Jeong-hoon, and Ga-in highlight the critical need for further research to deepen our understanding of immigrant students' challenges in mathematics education and to develop more effective strategies for promoting equity. Their narratives reveal significant gaps in current educational practices, particularly in addressing the cultural and linguistic diversity these students bring to the classroom. Understanding the specific cultural and linguistic barriers these students face is crucial for developing targeted interventions. By examining these barriers, researchers can identify the unique needs of immigrant students and create strategies to address language proficiency issues and cultural differences in learning styles and expectations. Additionally, research should investigate the psychological and emotional factors that influence immigrant students' engagement and performance in mathematics, such as self-efficacy, motivation, and the effects of stress and anxiety related to cultural adaptation and academic pressure.

Furthermore, the role of peer dynamics and social interactions in shaping the academic experiences of immigrant students warrants significant attention. Positive peer relationships can greatly support academic and social integration, while negative dynamics, such as bullying, can exacerbate feelings of isolation and hinder academic success. Research should focus on developing and validating effective pedagogical strategies such as differentiated instruction and the integration of educational technology. Differentiated instruction tailored to meet diverse learning needs can help immigrant students overcome language barriers and grasp complex mathematical concepts. Additionally, the integration of educational technology can provide personalized learning experiences that cater to individual needs, enhancing students' skills and confidence. Finally, identifying effective professional development programs for teachers is crucial for preparing them to meet the needs of

immigrant students. Training programs focused on cultural competency, language support strategies, and the use of technology in education can empower teachers to create more inclusive and effective learning environments. By focusing on these areas, further research can provide valuable insights and inform the development of inclusive and supportive educational practices that enable all students to achieve their full potential.

6. Conclusion

This study highlights the multifaceted challenges and opportunities faced by immigrant students in mathematics education, emphasizing the need for more tailored and effective pedagogical strategies to promote equity. The experiences of Ga-eun, Jeong-hoon, and Ga-in illustrate significant gaps in the current educational system, particularly in addressing the cultural and linguistic diversity that these students bring to the classroom. These gaps are evident in the limited support provided for language barriers, inadequate teaching methods that fail to engage diverse learners, and the lack of a nurturing environment that considers the psychological and emotional well-being of immigrant students. The narratives of these students underscore the critical role of understanding and addressing the unique challenges they face to foster a more inclusive and supportive educational environment.

Several key factors have been identified as crucial for the successful academic transition of immigrant Korean students. First, differentiated instruction is essential to meet the diverse learning needs of these students. This approach can help them overcome language barriers and understand complex mathematical concepts through various instructional strategies such as visual aids, hands-on activities, and collaborative learning. Second, the integration of educational technology can provide personalized learning experiences that cater to individual needs, helping students build their skills and confidence. Third, professional development for teachers is vital in preparing them to meet the needs of immigrant students. Training programs focused on cultural competency, language support strategies, and the use of technology in education can empower teachers to create more inclusive and effective learning environments. Finally, fostering a positive peer environment is crucial. Schools should implement anti-bullying programs, peer mentoring, and opportunities for collaborative learning that value diverse perspectives. Through the examination and improvement of these specific areas, it can contribute to a more equitable and supportive educational experience, ensuring that all students are well-prepared to thrive academically and socially.

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Appendices

Appendix 1 – Interview guide

Intervjuguide

Form : Individuelt, semi-strukturert dybdeintervju

Varighet : 45-60 min

Problemstilling

Hvilke utfordringer opplever de koreanske innvandrerelevene i Trondheim i å lære matematikk under overgangsperiode?

Forskningsspørsmål

1) Hvordan takler de koreanske innvandrerelevene i Trondheim utfordringene de møtte i å lære matematikk under overgangsperiode?

2) Hva slags støtte får de koreanske innvandrerelevene i Trondheim for å oppnå en vellykket overgang i å lære matematikk?

Introduksjon i forkant av intervjuet

- Takke for deltakelsen i prosjektet.
- Gjennomgang av informasjonsskriv og underskriving av samtykke.
- Eventuelle spørsmål før videoopptaket starter.
- Taushetsplikt og anonymisering av elever.

Innledende spørsmål/bakgrunnsopplysninger

- Fortell litt om deg selv

- Hvor gammel er du?
- Hvilken utdanning har du?
- Hvilket klassetrinn er du?
- Hvor gammel var du da du immigrerte til Norge?
    - Hvilket klassetrinn var du da du immigrerte til Norge?
    - Hva fikk deg til å immigrere til Norge?
- Hvor lenge har du bodd i Norge?

Opplevelsene dine under overgangsperiode

- Hvordan har du minnet fra dine tidlige mattetimer i Norge?
- Hvilke opplevelser har du hatt i å lære matematikk i Norge?
- Hvilke muligheter har du opplevd i å lære matematikk i Norge?
- Hvilke utfordringer har du opplevd i å lære matematikk i Norge?
- Hvilke aktiviteter har du opplevd i matteundervisning i Norge?
- Hvilke forskjeller er det for å lære matematikk mellom Norge og Sør-Korea?

Overgang i matteundervisning i Norge

- Hvordan følte du deg da du møtte utfordringer i matteundervisning?
- Hvordan var det å delta i aktivitetene i mattetimer?
- Hvilke muligheter i å lære matematikk har bidratt deg med å utvikle ditt matematiske potensial?
- Hvilke utfordringer i å lære matematikk har bidratt deg med å utvikle ditt matematiske potensial?
- Hva mente du om matematikk i Sør-Korea?
- Hvordan har din holdning til matematikk endret seg etter matematikkutdanning i Norge?
    - Hva tror du er grunner?

Støtte for en vellykket overgang

- Hvilke støtte fikk du når du møtte utfordringer i å lære matematikk?
- Hvem har bidratt deg med å utvikle ditt matematiske potensial?
    - Hvor mye har mattelæreren din bidratt til å utvikle ditt matematiske potensial?
- Hva var forskjellen mellom støtte fra hjem og skole til å overvinne utfordringene dine i å lære matematikk?
- Hva er rettferdige utdanningsmuligheter i matteundervisning for deg?
    - Beskriv rettferdige utdanningsmuligheter du fikk i mattetime.

Avslutning

- Muntlig oppsummering ved intervjuer der hovedpunktene som fremkom i løpet av intervjuet blir gjennomgått.
- Eventuelle spørsmål deltaker har.
- Høre om det er noe mer deltaker ønsker å legge til.

Avrundning i etterkant av intervjuet

- Gjentakelse av rettigheter.
- Takke for intervjuet.

Appendix 2 – Information letter and consent form

Vil du delta i forskningsprosjektet "De koreaske innvandrerelevene som lærer matematikk i Trondheim : En casestudie"?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å forske hvilke utfordringer de koreanske innvandrerelevene i Trondheim opplever i å lære matematikk under overgangsperiode. I dette skrivet gir jeg deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål
Det er en masteroppgave som blir fullført i løpet av vårsemester 2024. Temaet for oppgave er en casestudie om de koreanske innvandrerelevene som lærer matematikk i Trondheim. Formålet med forskningsprosjektet er å oppdage aspektene som bidro til de vellykkede overgangenene til de koreanske innvandrerelevene i Trondheim i å lære matematikk. Videre skal det forsøkes om utdanningsmuligheter med fokus på rettferdighet gjør elevene i stand til både å overvinne vanskelighetene med å lære matematikk og utvikle sitt potensial. Problemstilling som skal undersøkes er «Hvilke utfordringer opplever de koreansk innvandrerelevene i Trondheim i å lære matematikk under overgangsperiode?». For å bidra til å løse problemsilling er det formulert to forskingsspørsmpål: 1) Hvordan takler de koreanske innvandrerelevene i Trondheim utfordringene med å lære matematikk? og 2) Hva slags støtte får de koreanske innvandrerelevene i Trondheim for å oppnå en vellykket overgang i å lære matematikk?

Hvem er ansvarlig for forskningsprosjektet?
Institutt for lærerutdanning ved Norges teknisk-naturvitenskapelige universitet (NTNU) er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?
Du får spørsmål om å delta, for dette forskningsprosjektet handler om hvordan de koreanske innvandrerelevene i Trondheim overvant vanskene de møtte under matematikktime. Derfor vurderes det at du som immigrerte til Norge etter og med 5. trinn er egnet for dette studiet.

Hva innebærer det for deg å delta?
Jeg vil innhente noen opplysninger om deg fra et intervju. Intervjuet vil vare i ca. 45-60 minutter og gjennomføres samsvar med en intervjuguide og spørsmålene i den. Det vil være opplysninger om hvordan du overvinner utfordringene du møtte under overgangsperiode i mattetime. Intervjuet vil bli tatt opp og vil bli transkribert senere. Intervjuer vil bli holdt på et fysisk møte, men et videomøte er også mulig avhengig av omstendighetene.

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket

tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger
Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.

Hva skjer med personopplysningene dine når forskningsprosjektet avsluttes?
Opplysningene anonymiseres når prosjektet avsluttes/oppgaven er godkjent, noe som etter planen er
september 2024. Da blir alle personopplysninger og opptak slettet.

Hva gir oss rett til å behandle personopplysninger om deg?
Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra NTNU har NSD - Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke opplysninger vi behandler om deg, og å få utlevert en kopi av opplysningene
- å få rettet opplysninger om deg som er feil eller misvisende
- å få slettet personopplysninger om deg
- å sende klage til Datatilsynet om behandlingen av dine personopplysninger

Hvis du har spørsmål til studien, eller ønsker å vite mer om eller benytte deg av dine rettigheter, ta kontakt med:

- NTNU ved min veileder : Sikunder Ali (sikunder.ali@ntnu.no)
- Masterstudent ved NTNU: Sunyoung Lim (sunl@stud.ntnu.no)
- Personvernombud ved NTNU: Thomas Helgesen (thomas.helgesen@ntnu.no)

Hvis du har spørsmål knyttet til NSD sin vurdering av prosjektet, kan du ta kontakt med:

- NSD – Norsk senter for forskningsdata AS på e-post (personverntjenester@nsd.no) eller på telefon: 55 58 21 17.

Med vennlig hilsen

Sikunder Ali (veileder)

Sunyoung Lim (masterstudent)

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet [De koreanske innvandrerelevene som lærer matematikk i Trondheim : en casestudie], og har fått anledning til å stille spørsmål. Jeg samtykker til:

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet

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(Signert av prosjektdeltaker, dato)

Appendix 3 – Approval from NSD

Vurdering av behandling av personopplysninger

Referansenummer
379714

Vurderingstype
Standard

Dato
21.11.2023

Tittel
De koreanske innvandrerelevene som lærer matematikk i Trondheim : En casestudie

Behandlingsansvarlig institusjon
Norges teknisk-naturvitenskapelige universitet / Fakultet for samfunns- og utdanningsvitenskap (SU) / Institutt for lærerutdanning

Prosjektansvarlig
Sikunder Ali

Student
Sunyoung Lim

Prosjektperiode
03.01.2024 - 30.08.2024

Kategorier personopplysninger

- Alminnelige

Lovlig grunnlag

- Samtykke (Personvernforordningen art. 6 nr. 1 bokstav a)

Behandlingen av personopplysningene er lovlig så fremt den gjennomføres som oppgitt i meldeskjemaet. Det lovlige grunnlaget gjelder til 30.08.2024.

Meldeskjema

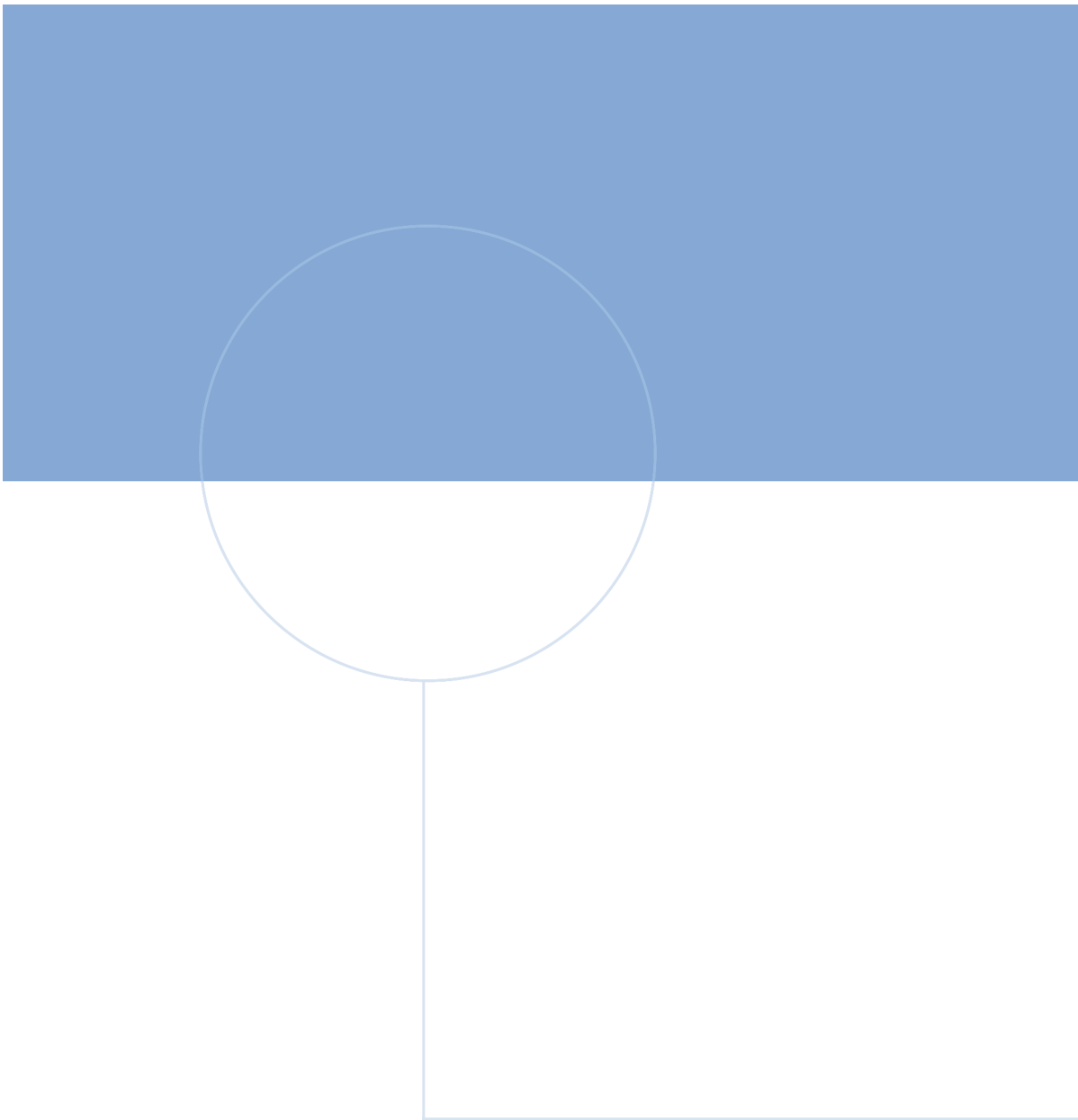
Kommentar

Personverntjenester har vurdert endringen registrert 21.11.2023.

INNHOLD I ENDRINGERI endringsmeldingen er det presisert at det ikke skal behandles opplysninger om etnisitet.

VÅR VURDERING ETTER ENDRINGERDet er vår vurdering at behandlingen av personopplysninger i prosjektet vil være i samsvar med personvernlovgivningen så fremt dengjennomføres i tråd med det som er dokumentert i meldeskjemaet med vedlegg den 21.11.2023. Behandlingen kan fortsette.

OPPFØLGING AV PROSJEKTET Personverntjenester vil følge opp ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet.



NTNU

Kunnskap for en bedre verden