FACULTY OF EDUCATION
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TEACHER QUALITY AND PARENT EDUCATION: THEIR RELATIONSHIP TO STUDENT ACHIEVEMENT IN MATHEMATICS

A comparison between Nordic and Gulf countries in TIMSS 2015

Azzah Alghamdi

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Abstract

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Aim: The main aim of this thesis is to explore the relationship between student mathematics achievement, teacher quality (educational level/ specialization) and parents' educational level in Nordic and Gulf countries. Furthermore, this thesis seeks to investigate interactions between teacher quality and parents' educational level in their relation to student mathematics Achievement.

Theory: This thesis applies Shulman's theory of content knowledge (CK) and pedagogical content knowledge (PCK). The theoretical framework emphasises the significance of studying the impact of teachers' knowledge, general content knowledge as well as pedagogical knowledge.

Method: The data comes from the Trends in International Mathematics and Science Study (TIMSS) 2015. Data from (a) teacher background questionnaire, (b) home environment support questionnaire, and (c) student mathematics achievement levels of fourth-grade students in Nordic and Gulf. Teacher quality and parents' educational level were independent variables in order to investigate the relationship between student mathematics achievement with teacher quality and parents' educational level on each country. ANOVA and linear regression were main methods of analysis. The data analysed using Statistic Software Program (SPSS).

Results: The results showed that parents' educational level had a significant positive relationship to student mathematics achievement levels in all countries. However, teacher quality (educational level/ specialization) did not show relation in the majority of the countries.
The study concludes that parent education plays a major role on student achievement irrespective of the country. On the other hand, the teacher quality is found to be the statistically not significant contribution to student mathematics achievement in the majority of Nordic and Gulf countries except Oman and Finland. However, the specialization of teacher significantly did not affect the student mathematics achievement except Denmark and Bahrain.

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List of abbreviations

ILSA	International large-scale assessment
GC	Gulf Council
GCC	Gulf Cooperation Council
GDP	Gross domestic product
IEA	International Association for the evaluation of educational Achievement
PISA	The Program for International Student Assessment
SES	Socioeconomic status
NELS	National Education Longitudinal Study
SBM	School-based management
PCK	Pedagogical Content Knowledge
DPC	Data processing and Research Centre
IDB	The IEA international Database Analyzer
CK	Content knowledge
SPSS	Statistical package for the social sciences
TIMSS	Trends in International Mathematics and Science Study
UAE	United Arab Emirates

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1 Introduction

For many years, teachers and researchers have tried to identify variables that may affect student achievement. Moreover, policymakers also sought to participate in such research process, in order to be able to reform schools and advance the educational process (Darling Hammond, 2000). Several factors might play a significant role on the student achievement such as differences in individual students' abilities. However, environmental and socioeconomic factors could also affect the overall image of student achievement. For a long time, students' social background was considered to be the single most important factor for student achievement (Coleman et. al, 1966). However, there is an emerging consensus that teachers contribute substantially to student achievement (Eriksson, Helenius, & Ryve, 2019; Goe & Stickler, 2008). Therefore, the question of the impact of teacher quality on student achievement becomes important since most of the developed educational program rely heavily on the relationship between different education-related factors and learning outcomes (Darling Hammond, 1999).

According to Darling Hammond (2000), it has been identified that teachers are regarded as one of the factors that significantly impact student achievement. Another related study, Maphoso & Mahlo, (2015) demonstrated that the teacher quality is considered to be one of the most influencing factors in student achievement in mathematics, that reflects their required skills and knowledge in the teaching process, and include formal education, experience, subject knowledge, pedagogy studies, and certification or license. On the other hand, Levpušček, Zupančič, and Sočan (2013), demonstrated that teacher qualifications had no direct impact on student achievement in mathematics. However, other environmental factors may play an additional role, such as school, equipment, the student's social and economic level, and parental education. Thus, it can be understood that there is a complex conflict about the impact of

teacher education on student achievement. This conflict can be explained by the differences between studies in identifying and measuring teacher quality (Goe & Stickler, 2008). While some agree that the teacher qualification will affect the student achievement, others went against this hypothesis. The correlation between teachers' qualification and student achievement level may be more complex than just assuming a direct relationship. Understanding the relationship between teacher quality and student achievement is an important step towards establishing better education policies that will improve the quality of education in schools (Goldhaber & Anthony, 2003).

On the other hand, the home environment, the socioeconomic level and parents qualifications could play an important role that might affect student achievement, whereas the involvement of parents in learning is vital for motivating students to do homework and encouraging them to achieve better (Qayyum, Madiha, Khaliq & Agha, 2015; Singh, Horo & Singh, 2016). Naturally, parents are the first and primary guides for their children, as they are the first role model that a student will have in his /her lifetime (Bempechat & Shernoff, 2012). Thus, there is a correlation between the achievements of students and the beliefs and behaviours of parents, that can have influence on how the students come to perceive their intellectual abilities, and the value of learning and education (Bempechat & Shernoff, 2012; Abu Tayeh, Al-Rsa'i & Al-Shugairat, 2018). Several studies have stressed the significance of exploring the impact of parental involvement in the educational process. A study conducted by Boonk, Gijselaers, Ritzen, Brand-Gruwel, (2018) showed that parent education and teacher quality are expected to have a positive impact on the student achievement. However, the studies have not investigated those variables profoundly. Such as any scientific dialogue, there are some researchers with conflicting opinions, and they also dispute the extent to which parents influence their children's academic achievement, and these researchers have indicated that

there is no strong evidence, indicating that quality of teachers has an impact on student achievement. From aforementioned studies, teacher quality and parent's education level could have different impacts on student achievements in different education systems. Different countries have different education policies and practices which may or may not lead to a system of quality education that can promote student achievement. Making a comparative analyses of different education systems in different countries allows researches and educators to have a better understanding of what needs to be done in order to improve the overall quality of educational systems. Hence, it is necessary to collect more comprehensive evidence on this issue, supported by the help of a reliable and robust dataset from a wide international assessment.

International large-scale assessment (ILSA) has been increasingly used in many countries to describe the students' abilities, skills and the current status of the education system (Dodeen, Abdelfattah, Shumrani, & Abu Hilal, 2012). Associating with the high concentrate and interest with country-level student achievement, various studies have been conducted and participated to create a plethora of students' scores data, which need to deliberate. Therefore, the current study will utilize TIMSS data as one of the common ILSA data set.

This thesis will utilize the Trends in International Mathematics and Science Study (TIMSS) data as one of the common ILSA data sets. As previously noted, the extent of the effect of teacher qualifications on student achievement are ambiguous. However, with the aid of ILSA data, there is an opportunity to shed light on this with a comparative perspective.

The thesis starts with laying out the problem statement, which is followed by a thorough rationale regarding the choice of the groups, Nordic and Gulf countries, for the analysis of

their education systems and comparisons within the TIMSS framework. Succeeding part presents a literature review - Factors that impact student achievement were explored and investigated. In the next part the theoretical framework is explained, together with different dimensions and extents of student achievement and teacher quality. Encompassing all the previous parts, in the next the relevance of the study and the research questions are given. Methodology and the results of the thesis are introduced in the next part, while the discussion about them is presented in the following. Finishing the thesis, limitations of the study and information about further research can be found.

2 Background

Gulf and Nordic Countries

Recently, countries throughout the entire world have been promoting teaching and learning mathematics. This is due to the recognised significance of learning mathematics for enhancing thinking, problems solving, and cognitive skills (Kwaah & Palojok, 2018). Several previous studies, such as Koedel, Li, Polikoff, Hardaway and Wrabel (2017), and Hill and Chill (2018) found that student achievements in mathematics are influenced by a range of variables that go beyond student-related aspects. The researchers imply that there are more environmental and structural considerations that play both direct and indirect roles in student achievements.

Looking to the subject with wide spectrum, Hanushek, Peterson, & Woessmann (2010); Abu Tayeh, Al-Rsa'i, & Al-Shugairat,(2018), pointed out that development of educational systems should not only rely on data collected from local frameworks, but rather be directed towards

utilizing international tests of educational reform, because these indicators give a hint about the status of the educational system in many countries, both as compared with previous years (if countries participated in previous cycles) and relative to other countries. The idea behind choosing several countries and not comparing a direct pair was to investigate the variabilities, if any, among those countries, and to be able to generalize and provide more stable findings.

In TIMSS framework 2015, the majority of Arab Gulf countries showed lower results in student achievement levels. Although, the governments of the aforementioned countries are funding the education system with large sums. Moreover, free education is guaranteed to all students. Nevertheless, the education outcomes did not reflect the amount of support that the education is receiving in these countries. Similar group of countries that have the same free education but scoring higher results in TIMSS 2015 were Nordic countries. Regardless of the governmental support to both Arab Gulf and Nordic countries, the quality of education might be different between these education systems. The literatures discussing the education quality in Arab Gulf countries are rare. Moreover, comparative study that investigate the education quality and parent education level in Nordic and Gulf has not been done before. Thus, by comparing several other countries with similar differences in culture background, such as we had noticed between Nordic and Gulf countries, we could evaluate the overall picture of both groups (Nordic and Gulf).

The selection of these countries was based on many reasons. One of the reasons was that the Gulf countries are the countries in development and all of them have the same education environment. On the other hand, to some extent, the Nordic countries have well established education quality. The second reason was the geographic aspect. If we observe the Nordic countries, we will find these countries share the geographical boundaries which may facilitate

the educational collaboration among different parties. On the other hand, Gulf countries share borders and educational core through the Gulf Cooperation Council (GCC). Therefore, these groups of countries influence each other in term of education collaborations and improvement. The third reason, as previously mentioned, was the free education. In all Nordic and Gulf countries the education is a mandatory process and it is offered for free to all students. The governmental funds toward education are one crucial factor that link Gulf and Nordic countries in term of education. Furthermore, the school-systems and teacher education are quite different in Gulf and Nordic countries. Nevertheless, the previous results of TIMSS (2015) report on student achievements placed the Gulf countries at the bottom of the mathematical achievement scale within a rank range of less than 452. Consequently, the gap between the higher-ranking Nordic countries and the lower ranking Gulf countries is approximately 67 (Mullis, Martin, Foy & Hooper, 2016). Both Nordic and Gulf countries have been applying advanced educational strategies to boost the educational processes and enhance the student achievement. Those countries have joined the TIMSS countries where their students participated in the TIMSS 2015. Nevertheless, the variables influencing student achievement have not been investigated, mainly the teacher quality and parent education. Accordingly, the current thesis aims to study the relationship between teacher's quality, parents' education and student achievement with focus on the mathematics.

Economic status in Gulf and Nordic countries

Arab Gulf is a regional cooperation between six countries; the United Arab Emirates, Kingdom of Bahrain, Kingdom of Saudi Arabia; Sultanate of Oman; State of Qatar; and the State of Kuwait (Batanouny, 1978). They represent the majority of the Gulf countries. All these

countries shared the same charter to strengthen the ties and relationships of cooperation, integration, and coordination amongst each other through Gulf Council (GC). The main objectives of the Gulf Council are boosting the unity among member countries, as well as strengthening relationships and cooperation in various fields such as Economics, Commerce, Education and Culture, Information and Tourism, and so forth (GCC, 2019). It is worth noting that the Gulf Council (GC) is the largest regional council in the Middle East region that held common education interests, as well as associated relevant educational policies within the GCC Education and Training Bureau administration. Moreover, the GC invested an average of 10.3 million US Dollars in 2016, which is approximately equivalent to 7.2% of the gross domestic product (GDP) (GCC-STAT, 2017). Moreover, it is expected to double within the next five years (Hoteit, Hachem, Erker & Farah, 2017). The Nordic countries include Denmark, Norway, Sweden and Finland. The Nordic countries share one objective of engaging in European activity in various fields such as energy, immigration, agriculture, security and defence, infrastructures, climate change, education, and culture (Lehnert, Giannopapa, & Vaudo, 2016). The Nordic Council is a formal co-operation between European Nordic countries that have ground-based educational policies and visions (NordkForsk, 2019). Furthermore, the average expenditure of Nordic countries on education reached 6.46% of GDP in 2016 (Nordic Council of Ministers, 2018).

The gap between the Gulf countries and the Nordic countries in mathematical achievement cannot be attributed to financial factors, since the Gulf countries expend the higher amount on education; thus, there are other reasons that have to be investigated to demonstrate the differences. In this thesis, the effect of the previously discussed factors (teacher quality, parents 'background and participation) will be studied on student achievements in mathematics, and as

the researcher explained earlier, the study will be carried out on data from a wide-ranging international assessment from the Arab Gulf countries and the Nordic countries.

There is a need to conduct a comparative study (has not been done before) among countries in order to identify weakness and support the decision-making process regarding mathematics teaching and learning in order to have education development.

3 Literature Study

Factors that impact and effect student achievement were extremely explored and investigated in the previous studies. Influencing factors can either be school-related factor or student-related factor. School- related factors comprise several factors such as school capability, teacher, technology, etc., while student-related factors include the home environment, parent involvement, family background, and student's psychology. In order to answer the current research questions, the current research only revises the studies that conducted teacher and parent impact on student achievement.

Studies about teachers -Related factor

Gustafsson, Nilsen, & Yang-Hansen, (2018) investigated the main school-characteristic that eliminates the relation between socioeconomic status and achievement, and consequently improved the educational outcomes. The study utilized the 2011 TIMSS data source, obtaining data from 50 countries. The study used two-level random slopes to identify the effect of the school characteristic variables (quality and quantity of instruction, school climate, and school SES) on the achievement. The results showed that school socio-economic status is negatively correlated with student achievement in mathematics. The result indicates that highly developed countries have the ability to reduce the relation between SES and student achievement through ensuring healthy school-climate and extensively focusing on academic success.

Yavuz, Demirtaşlı, Yalçın, & Dibek (2017) study examined the relation between student characteristics and teacher characteristics on student achievement in mathematics. Data were obtained from 2007 and 2011 TIMSS dataset. In the empirical descriptive analytical approach, around 141 teachers and 4498 students were included from the TIMSS 2007; and around 219 teachers and 6928 students were included from TIMSS 2011. Data analyzing is based on the hierarchical linear modelling (HLM) method. The research results proved the positive relation between teachers' emphasis on the achievement and student achievement, while there is no relation among teacher working condition, teacher collaboration and student achievement.

Zanini & Benton (2015) study aims to investigate the correlation between teaching methods and resource used in classes, and the mathematics achievement. The research utilized TIMSS 2011 data source for 8th grades, in addition to the PISA 2012 data source for 15year old students. Teaching methods used by teacher were measured through prevalence of the teaching styles in classrooms. Therefore, a meta-regression analysis was utilized. The study found that the teaching styles were positively correlated with the student performance; as well, the teaching styles were more correlated to the PISA student performance compared to the TIMSS student performance. The study implied that teacher has to care about using various teaching styles due to their significant impact on improving student achievement.

Levpušček, Zupančič, & Sočan (2013) study carried out the adolescent student achievement through investigating two sets of factors, individual factors and social factors. The set of factors were defined as following: individual factor was measured by Intelligence and Personality traits, while social factors were measured by parental involvement and SES, and teacher behaviour. The study sample consists of 416 students in grade 8, randomly selected from 13 public schools. The parent involvement was measured using The Inventory of Parental Influence (IPI-child version; Campbell, 1994), teacher behaviour was measured using a

developed version of the Teacher Support Scale (Puklek, 2001), and the mathematics achievement was measured by the final grades and Net score in mathematics subject. The result of the study found that parental education was moderation the relation between self-efficacy and student achievement, as well as, parental pressure was negatively moderation the relation between self-efficacy and student achievement. Furthermore, teacher behaviour in the classroom has an indirect effect on student achievement through self-efficacy. The study revealed that the teacher behaviour has relatively small indirect effect compared to the direct effect of self-efficacy, and teacher behaviour is not a prominent predictor for student achievement, but it has significant role in improving self-efficacy of the student, which, in turn, affect student achievement.

Studies about parents -Related factors

Antonijević (2017) study aimed to examine the relationship between parents' level of education and achievement of Serbian eighth grade students in mathematics and science. Parental support in teaching and learning and students' achievement in mathematics and science; and students' educational aspiration and their achievement in mathematics and science. To achieve these objectives the researcher used the quantitative and qualitative methods to compare between the study variables, thus the study utilized the 2003 TIMSS data source in Serbia which included 149 primary schools. At the end of the study, the researcher concluded that there is a positive relationship between parental influence and student achievement in mathematics and science, in parental education, support, and educational aspirations. Moreover, there is a relation between students' educational aspirations and their achievement.

McNeal (2014) study proposed a theoretical model that examines the linking of parent involvement with children and those practices with adults in the school environment. To achieve these objectives the researcher used a national survey in the United States, that is the National Education Longitudinal Study (NELS:88). The research estimates a series of

hierarchical models to test the effects of parent involvement on student attitudinal, behavioral and academic outcomes. After analyzing the 12,101 cases of data, the researcher confirmed that parent-child and parent-school involvement practices influence student attitudes and behaviors, thereby involvement practices influence student attitudes and behaviors, thereby indirectly affecting student achievement.

Izumi (2013) study aimed to examine the effect of school-based management (SBM) on student achievement in junior secondary schools in Botswana and determine how parental involvement affects mathematics and science test scores. To achieve these objectives the researcher used baseline model, thus the study utilized the 2007 TIMSS data source. In the end, the researcher concluded that systematic relationship between parental involvements and test scores could not be found both OLS and PSM models because there are no more data in TIMSS 2007 about of SBM and parental involvement.

Brecko (2004) study aimed to examine the relation between students 'social and family background and their academic performance in Slovene. Brecko used TIMSS 1995 data for three populations of students fourth grader student, eighth graders in primary school, and students in the final year of secondary school. The population represented students in grade 4 (n = 2566), students in grade 8 (n = 2708), and students in the final year of secondary school (n = 3372). After analyzing the data, the strong relationship between family background and student achievement was confirmed, but the relationship becomes weaker in the eighth grade and very weak in the final year of secondary school.

According to the previous studies and the large-scale evidences, the student achievement was influenced by various factors related either to teacher background or teaching practice. Even that the result of these studies reliable a clear conclusion cannot be drawn. About which teacher characteristic is the most effective for student achievement in those countries. Furthermore, some studies such as Levpušček, Zupančič, & Sočan (2013) asserted that teacher behavior is

not a key predictor for student achievement. Thus, this study carries out examination of teacher qualification as predictors for student achievement in countries contextual. In addition, the student achievement was influenced Parenting factor. Furthermore, some studies such McNeal (2014) and Antonijević (2017) asserted that parenting education practices influence student attitudes and behaviors, thereby indirectly affecting student achievement. From additional perspective, the previous studies provide a good example of how to exploit the international benchmark data in order to obtain an empirical evidence about the factors that affect student achievement. Therefore, this thesis deals with these trends take advantages of such large-scale data to drive new reliable and robust evidence that support the current research results.

4 theoretical frameworks

Student achievement

Student achievement is one of the most important outputs of the educational process, and at the same time, it is a basic criterion for judging to these outputs. However, the student's achievements are affected by many factors, which is confirmed by recent educational studies. One of these factors is the teachers and their efficiency and ability to teach. On the other hand, parents influence student achievement, since they are considered to be the first guide in student live. Therefore, this chapter provides a theoretical framework that clarified what is the achievement of students, as well as to clarify the role of the teacher and parents as factors affecting student achievement.

Vigorous debates have occurred among researchers over student achievement concept because this term is considered to be a complex concept because of its many aspects that indicate student performance in academic fields, such as reading, language, math, science etc. as measured by

achievement tests (Cunningham, 2012). Therefore, there is no single definition of "student achievement". There are different sets of definitions to describe the achievement of students based on results of exams, or mental abilities and skills possessed by students or as a criterion for judging education (Hayward, 2010).

In most studies, student achievement is defined as student's grade on standardized tests (Allen, 2005), that is the preferred definition of it because it is possible to use the result of achievement in comparisons to a variety of studies (Hayward, 2010). Additionally, the student achievement is defined as the amount of information or skills acquired by students expressed in test scores, which determine the level of success in a specific subject (York, Gibson, & Rankin, 2015).

On the other hand, Glenn (2012) and Yildiz (2017) defined the student achievement as the most important output of education where they showed that the concept of students' achievement includes educational and psychological connotations, such as:

- A basic criterion for judging academic abilities in a specific curriculum.
- An important indicator to determine the level of enhancement, benefits and social roles that students deserve.
- A major source of feedback on the extent to which educational goals have been achieved.
- Determines the amount of academic assistance that students need in order to overcome their learning disabilities.

Moreover, Adeyinka, Adedeji, and Olufemi (2011) described student achievement as a set of criteria used to judge the effectiveness of educational activities and the extent of the students' ability and efficiency to benefit from them. Also, they classify academic levels of students to high, medium or low.

As for Farooq, Chaudhry, Shafiq, and Berhanu, (2011) formulate the achievement of students as the academic performance that is affected by many factors, such as internal factors, which include the student's personality and abilities, and school factors that include the educational

system, teachers, classroom environment, etc. Also, factors associated with the family environment, which include the conditions of study, family relations, the amount of social, psychological support for the student.

According to Rugutt, & Chemosit (2005) during the past 40 years, learning environments have drawn the interests of educational researchers. Several educational researchers have proposed theoretical models and theories to explain existing linkages among learning variables and educational outcomes.

Thus, several theories came to examine the academic achievement of students and the factors that affect it, and one of the most prominent of these theories is learning outcomes theory by Robert Gagne. Gagne explained that there are several different types or levels of learning and the learning is a set of cognitive processes that pass the information process and become the new capabilities. (Kayvan, Kamran, & Sauid, 2011; Riswanto & Aryani, 2017).

This theory paid attention to learning outcomes and the factors affecting them, thus, Gagne theory clarifies that learning is influenced by three main components which are external conditions, internal and learning outcomes (Riswanto & Aryani, 2017).

Teacher quality

The study of Coleman et al (1966), is known as the Coleman Report (1966). In the report he defined the concept of teacher quality and the quality of the educational system. He presented a study of various theories and concepts that were studied and examined in the context of teacher quality and teachers' academic characteristic. Thus, the subsequent studies were conducted to the debate of the teacher's quality concept. In this thesis, the concept of teacher quality will be examined based on Shulman (1986) perspective. Therefore, the Shulman's

findings regard the concept of teacher quality will be described first, and then followed by the literature that discussed the association between teacher qualification and Student achievement.

Shulman's Contribution

Shulman's motivation to deliberate teacher quality aspect referred to his irritation about the teacher profession aphorism" He who can does. He who cannot teaches (Shulman, 1986). Accordingly, Shulman's study anchored on two main aspects, teacher knowledge of the subject and his pedagogical competence, which is better known as Content Knowledge (CK) and Pedagogical content knowledge (PCK) (Shulman, 1986; Ball, Thames, & Phelps, 2008; Kleickmann, et al., 2013). The Content Knowledge represents the amount of knowledge that teachers must have about the subject they taught guided by the question of "what is taught". The answer of such question implies that teacher to go beyond the knowledge of the subject matter to perceive the significance of the subject and amount of its inclusion in disciplinary. The related theoretical and practical implication is co-related with other subjects, and precisely gain the knowledge of what should be learned in this subject (Backes, et al., 2017). Fernandiz (2014) quoted from Bucat (2005) that there is a significant difference between content knowledge and pedagogical content knowledge, in which the last is concerned about understanding the teaching techniques and methods that confirm with teaching the subject in order to increase the students' learning. In other words, it is the teaching process and activities knowledge, which influence learning outcome and affected by institutional procedures and context. Consequently, it is true to define content knowledge as an associated requisite for pedagogical content knowledge.

Shulman and Sykes' (1986) model is constructed on the knowledge base to assess teaching competence. This model comprises eight categories as following:

1- Content Knowledge about the subject to be taught.

2- General Basic competencies such as reading, writing, reasoning and math skills

3- General knowledge of pedagogical concepts and techniques
4- Curriculum Knowledge
5- Content-specific knowledge
6- Realize the individual differences and diversity among students
7- Performance skills
8- Basic of professional aspects such as related ethics, cross-cultural factors and so forth (Cogil, 2008).

Ball, Thames, & Phelps (2008) revealed the Shulman's contribution in defining a teaching profession and their role in reframing the teacher knowledge based on the content in teaching, that stimulated sequent researcher and studies to focus precisely on the subject matter and the teacher thinking's role in teaching process, which have never been considered before. Shulman considered the content understanding as one of the significant technical knowledge required for the profession of teaching. Moreover, Shulmans' efforts developed typologies for knowledge that avail training and planning purposes.

In summary, Shulman defines knowledge base as pillars upon which to define the teacher quality to teach, as well as to improve their practice, due to its popularization and reliability features. Shulman defines the generic concept of the teacher competency and gears the concept that goes beyond the simple and mere teaching behaviours to formulate the knowledge base for the teaching profession.

Teacher Quality and Qualification

Darling-Hammond (2000) used the National Assessment of Educational Progress (NAEP) reading and mathematics ratings in its study of teacher credentials and student achievement. She analyzed the link between the percentage of well-qualified state teachers and NAEP student scores and found that teacher qualifications are strongly and positively associated with student achievement. The most important factors that need to be considered there could be

unknown variations between states that are related to higher standards for teachers. For example, in countries where there is a surplus of highly qualified teachers, the state may set high requirements for teacher qualifications and yet maintain a sufficient supply of teachers. Moreover, given the limitations of the results, it is not possible to make a causal argument about the relationship between student achievement and teacher qualifications. While the correlation can be calculated, it is likely that both variables (teacher credentials and student achievement) are influenced by some other unknown variable.

Darling-Hammond et al. (2005) analyzed the correlation between teacher and student data in Houston to assess whether teacher certification has made a difference in student achievement. Goe (2007) has recently conducted a research synthesis for the National Comprehensive Center for Teacher Education in an attempt to classify education variables for teachers through studies on which there is a clear consensus. Reviews of hundreds of research studies which are available online (www.ncctq.org/link.php) show the relation between variety of teacher quality variables and student achievement, as measured by standardized tests. Although several studies have been performed on the variables mentioned in the following section, Goe concentrated only on studies in which the authors directly related their results to the quality of the instructor. Goe's study shows many contradictory and poor assumptions, but the framework also establishes a few clear and reliable predictors of student achievement. This Research and Policy Brief breaks down the connection between teacher quality and student achievement that Goe identifies, with the intention of clarifying patterns related to current educational policy making. Moreover, Goe found that teacher qualifications and specialization and content knowledge of teacher is more important in secondary school than in primary school.

Goe's (2007) quality review focuses on four categories of quality indicators for teachers — teacher qualifications, teacher characteristics, teaching practices and teaching efficiency — which Goe identified as empirically capturing the primary variables examined in the quality

research studies published between 2000 and 2007. Largely due to the provisions of the No Child Left Behind (NCLB) Act on 'highly qualified teachers,' these four categories are also consistent with the current national emphasis on certification and licensing, experience and subject-matter knowledge. In addition, the four categories summarize the ways in which teacher quality is generally defined for policy purposes and are often related to recruitment and career-leader decision-making.

The teacher quality enhances the effectiveness of learning process which further leads to better student achievement and results. The studies included in this paper evade the reality that student achievements are directly related to the quality of teaching and effectiveness of the teachers. The experience, certification, teaching programs and policies are some indicators of effectiveness and credibility of a teacher (Darling-Hammond, 2000).

Teacher quality depends on different variables in which the most important are qualification, licensing and experience. These factors indicate the teacher's effectiveness in the teaching environment which aids the learning process and enhances the quality of education that students receive. Studies suggest that subject matter knowledge that teachers possess is another factor which is related to better students results (Darling-Hammond and Youngs, 2002). The effectiveness of teachers can be a source of higher grades for the students. A quality teacher helps in ensuring that the students' time is being utilized efficiently in the standard school hours. Teacher effectiveness can be measured by analyzing the grades that students achieve without changing or extending the school hours. In order to further understand and extend the research, there is a need to review the teacher performance measurement instruments and match the results with the student achievements (Darling-Hammond & Sykes, 2003). The measurement of teacher's performance should be comprehensive and directed towards the goals of finding the right connection or level of interdependence of student's results on teachers' quality. The relationship between teacher quality and students' learning pace as well

as the results they achieve, however, is evident through the research conducted. More research is required in order to understand the extent of relationship that exists between teachers' performances and student achievement.

Developing teacher quality and teaching quality is one of dominant wave in educational research. Gradually, research assumed that teacher competence and skills are a fundamental basis to explain the change in the quality of the school and student achievement. Thus, the teacher quality is better defined as an influential factor on the student achievement literature.

The definition of teacher quality was discussed in literature from two perspectives: teacher qualification and preparation, and teacher practice. Accordingly, revising teacher quality definition in literature must be adequate and indicated in the context of the writer's viewpoint. According to Goe (2007) teacher qualification is one of the four lenses through which the teacher quality could be measured. Goe (2007) explained it as "credentials, knowledge, and experience that teachers bring with them when they enter the classroom, such as grades, course work" p.3. Goe's definition tackles the certificated teachers, which includes those who attended a formal education in the one of accredited undergraduate programs and completed either minor or major educational subject.

Seebruck (2015) assessed teacher quality in term of certification, which status is a reliable and robust predictor of teacher performance that mainly contributes to the students' achievements. Kraft, Blazar and Hogan (2018), however, stated that teacher practice is the predominant predictor for student achievements. Their defence is based on the significance of the training addressing the constant problems and challenges in the teaching profession, as well as instantly providing the proper solutions and instructional practice to enhance student learning and outcomes. The aforementioned results, agreed with the longitudinal study carried out by Auletto and Cowen (2018), provided empirical evidences that teacher preparation and practice are the main properties for delineating teacher quality concept.

The study of Kaplan and Owings, (2015) emphasized that there are eleven dimensions of teacher quality which affected the student achievement positively, mentioned as: verbal competence, content knowledge, teaching methods learned in their academic discipline, teacher assessment standards, teaching technique and practice such as using a wide broad of teaching methods, enthusiasm for learning, flexibility, creativity, previous experience, teacher skills, availability of working with colleague opportunities, planning time and curricular richness and strength.

In shortlist dimensions, Goe & Stickler (2008) found that there are eight main dimensions for the teacher qualification: subject-matter knowledge, test scores, undergraduate institute, certification, the advanced degree, professional development, experience and content-based pedagogical knowledge. Subject-matter knowledge deliberated as subject-area expertise as shown in credentials, as well as subject-knowledge. While advanced degree is scrutinized as any possessing post-graduate degree that teacher earned. Furthermore, Whittle, Telford and Benson (2008) qualitatively explored the teachers' perspective toward measuring teacher quality that positively impact student achievement, found that majority of teachers agreed on the five main dimensions, which are perceived content knowledge, expectations, passion and enthusiasm, pedagogical content knowledge and use of reflective practices.

In summary, it is true to say that there is no standard 'one-size-fit-all' definition for teacher quality and teacher quality measurement. In this thesis, teacher qualification is considered as the set of information, knowledge and skills that teacher brought to the educational system. They gained those skills from previous experience in education system such as acquired certificates, and related majors. This simple explanation was poorly conducted in the last research; even it is the first scalable indication for teacher quality when the performance and outcome data were not available, such as new attendance teacher cases. In addition, it is compatible with what Whittle, Telford and Benson's (2018) say, "The most appropriate way

to define teacher quality is to define it within a given context". On the contrary, most and broad research focuses on interpretation of teacher preparation to measure teacher quality.

Due to its significance, the issue of teacher quality and qualification and their impact on the achievement of students has been studied by several researchers i.e. Croninger et al. (2007), Goe and Stickler (2008) and Croninger et al. (2003).

Parents effect on student's achievement

Parenting is one factor that has been consistently related to increasing academic achievement of students. This positive bond between parent and an academic achievement is well established (Paul & Ngirande, 2014). In many studies, it has been confirmed the paternity participation in the school administration their responsibility to educate children since the role of parents is no less importance than school in the education and development of children (Martinez, 2015). The term of parenting in education emphasizes the process of sharing the responsibility and that families and schools work jointly in promoting the success of the student. Thus, families factor terms used to describe any support a student receives from a guardian or parents (Bailey, 2017).

Since a long time ago, it turns out that there is a high correlation between academic successes and parental role. Parent Teacher Association (PTA) was founded in 1897 to support a healthy growing relationship between parents and teachers to teach children. (Smith, 2011). Therefore, numerous researchers such as (Paul & Ngirande, 2014; Bailey, 2017) have studied parenting and effects on the educational process and outcomes, under that it has been confirmed the parenting support of the student is a multidimensional construct which is not limited to engaging parents in school activities and events related to their child's education in a traditional way.

However, a more comprehensive view of parental support is based on the understanding that children's success is dynamically influenced by multiple contexts. (Paul & Ngirande, 2014)

Accordingly, most studies have clarified the role of parents in assisting their children such as organize time, exploit leisure time, solving homework, and provide them with psychological support to push them to learn. (Desforges & Abouchaar, 2003; Moshahid & Vadakkayil, 2016). As Chohan and Khan (2010) demonstrated that, the aspiration of parents regarding education for their children related to students' academic growth and have found that parental educational level has an impact on child's learning. Similarly, the academic success of students have been linked to the values and aspirations of parents. Thus, all students are more likely to experience academic success if their parents are supportive.

According to Ngure and Amollo (2017) parental educational level is an important indicator of children's educational and behavioural outcomes. Therefore, it has been suggested that parental education is indeed an important factor of child achievement, thus children of well-educated parents perform better on academic assessment tests. The educational level of the parents is considered as an independent factor of other parent involvement factor because the level of education may influence the value that parents place on education, which could influence their children's educational goals (Gooding, 2001).

5 Research Questions and relevant of the study

According to the introduction and previous studies sketched above, the main question of the research can be constructed as "What is the relationship between teacher qualifications, parent qualifications and student mathematics achievement in Nordic countries and Arab Gulf countries?" More specifically, the following research questions are steering the study:

1. Does differences in student achievement depend on teacher educational level for each country separately, Nordic country, Gulf country and for all together?

2. Does differences in student achievement depend on teacher specialization for each country separately, Nordic country, Gulf country and for all together?

3. Does differences student achievement depend on parent's education for each country separately, Nordic country, Gulf country and for all together?

This thesis aims to explore the relationship of teacher quality and Parents' educational level to student mathematics achievement in Nordic and Gulf countries. It aims to answer main question of the research:" What is the relationship between teacher qualifications, parent qualifications and student mathematics achievement in Nordic countries and Arab Gulf countries?". Thus, the results of the study can provide means to develop educational systems. The study is important for policymakers and educational institutions – to improve the strategy of selecting teachers according to their qualifications. Also, the results of this study could be considered as a motivational aspect for teachers to improve their performance, to support enable families to learn about their role in encouraging students to study and complete assignments.

6 Methodology

The aim of this thesis is to investigate the relationship between teachers' educational level, teacher specialization and parents' educational level on student mathematics achievement. Based on the study problem and the objectives of this thesis, descriptive statistics and statistical analysis were used to answer and test the questions of the study. As Pallant (2011) recognized, the methodology of the study has to comply with its questions, objectives and goals in order to produce valid results. A quantitative methodology is appropriate in the current study that investigates the relationship between teacher qualifications, parents' educational level, and student' mathematics achievement levels (Bryman & Cramer, 2011). The study relied on data from the Trends in International Mathematics and Science (TIMSS) 2015. This chapter introduces the following: (a) the information about the data source, sampling and population, questionnaire design and the variables, (b) statistical data analysis, (c) validity and reliability, and (d) ethical consideration.

TIMSS 2015 Data source

This thesis uses data from the Trends in International Mathematics and science study (TIMSS), which aims to evaluate the mathematics knowledge of the fourth and eighth grade students around the world. TIMSS data is repeated every four years since 1995 by the International Association for the Evaluation of Educational Achievement (IEA), and it measures the knowledge and skills in mathematics and science for fourth and eighth grade students in different countries, as well as collects information about educational contexts that may be related to students achievement (Provasnik, et al, 2016). The latest set of results from the TIMSS 2015 data focuses on mathematics knowledge and skills to compare the competencies of students in fifty-six countries. the main benefit of using TIMSS 2015 is that it provides a compare between students' in mathematics and science at knowledge and skills in the same

age, as well as clarify affected it by different factors such as teacher and parents' qualifications. Another benefit is its large- scale accessibility, which provides adequate thousands of student data to estimate and evaluate models. In the present study, we make use of Nordic and Gulf countries data from the 2015 assessment. In the TIMSS data, fourth grade and eight grade students were selected in the procedure. Importance of the data that was collected about fourth graders is the fact that they are still at the basic stage of learning process. On the other hand, the significance of the students of the eighth grade is the complete opposite, which is the fact that they are at the critical stage of growing up, when their mind and way of thinking is changing and developing. What is important to mention is that the only countries from the Nordic group that were participate in the assessment of eighth grade were Norway and Sweden. Whereas, all countries participated in grade four. Therefore, to narrow the focus in this thesis, grade four was selected in two groups of countries for the assessment in TIMMS data 2015 - Nordic and Gulf countries.

TIMSS data was collected from students, teachers, parents and schools. The current thesis uses information from different questionnaires from teacher and parent, as well as TIMSS mathematics test. In TIMSS dataset several variables were collected using questionnaires and tests on several countries. The dataset includes demographic, SES and student mathematics achievement. It is worth to mention, that these tools are used to measure various variables, However, the current study used particular variables that may answer the proposed questions, not all measured variables by the TIMSS instrument. These variables are:

a) Student achievement test that collected information about overall score of mathematics achievement for each student, which is reported using five so called plausible values (PV).
b) TIMSS teacher questionnaire collects information about background, and preparation of teachers; also asks about instructional activities and collects information about the

classroom context and the topics taught to students. Nevertheless, in this thesis I focused on teachers' formal competence, which are certification status and area of specialization.

c) TIMSS home questionnaire that collects information about involvement and parents support to student, also asks about educational background and attitude toward education in mathematics and science. However, this study was focused on level of education of parents.

Sampling and sampling strategy in TIMSS 2015

In this thesis, the first sampling technique were used to select the countries, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and The United Arab Denmark, Finland, Sweden and Norway. The IDB analyzer module was used to select the countries for this study. The second phase of this study, since the main focus was on teachers, aggregated student achievement on teacher level to be able to study each teachers' effect on his or her students. Another option for the research would be multilevel modelling. The aggregated student achievement variable was checked for normality (e.g., using Kolmorogorov-Smirnov test) and it was approximately normally distributed in all countries.

The following table (1) illustrated that the sample study includes 4962 teachers and 111427 students in Nordic and Gulf Countries.

Table 1 Number of Teacher and Student Sample in Nordic and Gulf Countries

Country	Teacher (N)	Student (N)
Bahrain	445	8292
Denmark	305	5897
Finland	400	6550
Kuwait	587	7615
Oman	581	15304
Norway	280	6502
Qatar	407	9479
Saudi Arabia	374	8674
Sweden	233	5467
United Arab Emirates	1350	37647

Variables of study

TIMSS data was collected from students, teachers, parents and schools. The current thesis uses information from different questionnaires from teacher and parent, as well as TIMSS mathematics test. In TIMSS dataset several variables were collected using questionnaires and tests on several countries. The dataset includes demographic, SES and student mathematics achievement. It is worth to mention, that these tools are used to measure various variables, However, the current study used particular variables that may answer the proposed questions, not all measured variables by the TIMSS instrument. These variables are:

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c) TIMSS home questionnaire that collects information about involvement and parents support to student, also asks about educational background and attitude toward education in mathematics and science. However, this study was focused on level of education of parents.

TIMSS produced five plausible values (PV) of mathematics achievement for each student. Only the first value in TIMSS was used because there are no significant differences or superiority among all plausible values (Wang, 2001). The first plausible (PV1) used in this thesis is conciliating with the value used in TIMSS report. All variables that were analyzed in this thesis are presented in following.

Student achievement

Student achievement is students' score on a standardized test or a students' grades in their classes (Hayward, 2010). In this thesis, the student achievement defined as the dependent variable is the first plausible value (1st Plausible Value Mathematic) of the fourth grade in mathematics achievement test.

Teachers' educational level in TIMSS

In this thesis, teacher is defined as one who holds a teaching certificate and is well qualified in the area of specialization. In TIMSS original data, there are seven choices within teacher education level:

1) Did not complete upper secondary
2) Upper secondary

3) Post-secondary non tertiary
4) Bachelor or equivalent
5) Master's degree
6) Doctorate degree

The majority of teachers in all countries held a bachelor's degree or equivalent; however, the surprising point is that Saudi Arabia country has around 35% of math teachers who did not complete upper secondary or only have post-secondary non-tertiary. On the other hand, Kuwait, Qatar, Sweden and United Arab of Emirates have teachers with doctoral degree and equivalent, however, it is of a lower percentage. Since some categories only included few teachers (some countries have only one case of teacher who did not complete upper secondary or have post -secondary non tertiary as well as one case with doctoral degree) I categorized them in three categories:

- Less than bachelor
- Bachelor or equivalent
- Master's degree or higher

- While not all the countries had many teachers with a master's degree, I considered information about teachers having a master level degree important. Teachers in Finland are often highlighted as they are required to have a Master and therefore it is justified to see if it makes a difference in the other countries. Initiatives for teacher to have a master's degree can be found in Norway where this is visualized as the ideal and future goal (Malinen, Väisänen & Savolainen, 2012).

Regarding teachers' certification I considered two categories: those with math and education subjects' teacher and those without. A dichotomized variable was thereby created:

- Education or math major (Yes)
- Others (No)

In Table 2 below, descriptive statistics for the two variables are presented.

Table 2 Descriptive statistics for teacher Qualification in all Nordic and Gulf countries

Variable name	label	N	Min	Max	M (SD)
TeachEduLvl	Level of formal education completed	4165	1	3	2.98 (0.38)
TeachMathEduSpec	Education or math specialty	4498	0	1	0.78 (0.41)

Parents' highest education level in TIMSS

Parents' qualifications are the level of education of parent that will be measured by considering the highest educational certificate obtained by the father or mother in the family during lifetime (Abu Bakar , Mamat, & Ibrahim, 2017).In TIMSS there are five choices in parents education level:

1) University or higher
2) Post-secondary but nor university
3) Upper secondary
4) Lower secondary
5) Some primary, lower secondary or no school

When it comes to parents' degree level in Nordic countries, more than half of them have a university degree or higher, since percentages are 64%, 51%, 65%, 52% for Denmark, Finland, Norway, and Sweden respectively.

While in Gulf countries, even that the majority of parents have university degree or higher, less than half of them actually have it, since the percentages are 39%, 35%, 54%, 66%,46%, and 59%for Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab of Emirates respectively. Parent questionnaire provided information about their education level (e.g. the parents have no completed secondary school, have secondary or post-secondary school and bachelor's degree or higher) and was categorized:

- Lower than secondary school
- Secondary or post-secondary but not bachelor
- Bachelor's degree or higher

In Table 3 below, descriptive statistics for parents' education level are shown.

Table 3 Descriptive statistics for Parents Qualification in all Nordic and Gulf countries

Variable name	label	N	Min	Max	M (SD)
ParEduLvl	Parent education Level	90329	1	3	2.367 (0.716)

Statistical analysis

Data was primarily analyzed by means of ANOVA and regression techniques. Continuous variables were recorded as a mean of standard deviation. Categorical variables were presented as frequencies and percentage. Bivariate variables were performed using t-test, ANOVA. A Linear regression model was constructed to identify parameter affecting the dependent variable (student achievement). The following independent variables were evaluated: countries (Nordic and Gulf), teacher education level (e.g., whether they have less than bachelor and bachelor level and master's degree or higher),Teachers specialization (e.g., whether they have education or math) and parents education level (e.g. the parents have no completed secondary school, have secondary or post-secondary school and bachelor's degree or higher)

Results from the analyses were expressed as coefficients with 95% of confidence and interaction between independent variables and explored the level of significance that was set to $P > 0.05$.

To achieve the research goal, statistical package for the Social Science (SPSS) was used for preparing and analyzing the data.

Procedure that I used are:

1- Frequencies and Percentage

2- The t-test is used to compare means of two groups (Kim, 2015).

3- ANOVA analysis of group variance of measurable models (for example, the "variety" among and between groups). It is used to dissect the distinctions among gathering implied in an example. Analyst and developmental scholar Ronald Fisher created ANOVA analysis test. The one-way ANOVA test is used for multi-category variables.

4- Multiple linear regression includes all independent variables that may have a direct rule or indirect effect on the dependent variable. It is an appropriate method if the dependent variable is continuous (Bryman & Cramer, 2011).

Reliability and validity

According to National Center of Education (NCES) (2015), TIMSS mathematics test used both multiple choice and constructed items to ensure the consistency of data. As it was reported, the reliability of data was ensured by carefully constructing the items and analyzing them by national research coordination teams (NCES, 2015). The items, rubrics and protocols of the survey were revised accordingly. The current study uses TIMSS 2015 data, which thus has already been validated and ensured with reliability. Therefore, the present study will implement the measures and test that complies with the type of retrieved data and the objectives of this study. Validity is ensured when collecting large number of data among recruited samples recruited from different parts of the world. This will allow generalizing the results on wider population group. It is considered that the study ensures reliability and validity.

Ethical consideration

One of the principles that the researcher should implement is ethics, which is considered to provide assurance that the research will not cause any harm to those who participate in the study. It is therefore essential that the researcher carefully considers the rules of ethics. The major ethical issue for large-scale assessments, such as TIMSS, is to manage the privacy and confidentiality of the data that is collected for the study. This is what should be thought about considered during the data collection of the original data. The data should not contain any identifying information about teachers or students, as well as their parents. Since the present study is a secondary analysis it would significantly reduce the scope of ethical considerations to be embedded in the research planning and execution. This does not mean that it is less important, but the secondary data of the research eliminates the necessity to take measures to assure the recruitment and participants, even though it is protecting their confidentiality and anonymity. The retrieval of the required data from a free repository of public disclosure (TIMSS) mitigates the need to request permission from the data collector to use the findings for other research purposes. The study is focusing on student achievement and its relation to teachers and parents' education level. Nevertheless, teachers and parents' education levels alone are not the only factors that play a role on the student achievement level. By considering only the mentioned variables, an ethical issue might be brought by misinterpreting the findings to the readers or communities that the students' achievements are referred to. In summary, the three major ethical concerns in this study will be: the honest and respectful use of TIMSS information; clarity regarding ideas drawn from prior research to avoid any information misuse or misinterpretation; a clear indication of the authorship and ownership of the data source.

7 Results

In this chapter, the analyses are presented in two steps with statistics, diagrams and tables. The first part presents teachers' education level, teachers' specialization and parents' education level. The second part is a comparison between Nordic and Gulf countries.

Descriptive findings:

Teacher education level

Teachers' education levels in Nordic and Gulf countries are presented in Figure 1. In all the countries of both groups the majority of the teachers hold a bachelor's degree or equivalent. The only exception is Finland, where the master's degree is more common to be held on the position of a teacher. On the other hand, teachers from most of the countries did not have lower education than the level of bachelor's degree. In Saudi Arabia, the percentage of teachers without a bachelor's degree was the highest among all the countries in the study. Figure 1 shows the percentage for each education level for the teachers of every country. The country that stands out is Finland on the account of the high education that teachers are required to have.

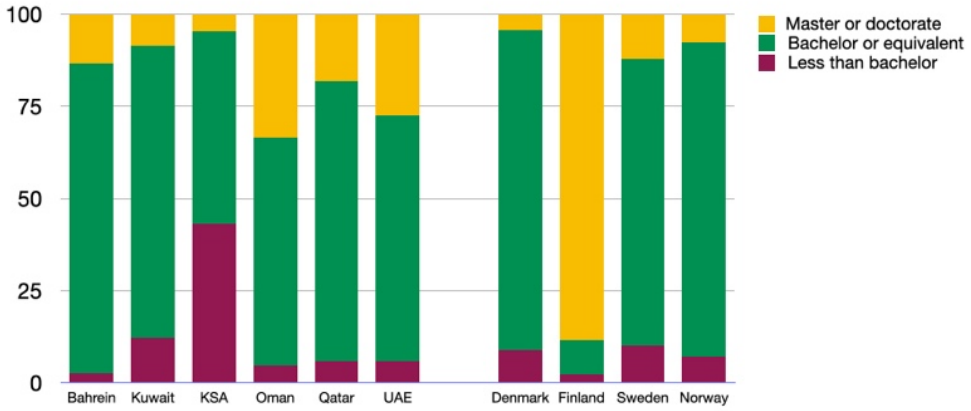

Figure 1. Percentile of the number of teachers with regards to education levels in Nordic and Gulf countries.

Teacher specialization

The majority of teachers were specialized in either math or education field. which can be seen in Figure 2. However, many of them (>25%) did not hold math nor education major in Saudi Arabia, Qatar and the United Arab Emirates.

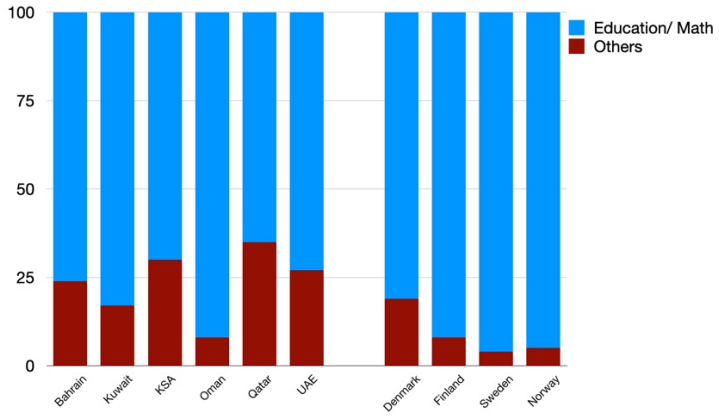

Figure 2. percentile of the number of teachers with regards to specialization (education/ Math) in Nordic and Gulf countries.

Parents' education level

Parents education levels in the Nordic and Gulf countries are presented in Figure 3. When it comes to the degree, most of the parents from both groups hold bachelor's degree or higher it, with the exception to Oman and Bahrain. Furthermore, the number of parents with secondary

education degree or below was notably lower in the group of Nordic countries compared to Arab Gulf countries.

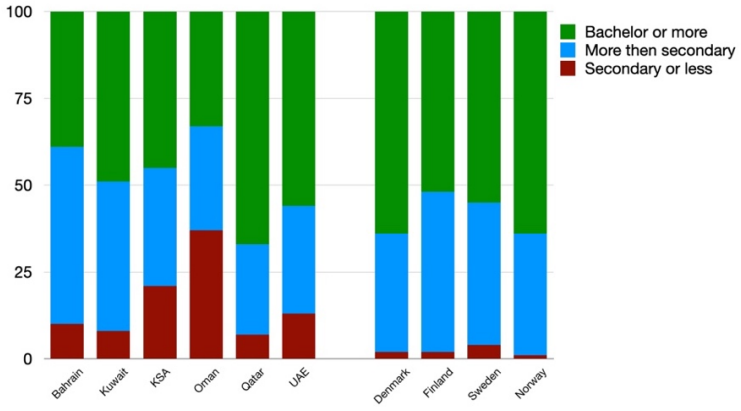

Figure 3. percentile of the number of parents with regards to education levels in Nordic and Gulf countries.

Analysis of students' achievement level

The following table (4) shows the Descriptive statistics for mathematics education for Nordic countries and Gulf countries separately.

The mean scores of mathematics achievement in Nordic countries are higher than in Gulf countries, since the average mean score in Nordic countries equals 531.46 and in Gulf countries equals 418.97. In Gulf countries the highest mean score was in Bahrain (451.06), and the lowest was in Kuwait (344.13). In Nordic countries the highest mean score was in Norway (549.93), and the lowest was in Sweden (519.63). Nevertheless, the differences between Nordic countries were not statistically significant. The overall mean score for all countries is 446.58

Table 4.Descriptive statics for mathematics education in all Nordic and Gulf countries.

Country	N	Min	Max	Mean	SD
Bahrain	445	289	611	451.06	45.451
Kuwait	587	219	523	344.13	61.080
Saudi Arabia	374	251	587	385.01	59.567
Oman	581	258	578	417.01	56.182

Country	N	Min	Max	Mean	SD
Qatar	407	291	661	434.27	63.678
United Arab Emirates	1350	256	686	446.56	78.988
Gulf Countries	3744	219	686	418.97	76.005
Denmark	305	419	618	538.69	36.964
Finland	400	364	609	519.91	45.073
Sweden	233	383	638	519.63	35.999
Norway	280	458	665	549.93	26.953
Nordic Countries	1218	364	665	531.46*	39.789

* indicates $p < 0.05$ between Nordic and Gulf countries
Mean value of mathematic achievement level in TIMSS is (500)

In the table (4) above, the numbers of students included in the study (4962) from each country are presented. The number of students included from the Gulf countries was more than three times higher (3744) than the number of students from the Nordic countries (1218). Together with those numbers, the lowest (Min) and the highest (Max) score that students attained are introduced. When it comes to the Mean Value, it represents the average of all the scores from all the students for each country separately. Mean value is the central value in the table that shows statistically significant differences between the two groups of countries. What can be noticed from the table when observing the mean value is that it shows higher mathematics achievement level in Nordic countries than in all the countries from the Gulf group. Not only that, but the mean values of each country from the Nordic group were higher even than the TIMSS overall average. On other hand, the mean values of each country from the Gulf group were lower than the TIMSS overall average.

All things considered; it can be noticed that students from Nordic countries performed better compared to the students from the Gulf countries. Standard deviation (SD) shows how many of achieved students' scores deviate from mean value. It can be understood that standard deviation was almost twice as high in the Gulf countries (76) than in the Nordic countries

(39). These results indicate that in the Gulf countries, the scores of the students were much different than the mean value (the average score), which shows a dispersing value of the student achievements, since high standard deviation shows that the results are not close to the mean value. This high SD may reflect a non-homogeneous result. On the contrary, in the Nordic countries where standard deviation is twice as low, the results can be understood as much more pleasing. Results of the students in the Nordic countries were more homogeneous regarding their achievement. This may indicate that Nordic countries have school-systems with higher equality among the students.

Teachers' education level

Mean values of mathematics achievement level with regards to teachers' education levels in countries are presented in table (5). The majority of countries had a large proportion of teachers with a bachelor's degree or equivalent. However, there were some countries that had teachers who did not have bachelor's degrees. However, they had completed their secondary school. Mathematics achievement level varies in relation to the level of teachers' education. This variation, however, was not statistically significant in the majority of countries. One-way ANOVA with post-hoc tests was used to compare the means of the studied samples from the different countries in the study and the results were included in the table (5) and table (6) and was illustrated as follows:

-In Oman there is difference in means of math scores due to level of education of teachers since the p- value equals $0.000 < 0.05$, and from Tukey's multiple comparison test – a test that can be used to determine which means amongst a set of means differ from the rest – in Table (6) , the difference between "master degree or more " and "Bachelor degree or equivalent " in favor of "Less than bachelor " .

- In Kuwait there is difference in means of math scores due to level of education of teachers since the p- value equals 0.026 < 0.05, and from Tukey's multiple comparison test – a test that can be used to determine which means amongst a set of means differ from the rest – in Table (6) , the difference between "Bachelor degree or equivalent " and "Master's degree or more " in favor of "master degree or more " and there is no difference in means of math scores for other Gulf countries since the p-value is greater than 0.05.

-In Finland there is difference in means of math scores due to level of education of teachers since the p- value equal 0.01 < 0.05, and from Tukey HSD multiple comparison in Table (6), the difference between "less than bachelor "in favor of "master's degree or higher ". Although the high percentage of teacher that were holding master's degree or more, no significant difference was found between "bachelor's degree or equivalent "and "master's degree or more ". Finally, there is no difference in means of math scores for other Nordic countries, since the p-values were greater than 0.05.

Table 5 Results of mean values (± SD) of student mathematic achievement level with regards teacher education level in all Nordic and Gulf countries. N refers to number of teachers

Country	Teacher education level	N	(%)	Mean	± SD
Bahrain	Less than bachelor	10	(2.5)	437.7	46.48
	Bachelor or equivalent	331	(84.2)	452.0	43.16
	Master or PhD	52	(13.2)	442.7	60.15
Kuwait	Less than bachelor	59	(12.2)	345.8	57.0
	Bachelor or equivalent	382	(79.1)	339.8	56.8
	Master or PhD	42	(8.6)	366.0	87.9
Saudi Arabia	Less than bachelor	116	(43.2)	382.0	60.4
	Bachelor or equivalent	140	(52.2)	384.9	54.9
	Master or PhD	12	(4.4)	390.9	67.3
Oman	Less than bachelor	23	(4.6)	460.1	56.8
	Bachelor or equivalent	305	(61.8)	420.0	54.7
	Master or PhD	165	(33.4)	401.6	59.5
Qatar	Less than bachelor	21	(5.8)	453.7	55.1
	Bachelor or equivalent	274	(75.9)	430.2	63.2
	Master or PhD	66	(18.2)	448.8	63.2
U.A.E.	Less than bachelor	62	(5.8)	452.2	60.93
	Bachelor or equivalent	707	(66.8)	443.2	77.38
	Master or PhD	289	(27.3)	460.1	87.92

Country	Teacher education level	N	(%)	Mean	± SD
Denmark	Less than bachelor	24	(8.9)	547.8	36.7
	Bachelor or equivalent	233	(86.6)	537.2	36.2
	Master or PhD	12	(4.4)	545.5	40.7
Finland	Less than bachelor	9	(2.3)	477.8	75.3
	Bachelor or equivalent	36	(9.3)	512.4	44.8
	Master or PhD	340	(88.3)	521.3	44.0
Sweden	Less than bachelor	21	(10.2)	514.1	31.9
	Bachelor or equivalent	159	(77.5)	520.2	37.6
	Master or PhD	25	(12.1)	519.3	36.8
Norway	Less than bachelor	18	(7.2)	544.2	29.0
	Bachelor or equivalent	213	(85.2)	551.4	26.9
	Master or PhD	19	(7.6)	544.8	26.0

Table 6 Tukey HSD multiple comparison due to level of education of teachers

Country	Level of education	Less than bachelor	Bachelor or equivalent	Master or PhD
Oman	Less than bachelor		40.07*	58.54*
	Bachelor or equivalent	-40.07		18.47*
	Master or PhD	-58.54*	-18.47	
Finland	Less than bachelor		-34.59	43.53*
	Bachelor or equivalent	34.59		-8.93
	Master or PhD	43.53*	8.93	
Kuwait	Less than bachelor			
	Bachelor or equivalent		6.09	-20.15
	Master or PhD	-6.09		-26.24*
		20.15	26.24*	

Teacher specialization

In order to more in-depth study the differences and characteristics of teacher quality in the different countries, I have focused on the teachers' specialization in mathematics and education. This section showed the differences of students' achievement between Gulf and Nordic countries according to specialization of teacher.

Mean values of mathematics achievement level according to teachers' specialization for fourth grade are presented in the table (7). In all countries, the majority of teachers were holding math or education degree.

Independent t-test was used to investigate the relation of the independent variable (teachers' specialization) on the dependent variable (student mathematics achievement). The following table shows how the measured differences of teacher specialization relate to the students' mathematics achievement in both Nordic and Gulf countries. teachers' specialization in math or education did not have a significant relation on student mathematics achievement in the Nordic and Gulf countries except Denmark. I have one explanation for this, this condition can be referred to the class grade and related mathematic content. Since the study considered the Grade 4, in which student is only taught fundamental mathematical operation and concepts excluding any higher-order mathematical operation. Thus, related regulations did not obey to specialization condition for hiring teachers or filling the position for 4^{th} grade mathematics teacher, for example, any science teacher can teach math for this particular grade.

Table 7. Results of mean values (± SD) of student mathematic achievement level with regards teacher specialization in all Nordic and Gulf countries

Countries	Education specialty	N (%)	Mean	± SD
Bahrain	Other	106 (25.4)	445.4	46.6
	Math or education	311 (74.5)	454.7	45.1
Kuwait	Other	97 (18.2)	345.7	68.7
	Math or education	434 (81.7)	343.4	58.5
Saudi Arabia	Other	112 (35)	388.7	52.3
	Math or education	208 (65)	383.4	59.6
Oman	Other	46 (8.4)	413.3	59.0
	Math or education	496 (91.5)	417.4	56.4
Qatar	Other	143 (36.6)	421.3	54.3
	Math or education	247 (63.3)	440.5	67.9
U.A.E.	Other	374 (30.7)	446.7	76.3
	Math or education	842 (69.2)	446.9	79.1
Denmark	Other	60 (24.3)	551.1*	35.8
	Math or education	186 (75)	534.4	35.8
Finland	Other	30 (8)	494.0	55.4
	Math or education	345(86.3)	446.9	79.1
Sweden	Other	8 (3.4)	551.1	35.8
	Math or education	200 (95.8)	534.4	35.8
Norway	Other	14 (5)	512.1	35.1
	Math or education	231 (94.5)	521.0	36.5

Parent education level

This section presents the relationship between parents' educational level and student mathematics achievement in both Nordic and Gulf countries. The positive effect of parents' education on the student mathematics achievement was detected in both Nordic and Gulf countries.

Mean values of mathematics achievement level with regard to parents' education level in all countries were presented in Table (8). There was a positive correlation between student achievement level and parent education level. The higher parents' education level was, the

better students' achievement level was. Linear regression showed a significant relation between parent education level and students mathematics achievement level. One-way ANOVA was used, and the results are included in Table (8) and Table (9) which is illustrated as follows:

There are differences in means of math scores due to level of education of parents, since the p-value equals < 0.05, and from Tukey HSD multiple comparison in Table (9) , the difference between "Bachelor's degree or more " and "More than secondary less than Bachelor's degree is " in favor of "Bachelor's degree or more " .

Table 8 Descriptive statistics of mean scores of mathematics according to level of education of parents

Country	Parent education level	N (%)	Mean	SD
Bahrain	Less than secondary	676 (9.6%)	406.8	83.9
	Secondary or post-secondary less than bachelor	3566 (50.9%)	446.1	81.9
	Bachelor or more	2760 (39.4%)	480.5	78.3
Kuwait	Less than secondary	430 (7.6%)	312.9	92.5
	Secondary or post-secondary less than bachelor	2341 (42.6%)	329.7	98.6
	Bachelor or more	2844 (50.6%)	376.6	100.8
Saudi Arabia	Less than secondary	1628 (21.1%)	367.0	93.43
	Secondary or post-secondary less than bachelor	2652 (34.4%)	382.6	86.8
	Bachelor or more	3426 (44.4%)	395.6	87.0
Oman	Less than secondary	4839 (37.1%)	397.1	98.9
	Secondary or post-secondary less than bachelor	4015 (30.8%)	426.4	98.6
	Bachelor or more	4177 (32.0%)	452.3	98.4
Qatar	Less than secondary	575 (7.9%)	377.6	85.2
	Secondary or post-secondary less than bachelor	1923 (26.7%)	408.0	88.6
	Bachelor or more	4702 (65.3%)	464.7	91.9
United Arab Emirates	Less than secondary	4016 (12.8%)	385.8	88.5
	Secondary or post-secondary less than bachelor	9868 (31.4)	421.9	93.2
	Bachelor or more	17476 (55.7%)	484.8	97.5
Denmark	Less than secondary	129 (2.4%)	498.7	69.8
	Secondary or post-secondary less than bachelor	1776 (34.1%)	528.5	70.9
	Bachelor or more	3288 (63.3%)	552.4	72.8
Finland	Less than secondary	136 (2.2%)	475.3	66.09
	Secondary or post-secondary less than bachelor	2876 (46.9%)	520.5	65.5
	Bachelor or more	3120 (50.8%)	551.1	64.9
Sweden	Less than secondary	195 (4.4%)	464.9	69.8
	Secondary or post-secondary less than bachelor	1823 (41.7%)	514.4	60.5
	Bachelor or more	2352 (53.8%)	545.7	62.2
Norway	Less than secondary	40 (1.4%)	494.3	93.7
	Secondary or post-secondary less than bachelor	967 (35.55%)	540.6	64.6
	Bachelor or more	1713 (62.9%)	579.7	65.5

Table 9 Tukey HSD multiple comparison due to level of education of parent

Country	Level of education	Less than secondary	Secondary or post-secondary but not bachelor	Bachelor's degree or more
Bahrain	Less than secondary		-39.30*	-73.71*
	Secondary or post-secondary but not bachelor	39.30*		-34.40*
	Bachelor's degree or more	73.71*	34.40*	
Kuwait	Less than secondary		-16.85*	-63.73*
	Secondary or post-secondary but not bachelor	16.85*		-46.88*
	Bachelor's degree or more	63.73*	46.88*	
Saudi Arabia	Less than secondary		-15.61*	-28.58*
	Secondary or post-secondary but not bachelor	15.61*		-12.97*
	Bachelor's degree or more	28.58*	12.97*	
Oman	Less than secondary		-29.30*	-55.13*
	Secondary or post-secondary but not bachelor	29.30*		-25.83*
	Bachelor's degree or more	55.13*	25.83*	
Qatar	Less than secondary		-30.44*	-87.09*
	Secondary or post-secondary but not bachelor	30.44*		56.64*
	Bachelor's degree or more	87.09*	56.64*	
United Arab Emirates	Less than secondary		-36.11*	98.94*
	Secondary or post-secondary but not bachelor	36.11*		-62.82*
	Bachelor's degree or more	98.94*	62.82*	
Denmark	Less than secondary		-29.78*	-53.66*
	Secondary or post-secondary but not bachelor	29.78*		-23.88*
	Bachelor's degree or more	53.66*	23.66*	
Finland	Less than secondary		45.16*	-75.74*
	Secondary or post-secondary but not bachelor	45.16*		-30.58*
	Bachelor's degree or more	75.74*	30.58*	
Sweden	Less than secondary		-49.45*	-80.76*
	Secondary or post-secondary but not bachelor	49.45*		31.30*
	Bachelor's degree or more	31.30*	80.76*	
Norway	Less than secondary		-46.29*	-85.37*
	Secondary or post-secondary but not bachelor	13.79*		21.44*
	Bachelor's degree or more	-7.65*	-21.44*	

Teacher quality and parent highest education

Multiple linear regression analysis was used to investigate the effects of teacher quality and parent education level as independent variables and student achievement as depended variable.

The following table (10) shows the regression analysis among teacher quality, parent education level and student achievement for the Nordic and Gulf countries separately.

First, the regressions were evaluated by means of the R^2 value and ANOVA. The values of R (correlation coefficient) for the ten countries equals R=.154, R=.202, R=.020, R=.042, R=.331, R=.415, R=.197, R=.224, R=.428 and R=.158 respectively for Bahrain, Kuwait, Saudi Arabia, Oman, Qatar, United Arab Emirates, Denmark, Finland, Sweden, Norway,. Thus, the explained variance was very low for some countries. In the ANOVA it was also shown that the regression was not significant in the majority of the countries in teacher education level and specialization. The model for these countries indicates that most of the variance was not possible to explain by the independent variable.

Finland and Oman were the countries where teacher qualification had significant impacts on student mathematics achievements. Whereas, the rest of the countries did not show significant impacts on the student achievement. In order to provide the full details of the regression model, the coefficient of model calculated for ten countries is shown in the following table10. The table shows three characteristics of teacher qualifications - the completed level of formal education, and the specialization, and parents' highest education level.

It was observed that in Finland, the relationship between teacher quality and student achievement was ($p<.05$). This shows that classrooms with a teacher with a higher degree of specialization have higher mathematics achievement.

Table 10 Coefficients for Model (Teacher Quality and Student Mathematical Achievement)

Countries		**Unstandardized Coefficients**		**Standardized Coefficients**	**T**	P value
		B	**Std. Error**	**Beta**		
Bahrain	(Constant)	311.3	45.01		6.91	.000

	level of formal education completed	4.95	14.35	.016	.345	.730
	specialization	10.79	5.12	.099	2.10	.036
	Parent highest education level	50.15	6.21	.380	8.07	.000
Kuwait	(Constant)	167.8	33.714		4.98	.000
	level of formal education completed	-11.22	8.855	-.54	-1.26	.205
	specialization	3.205	6.937	.020	.462	.644
	Parent highest education level	84.392	8.077	.447	10.44	.000
Saudi Arabia	(Constant)	335.67	31.94		10.507	.000
	level of formal education completed	1.038	8.235	.009	.126	.900
	specialization	-2.99	8.235	-.025	-.368	.714
	Parent highest education level	21.767	25.234	0.044	0.862	.044
Oman	(Constant)	499.81	41.2		12.109	.000
	level of formal education completed	-45.54	13.12	-.158	-3.470	.001
	specialization	19.106	9.710	.091	1.968	0.050
	Parent highest education level	17.124	6.358	.127	2.693	.007
Qatar	(Constant)	187.51	49.92		3.756	.000
	level of formal education completed	-5.702	14.82	-.017	3.756	.102
	specialization	7.434	5.828	.057	-.385	.203
	Parent highest education level	101.298	8.108	.562	12.494	.000
United Arab Emirates	(Constant)	110.984	28.986		3.829	.000
	level of formal education completed	3.627	8.667	.010	.418	0.676
	specialization	.579	4.144	.003	.418	.676
	Parent highest education level	133.704	4.995	.644	26.76	.000
Denmark	(Constant)	150.226	16.307		.062	.000
	level of formal education completed	21.33	4.914	.062	4.341	.213
	specialization	20.123	2.931	.101	9.212	.005
	Parent highest education level	29. 76	3.071	.432	30.210	.000
Finland	(Constant)	228.88	70.89		3.228	.001
	level of formal education completed	31.600	22.718	.064	1.391	.005
	specialization	24.439	7.343	.151	3.287	.001
	Parent highest education level	71.582	7.561	.433	9.467	.000
Sweden	(Constant)	283.312	32.418		8.739	.000
	level of formal education completed	5.771	7.926	.040	8.739	.467
	specialization	.866	10.990	.004	.079	.937
	Parent highest education level	89.831	7.559	.655	11.883	.000
Norway	(Constant)	407.919	27.043		15.084	.000
	level of formal education completed	9.864	6.528	.089	1.511	.132
	specialization	5.719	6.976	.049	.820	.413
	Parent highest education level	41.438	6.273	.393	6.606	0.000

a. Dependent Variable: student achievement

-As it can be noticed in table10, the significant value for level of completed formal education variable was less than 0.05 in Finland and Oman countries. While specialization variable was less than 0.05 in Denmark and Bahrain, only with P value = 0.005. This may indicate that teacher quality impact student achievement in Finland, Oman, Denmark and Bahrain.

-As shown in table 10, Parents' Highest Education Level for all countries were statistically significant with $p<0.05$. This indicated that Parents' Highest Education Level impacts student mathematics achievements in all ten countries.

Comparisons between Nordic and Gulf countries

To have more comprehensive viewpoint, this section showed the differences of student achievement among the ten countries. By analyzing the student achievement in mathematics, it was notes that all of countries had approximately normal distribution of their student achievements in TIMSS 2015. In order to study the difference between students of each country, two tests were performed - Independent sample t-test and one-way ANOVA analysis test.

Independent Sample T test was used to compare mathematics achievement between Nordic and Gulf countries. The result illustrated in Table (11) shows that the p- value < 0.05, and the absolute value of t test = 66.723 > 1.96 SD, which means there is a difference in mathematics achievement between Nordic and Gulf countries and the difference is in favor of Nordic countries.

Table 11 Independent Samples Test for differences in mathematics achievement between Nordic and Gulf countries

Field	Country	N	Mean	Std. Deviation	T	P-value
Mathematics achievement level	Gulf	3744	418.9	76.0	-66.723	0.001
	Nordic	1218	531.5	39.8		

One-way ANOVA was used to explore the differences between the countries when it comes to mathematics achievement levels. There is a difference in means of math scores between the countries since the p- value < 0.05. From post hoc multiple comparison is in table (12), and the differences between countries for the cells are marked with an asterisk where there were a significant difference.

Table 12 Independent Samples Test for differences in mathematics achievement between Nordic and Gulf countries

Mean difference	Bahrain	Kuwait	Saudi	Oman	Qatar	UAE	Denmark	Finland	Sweden	Norway
Bahrain		106.9*	66.0*	34.1*	16.8*	4.5	-87.6*	-68.9*	-68.6*	-98.9*
Kuwait	-106.9*		-40.9*	-72.9*	-90.1*	-102.4	-194.6*	-175.8*	-175.5*	-205.8*
Saudi	-66.0*	40.9*		-31.9*	-49.3	-61.6*	-153.7*	-134.9*	-134.6*	-164.9*
Oman	-34.1*	72.9*	32.0*		-17.3*	-29.6*	-121.7*	-102.9*	-102.6*	-132.9*
Qatar	-16.8*	90.1*	49.2*	17.3*		-12.3*	-104.4*	-85.6*	-85.4*	-115.7*
UAE	-4.5	102.4*	61.6*	29.6*	12.3*		-92.1*	-73.4*	-73.1*	-103.4*
Denmark	87.6*	194.6*	153.7*	121.7*	104.4*	92.1*		18.8*	19.1*	-11.2
Finland	68.9*	175.8*	134.9*	102.9*	85.6*	73.4*	-18.8*		0.3	-30.0-*
Sweden	68.6*	175.5*	134.6*	102.6*	85.4*	73.1*	-19.1*	-0.3		-30.3*
Norway	98.9*	205.8*	164.9*	132.9*	115.7*	103.4*	11.2	30.0*	30.3*	

Summary of the results

The descriptive analyses showed that teachers' education levels in Nordic and Gulf countries, the majority of the teachers hold a bachelor's degree or equivalent. Except Finland, where the master's degree is more common. However, the surprising point that in Saudi Arabia, teachers that hold less than bachelor's degree were the highest among all countries. It was almost about 50% of all teachers in Saudi. Parents with education level less than secondary school in Gulf countries was greater than those in Nordic countries.

The regression model showed that neither teachers education level nor teachers' specialization were affecting the student mathematics achievement level in none of countries except Oman and Finland where parental education was under statistical control. Parents' education level was strongly related to student mathematics achievement level in all countries. Students who come from families where both parents had lower education than secondary school showed lower results and had lower mathematics achievement level. On the other hand, the students from the families where parents had a bachelor degree or higher education level, always achieved better results and had higher mathematics achievement level.

8 Discussion

The aim of this thesis was to investigate the relationship between teachers' qualifications and parents' education on student mathematics achievements between the Nordic and Gulf countries. According to previous research, there are no studies that have investigated the representative variables in the Arab Gulf and Nordic countries.

In this section results from the research are discussed in terms of teachers' qualifications and parents' educations affects students' mathematics achievements and the differences in education systems and culture background between Nordic and Gulf countries. This section discussed the main research question distinctly.

"What is the relationship between teacher qualifications, parent qualifications and student mathematics achievement in Nordic countries and Arab Gulf countries?"

Teacher qualifications

The results of the study showed that only in two countries teacher qualifications had statistically significant impacts on student mathematics achievements. The results from just two countries out of ten, showed that teacher quality impacts their student achievement, which is agreed with the study results of (Levpušček et al, 2013), which emphasized that there is an indirect effect of teachers' performance on student achievement. The indirect effect is associated with the weak relation between teacher quality and student achievements outcomes. Also, in the synthesis research by Goe (2007) it is mentioned that teachers' education level and specialization of teachers and content knowledge is more important in secondary school than in primary school.

On the other hand, the differences related to teacher quality cannot be neglected as they provide in-depth understanding of the relationship between the teachers' quality and students' achievements. In terms of specialization, the highest percentage of having specialized mathematics teachers was in Finland (86.3%). Finland also has the highest percentage of teachers with master's degree too (88%). This explains the significant relationship between teachers' qualifications and students' achievement.

While, Saudi Arabia had the lowest percentage of teachers with a bachelor or master's degree (43.6%). This showed a relation between teachers' quality and students' achievements, but statistically it is a weak relationship. However, this number is large compared to other countries. The explanation of such number can be referred to the employment procedures and policy, these teachers are employed within an old version of employment regulations, and they did not replace yet (retired). Agree with Shulman theory, the quality of teacher defined by his acknowledgment in content and pedagogy, thereby, teachers, who did not complete upper

secondary and have higher experience, have higher acknowledgment in content and pedagogy, in turn, higher student achievement. The same explanation can be made for Oman since the favor of difference is back to teachers who have a bachelor's degree.

When it comes to other countries (Bahrain, Kuwait, Norway, Saudi Arabia, Sweden and United Arab Emirates) the differences due to teachers' quality (specialization and education level completed) are not statistically significant as the results show. It is worth to mention that these countries conduct various genre of teacher training such as pre-service training, during service training and so forth. It can be concluded that these training programs may eliminate the differences in terms of specialization or educational degree level of teachers. The results of Wong (2004) are in line with this result; the training programs contribute to the education of teachers and help reduce the differences between them. In the same context, Harris and Sass (2011) found a positive relationship between teachers' training and productivity- that both positively impact the students' achievement.

Based on the results, it can be concluded that the training programs (pre-service and during service) enriches the acknowledgment of the teachers in both subject content and pedagogy. The student achievement assumed to be relevant as shown in the study of (Zanini & Benton, 2015). These results accommodate with the result of Yavuz et al., (2017) which analyzed TIMSS (2007 and 2011) data and found that there is no significant relationship between students' mathematics achievement and teachers' collaboration in improving teaching.

Parents' education level

As results show, Parents' Highest Education Level had a significant impact on student achievement in all ten countries. The results showed that the number of parents with higher education levels in Nordic and Gulf countries are relatively high except in Oman.

Parents' education level is significantly positively related to student mathematics achievement and this factor is noticed to significantly vary across population in schools. This indicates that the achievements of many students appear to be dependent on other factors than their parents' level of education. These results are common in traditional mathematics achievement literature (Education Matters, December 2004).

The results of this study agree with the results of aforementioned studies such as McNeal (2014) and Brecko (2004) in which it is confirmed that parents' involvement influences students' attitudes and behaviors, thereby indirectly affects student achievement. Nevertheless, Antonijević (2017) study is concluded there is the stable relation between parental influence and student achievement. In counter, Izumi (2013) study indicated that there is no systematic relationship between parental involvements and test scores from their children.

Parents' education

The results indicated that there are significant differences among all the educational level groups in all countries. It is noticed that the respondents with different educational levels have the same student mathematical achievement rate. These findings explain that good education Level of Parents has the potential to help increase student mathematics achievement.

The results also showed that the majority of parents' degree level in Nordic countries was university or higher degree, while in Gulf countries, the percentage of parents who had university degree or higher was lower than 50% of all educated people. did not exceed the half portion. Thus, the parents' degree level of education in Nordic countries is greater than the Arab Gulf countries. This indicates that the families participating in the study had a sufficient educational level, either the university or higher degree. This fact leaded them to achieve good educational, social and economic opportunities for their children in the future. Therefore, the

overall parents' educational level of the Arab Gulf countries is lower than that in Nordic countries. This difference between Nordic and Gulf Countries in parental educational level can be explained with various factors. First, the education system in Gulf countries (most of them) is still in development and in the stage of upgrading. At the same time, in some countries, such as Oman, the education system is upgrade slowly compared to Gulf countries. Despite the large and intensive efforts, the awareness of the importance of complementarily education among Arab families is insufficient. However, the results are promising and hold the opportunity for big growth.

Conclusions

This section ends with presenting the fundamental findings for each of the research questions, and conclusions drawn and proposals for the study. In addition, it mentions some implications for future research and translation projects as well as the project's limitations.

Summary of the research

The study intends to examine the sources of the differences in mathematics achievement between both Gulf and Nordic countries, tackling two main factors, which are teachers' qualification and parents' qualification. The study selected these factors based on the last research's results that asserted the effect of the variables on students' achievement. Accordingly, any differences between two such variables can plausibly interpret the gap between both Gulf and Nordic countries. Understanding the differences related to teacher

quality and parent educational level among all countries, which simultaneously correlate to student achievement will surely help policy and decision maker to more devote on such influential factors, such as effective results.

In order to get more evidence and to understand it more accurately, TIMSS 2015 data was used for analysis, and carried out several findings. The most important findings are:

- The majority of Nordic and Arab gulf teacher held a bachelor's degree or equivalent except Finland, where the master's degree is more common.
- The overall parents' educational level of the Arab Gulf countries is lower than in Nordic countries.
- There is significant relationship between parents' highest education level and student mathematics achievement.

Limitations

The study will be limited to fourth grade students in Gulf countries and the Nordic countries in mathematics, during the TIMSS in 2015. Furthermore, the study will be limited to the degree and specialization of teachers' qualification only. It is worth to mention that TIMSS data have various defined variables for Teacher quality, but the current study is only interested in the aforementioned. The highest educational certificate held by either one of parents' without tackling both parents' qualification degree distinctly is used to measure the parents' qualification in the thesis. This study did not consider the intersection between parental education and teacher qualifications and student achievement. It may be so that parents with high education select schools where teachers have high competence or that teachers with high qualification want to work in schools where students achieve high scores. This selection mechanism can result in showing that effects of teacher qualification on student achievement is spurious, and that instead, student achievement is depending on the parental education. This

pattern can be different across countries and my future research will be devoted to studying these issues. Furthermore, for study of teacher qualification and student achievement I used aggregated data. Another option would be to use multilevel modelling and I plan to use such analytical strategy in forthcoming studies.

Implications for future research and projects

Based on the results, the researcher suggests some recommendations that aim to pay attention to the students' achievement and the factors affecting it in Gulf and Nordic countries, as the following:

- Further research will be vital for more factors of student achievement in the Nordic and Gulf countries to get results that are more generalizable.
- Conduct further study to find the intermediate variables that interpret the relations between the student achievement and teacher quality.
- Collect evidence on the indirect effect of the teacher qualification and specialization on the student achievement.
- Examine the intermediate role of parents' educational background between teacher qualification and student achievement relation.
- Collect evidence from TIMSS 2015 data, to identify the role of the teacher training on eliminating the differences in student's achievement among teachers due to the qualification and specialization variables.
- Conduct more researches to explore the factors determination in term of knowledge, ideology, and creativity for the teacher and parents' impact on student achievement.
- Expand the study sample to conclude all countries to enhance the understanding on the student achievement.

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Appendices

Appendix A: Home environment support questionnaire

20

What is the highest level of education completed by the child's father (or stepfather or male guardian) and mother (or stepmother or female guardian)?

*Check **one** circle in each column.*

	Child's father	Child's mother
a) Did not go to school	○	○
b) Some <Primary education—ISCED Level 1 or Lower secondary education—ISCED Level 2>	○	○
c) <Lower secondary education—ISCED Level 2>	○	○
d) <Upper secondary education—ISCED Level 3>	○	○
e) <Post-secondary, non-tertiary education—ISCED Level 4>	○	○
f) <Short-cycle tertiary education—ISCED Level 5>	○	○
g) <Bachelor's or equivalent level—ISCED Level 6>	○	○
h) <Postgraduate degree: Master's—ISCED Level 7 or Doctor—ISCED Level 8>	○	○
i) Not applicable	○	○

Appendix B: Teacher background questionnaire

G4

What is the highest level of formal education you have completed?

*Check **one** circle only.*

- Did not complete <Upper secondary education—ISCED Level 3> ---
- <Upper secondary education—ISCED Level 3> ---

(If you have not completed <post-secondary or tertiary education>, go to #G6)

- <Post-secondary, non-tertiary education—ISCED Level 4> ---
- <Short-cycle tertiary education—ISCED Level 5> ---
- <Bachelor's or equivalent level—ISCED Level 6> ---
- <Master's or equivalent level—ISCED Level 7> ---
- <Doctor or equivalent level—ISCED Level 8> ---

Appendix C: Teacher background questionnaire

G5

A. During your <post-secondary> education, what was your major or main area(s) of study?

*Check **one** circle for each line.*

	Yes	No
a) Education—Primary/Elementary	○	○
b) Education—Secondary	○	○
c) Mathematics	○	○
d) Science	○	○
e) <language of test>	○	○
f) Other	○	○

B. If your major or main area of study was education, did you have a <specialization> in any of the following?

*Check **one** circle for each line.*

	Yes	No
a) Mathematics	○	○
b) Science	○	○
c) Language/reading	○	○
d) Other subject	○	○