SAUDI MATHEMATICS TEACHERS' BELIEFS AND ATTITUDE TOWARDS TEACHING MATHEMATICS

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ABSTRACT

Mathematics is one of the major educational subjects in schools because of its overwhelming relevance and application to human life and progress. Mathematics is central to human development and mastery of the planet earth and beyond particularly in this age of computer and information technology. Teaching Mathematics is an endeavor that dated back three (3) millennia. For centuries, teaching and Mathematics teachers have been subjected to various forms of scholarly investigations. This study examines teachers' beliefs and attitudes and their impacts on the way they teach the subject of mathematics in their respective schools across the Kingdom of Saudi Arabia. The general objective of this study is to study mathematics teachers' beliefs and attitudes, particularly at the intermediate school level in Saudi Arabia. To achieve this objective, the study completely relies on quantitative data obtained through survey questionnaires. The study distributed 146 questionnaires (100 female 68.5%, and 46 male 31.5%) to intermediate schools' mathematics teachers based in the City of Riyadh and its surroundings, the Kingdom of Saudi Arabia. The study found that majority of the intermediate schools' mathematic teachers participating in this study expressed high agreement and high level of beliefs towards teaching mathematics. In addition, it is also discovered that majority of the mathematic teachers participating in this study expressed high agreement that their attitudes towards teaching mathematics is very high. This means that there is a statistically significant relationship between mathematics teachers' beliefs and attitudes towards teaching mathematics and the relationship is a strong and positive one. Furthermore, the study also employs t-test to examine any statistical significance between male and female intermediate schools' mathematics teachers. The results of the independent sample t-test show no statistically significant difference among both males and female's mathematics teachers in the

intermediate level of Saudi schools. Even though male mathematics teachers have higher beliefs regarding teaching mathematics than their female counterparts, the difference in the mean score of mathematics teachers' beliefs is not large enough so that the results are not statistically significant. This was also found to be the case in relation to difference of mathematics teachers' attitudes based on gender and experience. The study recommended further studies in other parts of Saudi Arabia to help in generalizing the findings of this research.

Keywords: Mathematics, Mathematics Education, Beliefs, Attitude, Saudi Arabia

Kepercayaan dan Sikap Guru Matematik Arab Saudi Terhadap Pengajaran Matematik

Abstrak

Matematik merupakan salah satu subjek pendidikan yang utama di sekolah kerana ia sangat relevan dan berguna dalam kehidupan manusia dan kemajuan hidup. Matematik merupakan pusat kepada perkembangan manusia dan penguasaan planet bumi terutama sekali di era komputer dan teknologi maklumat. Pengajaran Matematik adalah usaha yang berusia tiga (3) milenium. Selama berabad-abad, subjek matematik dan guru-guru matematik telah melalui pelbagai bentuk kajian ilmiah. Kajian ini meneliti kepercayaan dan sikap guru serta kesannya terhadap cara mereka mengajar subjek matematik di sekolah masing-masing di seluruh Arab Saudi. Bagi mencapai objektif ini, kajian bergantung sepenuhnya kepada data kuantitatif yang diperoleh melalui borang soal selidik. Kajian ini telah mengedarkan 146 borang soal selidik (100 wanita: 68.5%, dan 46 lelaki: 31.5%) kepada guru matematik sekolah menengah yang berpusat di Riyadh, Arab Saudi dan sekolah-sekolah di sekitarnya. Kajian mendapati bahawa majoriti guru matematik sekolah menengah yang menyertai kajian ini menunjukkan persetujuan dan kepercayaan yang tinggi terhadap pengajaran matematik. Di samping itu, kajian mendapati bahawa majoriti guru matematik yang menyertai kajian ini menunjukkan persetujuan yang tinggi bahawa sikap mereka terhadap pengajaran matematik sangat tinggi. Ini bermakna terdapat hubungan yang signifikan secara statistik antara kepercayaan dan sikap guru matematik terhadap pengajaran matematik dan hubungannya sangat kuat dan positif. Selain itu, kajian ini juga menggunakan ujian T untuk menilai apa sahaja hubungan statistik yang

signifikan antara guru matematik lelaki dan perempuan di sekolah menengah. Hasil ujian T sampel bebas menunjukkan tiada perbezaan statistik yang signifikan antara guru matematik lelaki dan guru matematik perempuan di sekolah menengah di Arab Saudi. Walaupun guru matematik lelaki mempunyai kepercayaan yang lebih tinggi terhadap pengajaran matematik berbanding rakan perempuan mereka, perbezaan skor kepercayaan guru matematik tidak cukup besar sehingga hasilnya tidak signifikan secara statistik. Begitu juga dalam perkara yang berkaitan dengan perbezaan sikap guru matematik berdasarkan jantina dan pengalaman. Kajian ini mencadangkan agar kajian lebih lanjut dijalankan di kawasan-kawasan lain di Arab Saudi bagi membantu menggeneralisasikan penemuan kajian ini.

Kata kunci: Matematik, Pendidikan Matematik, Kepercayaan, Sikap, Arab Saudi

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TABLE OF CONTENTS

Absract iii

Abstrak v

Acknoledgements vii

Table of Contents ix

List of Figures xiv

List of Tables xv

List of Symbols and Abbreviations xvii

List of Appendices xviii

CHAPTER ONE 1

INTRODUCTION.....1

1.1 Background of the Study.....1

1.2 Problem Statement 4

1.3 Research Objectives 10

1.4 Research Questions 11

1.5 Research Significance 11

1.6 Theoretical framework of study 13

1.7 Conceptual Framework 13

1.8 Definition of Terms 15

1.9 Conclusion.....16

CHAPTER TWO 17

LITERATURE REVIEW 17

2.1 Introduction 17

2.2 The Development of Teaching Mathematics in Saudi Arabia 17

2.2.1 The Mathematics and Science Curricula Project (2008) 19

2.2.2 The New Mathematics Curriculum 21

2.3 Teaching Mathematics in Saudi Schools 22

2.4 Theoretical of the Study 28

2.4.1 Teacher Beliefs 32

2.4.2 Teachers' Mathematics Beliefs 34

2.4.3 Teachers' Attitude 41

2.4.4 Role of Beliefs and Attitudes in Teaching Practice 41

2.5 Empirical Research in Level of Mathematics Teachers' Attitude and Beliefs 46

2.5.1 Gender and Teachers' Attitude 50

2.5.2 Gender Segregation in Saudi Arabia 51

2.6 Conclusion 52

CHAPTER THREE 54

METHODOLOGY 54

3.1 Introduction 54

3.2 Research Design 54

3.3 Research Approach....56
3.4 Sampling Method....56
3.4.1 Population....56
3.4.2 Sample Size Determination....57
3.4.3 Sampling Procedure....58
3.5 Research Instruments....58
3.5.1 Validity and Reliability....62
3.5.2 Pilot Study....63
3.6 Research Procedures....65
3.7 Data Analysis....66
3.8 Conclusion....68

CHAPTER FOUR....69

RESULTS....69

4.1 Introduction....69
4.2 Response Rate....70
4.3 Participants' Demographic Characteristics....70
4.3.1 Gender....71
4.3.2 Teachers Teaching Experience....71
4.4 Mathematics Teachers' Beliefs on Teaching Mathematics....72
4.4.1 Beliefs on Role....73
4.4.2 Beliefs in Teaching....74

4.4.3 Beliefs on Learning Mathematics 76

4.4.4 Overall Result of Teachers' Belief 77

4.5 Mathematics Teachers' Attitudes toward Teaching Mathematics 78

4.5.1 Relationship between Teachers' Beliefs and Attitudes 81

4.5.2 Difference in the Level of Mathematics Teachers' Beliefs Based on Gender 83

4.5.3 Difference in the Level of Mathematics Teachers' Beliefs Based on Experience 86

4.5.4 Difference in the Level of Mathematics Teachers Attitudes Based on Gender 90

4.5.5 Difference in the Level of Mathematics Teachers Attitudes Based on Teaching Experience 92

4.6 Conclusion 95

CHAPTER FIVE 97

DISCUSSION AND CONCLUSION 97

5.1 Summary of the Research 97

5.1.1. Level of Mathematics Teachers' Beliefs on Teaching Mathematics 98

5.1.2 Mathematics Teachers' Attitudes toward Teaching Mathematics 100

5.1.3 Relationship between Teachers' Beliefs and Attitudes 101

5.1.4 Difference of Mathematics Teachers' Beliefs Based on Gender and Experience 103

5.1.5 Difference of Mathematics Teachers Attitudes Based On Gender And Experience 105

5.2 Findings from Discussion 107

5.3 Implications 108

5.3.1 Implication to Teacher 108

5.3.2 Implication for Curriculum Developers 109

5.3.3 Implication to the Ministry of Education 109

5.4 Limitation of the Study 110

5.5 Recommendations for Further Research 110

5.6 Contribution of This Study 112

5.7 Conclusion 112

REFERENCES **114**

Appendix A 114

Appendix B 114

Appendix C 114

List of Figures

Figure 1.1	BANDORA THEWRICAL FREAMWORK	13
Figure 1.2	Conceptual Framework's Model of the Study	14
Figure 3.1	Research Design	55

List of Tables

Table 2.1	Trends in Mathematics Education and Science Study	18
Table 3.1	Krejcie and Morgan's (1970 Sample Size Guidelines	57
Table 3.2	Cronbach Alpha Value	64
Table 3.3	Data Analysis	67
Table 4.1	Summary of Data Collection and Response Rate	70
Table 4.2	Gender	71
Table 4.3	Experience	72
Table 4.4	Level of Beliefs on Role of Teaching Mathematics	73
Table 4.5	Level of Beliefs on Teaching Mathematics	75
Table 4.6	Level of Beliefs on Learning Mathematics	76
Table 4.7	The Result of the Current Level of Teachers' Beliefs on Teaching Mathematics	78
Table 4.8	Level of Attitudes towards Teaching Mathematics	79
Table 4.9	Relationship between Mathematics Teachers' Beliefs and Attitudes towards Teaching Mathematics	81
Table 4.10	Skewness and Kurtosis of Teachers' Beliefs based on Gender	83
Table 4.11	Levene's Test of Equality of Variance for Teachers' Beliefs Based on Gender	84
Table 4.12	Independent sample t Test	85

Table 4.13	Skewness and Kurtosis of Mathematics Teachers' Beliefs	86
Table 4.14	Levene's Test of Equality of Covariance for Students' Beliefs towards Mathematics based on Years of Teaching Experience	88
Table 4.15	Descriptive Statistics	89
Table 4.16	One-way ANOVA of Teachers' Beliefs in Teaching based On Experience	90
Table 4.17	Skewness and Kurtosis of Teachers' Attitudes based on Gender	91
Table 4.18	Levene's Test of Equality of Variance for Teachers' Attitudes based on Gender	91
Table 4.19	Independent Sample t-Test Regarding Teachers' Attitudes Based on Gender	92
Table 4.20	Skewness and Kurtosis of Teachers 'Attitudes based on Teaching Experience	93
Table 4.21	Homogeneity of Variance	94
Table 4.22	Descriptive Statistics for Teachers' Attitudes	94
Table 4.23	One-way ANOVA for Teachers' Attitudes	95

List of Symbols and Abbreviations

ANOVA	Analysis of Variance
ATT	Attitude
BLF	Belief
GCC	Gulf Cooperation Council
GD	Gender
H	Refers to the Hijri Islamic calendar
M	Mean
NCTM	national Council of Teachers of Mathematics
SD	Standard Deviation
SEM	Structural Equation Modelling
TALIS	Teaching and Learning International Survey
TDP	Teacher Professional Development Program
TIMSS	Trends in International Mathematics and Science Study
TPACK	Technological Pedagogical Contents Knowledge
U.S.	United States of America

List of Appendices

Appendix A Questionnaire Survey on Saudi Mathematics Teachers' Beliefs and Attitude towards Teaching Mathematics …… 133

Appendix B Request Letter Granting Permission to Conduct Research From the Education Attach office, Royal Embassy of the Kingdom of Saudi Arabia, Kuala Lumpur Malaysia …… 139

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Mathematics is one of the major educational subjects in schools which is due to its overwhelming relevance and application to human life and progress. Mathematics is central to human development and mastery of the planet earth and beyond particularly in this age of computer and information technology. It occupies a central position in the schools' curriculum of almost all countries (Menz, 2015) as it underpins all the sciences as a language and a way of thinking (Ball, 2009). This underlines the universality of Mathematics as an educational subject in all levels of education. Virtually, everyone in human society needs Mathematics, some definitely more than others. For instance, a lawyer's mathematical needs are different from that of a housewife although neither will admit to needing it much at all (Menz, 2015).

Teaching Mathematics is an endeavor that dated back three (3) millennia. Mathematical symbols and markings were found in the very ancient tablets of the Egyptians, the Babylonians, the Chinese as well as those on the Indian subcontinent (UNESCO, 1999). This is an indication that the teaching of Mathematics is one of the oldest among the subjects of school curricular. Today, Mathematics is taught at all levels of education, from primary, secondary, to the tertiary and university levels. However, there are various common problems associated with teaching mathematics around the world (Spelke, 2005). Among these problems are teachers' beliefs and attitudes towards teaching math, teachers' knowledge and experience and so on (Chinn, 2016; Charalambous, Panaoura & Philippou, 2009; Ernest, 2006; Hamadneh

& Al – Masaeed, 2015; Mazieres, 2016; White et al., 2005). For example, Hamadneh and Al – Masaeed (2015) found that there are no statistically significant distinctions in teachers' attitudes towards math because of their years of teaching, and teaching experience. Interestingly, this study also covered that teachers' attitudes towards math would be differentbecause of teacher educational qualifications, in favor of those holding diploma degrees. In a study conducted by Mazieres (2016), the finding of the research indicated that teachers' beliefs on developing knowledge are not aligned with current mathematics education thinking. Surprisingly, developing countries are claimed to have more problems in relation to teaching mathematics than their counterpart developed countries (Gezahegn, 2007). This might be as a result of the development and knowledge gap between the developed and the developing world which is not only limited to teaching mathematics but other social and educational aspects as well.

Beliefs and attitudes are very important concept when trying to understand the thought processes and classroom practices of teachers (Chinn, 2016; White et al., 2005; Charalambous, Panaoura & Phillippou, 2009). They also drive classroom actions and trigger teachers' change process (Charalambous, Panaoura & Phillippou, 2009). Teachers' beliefs and attitude stem out from their personal experiences (Stuart & Thurlow, 2000), professional experiences (Page & Clark, 2010), and formal learning experiences (Charalambous, Panaoura & Phillippou, 2009). Due to the role these concepts play in classroom practices generally and students' performance and achievement in particular, more scholarly investigations are needed particularly in the context of developing countries (Such as Kingdom of Saudi Arabia) where teaching mathematics needs improvements in order to catch up with the developed nations.

The Kingdom of Saudi Arabia is one of the countries that is keen to improve its educational sector generally and the teaching of mathematics and other science related fields in particular which is in order to meet the Kingdom's aspiration embodied in the its vision 2030 (Kingdom of Saudi Arabia, 2016). In the statement of the vision 2030, it states that the Kingdom's new vision is based upon a thriving economy that will provide opportunities for all by building an educational system aligned with market needs and creating economic opportunities for entrepreneurs; small, medium size and corporate level (Kingdom of Saudi Arabia, 2016). For this purpose, the Kingdom has assigned top priority to the improvement of its educational system generally and the educational infrastructure, teachers' personal development and ability. One of the examples of such initiative is the King Abdullah bin Abdulaziz Public Education Development Project which is tasked with the school and curriculum reform (Alghamdi & Al-Salouli, 2012). In 2006, Ministry of Education in the Kingdom made a policy to modernize public education curricula particularly mathematics and science subjects under the Decision No. 3 /b/43854 on 26/8/1425h and decision No. 7544 / m b on 22/10 / 1427h (Aseeri, 2015). The policy involved all academic levels of public education, from the first grade to the twelfth, to be modeled according to the American International Series under the specialised company McGraw Hill Education which is based on international standard (Aseeri, 2015). The Ministry of Education of the Kingdom stated that "the world is governed by the economics ofknowledge and the power of ever renewing sciences… In addition, we face a world withcomplex relationships and interactions and those who possess the knowledge, skills andwill join the march of human progress." (Ministry of Education: Saudi Arabia, 2004, p.8).

The system of education in Saudi Arabia is designed based on 6-3-3 system. This implies that children spend six (6) at primary school, three (3) years at

intermediate school and another three (3) years at secondary school (Kingdom of Saudi Arabia, 2006). In addition, there is also kindergarten school for children between the age three (3) and (5). However, attendance of kindergarten is not a requirement for admission into the first grade (Kingdom of Saudi Arabia, 2006). Hence, formal education at the Kingdom of Saudi Arabia begins at the age of six (6) where a child is required to attend primary school for six (6) followed immediately by three (3) years at the intermediate school before completing the final three (3) years at the secondary level. Mathematics subject is compulsory for students at all levels except the last two years of secondary school for those students who chose not to study natural science subjects (Alreshidi, 2016).

It is against the backdrop of the Kingdom's educational and curricular reforms in science and mathematics that this study aims at finding mathematics' teachers beliefs and attitudes towards mathematics teaching. The study will focus on intermediate school being the level that could be identified as the backbone of the Saudi educational system and also for being the level the researcher is most familiar with in terms of teaching experience. The following sections discuss the problem statement, research questions and objectives.

1.2 Problem Statement

In spite of the clear emphasis from the Ministry of Education in Saudi Arabia on the improvement of students' abilities to learn, develop higher thinking skills and communication in mathematics and the provision of high standard of quality education, Saudi students' are still under performing and underachieving in the subject of mathematics (Ministry of Education, 2007). To meet the goal set out by the Ministry of Education, additional training courses have been provided for teachers along with

the implementation of an improved curriculum in schools which were designed to improve students' performance and achievement levels in mathematics (Alreshidi, 2016; Almaleki 2010; Al-Mutairi 2006; Buthaina, 2006). However, all these have not fixed the problem of low achievement levels in mathematics nor has it changed students' reluctance towards learning mathematics in Saudi schools.

The problem of low students performance and achievement can be squarely caused by teachers' beliefs and attitudes towards mathematics (White et al., 2006). Teachers' beliefs and attitudes towards teaching mathematics is a topic that has been of concern to scholars in the field of mathematics education for long (Yates, 2006; Handal, 2003; Leder, Pehkonen, & Törner, 2002; Buzeika, 1996; Leder, 1993; McLeod, 1989, 1992). Questions such as what mathematics is, how mathematics teaching and learning actually occurs, and how mathematics teaching and learning should occur ideally, have been among the various questions raised by scholars in an attempt to deal with teachers' beliefs and attitudes in teaching mathematics (Handal, 2003; Ernest, 1989a, 1989b; Thompson, 1991). The range of mathematical beliefs of teachers is very vast due to the inclusion in its list all teachers' thoughts on personal efficacy, computers, calculators, assessment, group work, perceptions of the culture of a school, particular instructional strategies, textbooks, students' characteristics as well as attributional theory, among others (Handal, 2003). There is still the lack of clarity on whether teachers' beliefs influence instructional behavior or teachers' practices influence their beliefs (Negreiros, 2017; Buzeika, 1996). However, it has been ascertained that beliefs are resistant to change (Kagan, 2010) and they function as filters to new knowledge (Galvis, 2012) and often serve as barriers to change in teaching practices (Fullan & Stegelbauer, 2016).

Some argued that knowledge and beliefs are inextricably interconnected and that beliefs have strong effects on individual's behavior (Galvis, 2012). It has been noted that there is a failure in mathematics curriculum reform worldwide (Battista, 1994) which stems from the lack of compatibility "between the intent of the curriculum innovation and teachers' pedagogical knowledge, beliefs and practices…" (Yates, 2006, p. 433). This shows how significant teachers' beliefs and attitudes towards teaching mathematics is.

The issue of teachers' beliefs and attitude is a concern everywhere due to its central role in teaching practices of mathematics (Hendal & Herrington, 2003; Kagan, 2010; Galvis, 2012). The way teachers implement new methods, curriculum or programs in their classrooms depends largely on whether their beliefs and attitudes towards teaching mathematics is compatible with the newly proposed methods, curriculum or programs (Kagan, 2010; Galvis, 2012). Thus, beliefs and attitudes have significant impact on teachers' classroom practice, the way they perceived teaching, learning and assessment, and also the ways they perceive students' potential, abilities, dispositions, and capabilities (Barkatsas & Malone, 2005).

Different beliefs and attitudes of teachers affect the way they teach their subjects, particularly in the subject of mathematics. Students as learners and receivers of the product of knowledge from the teacher always are at the receiving end (Ernest, 2006; White et al., 2005). This means that beliefs and attitudes of teachers are likely to affect teachers' performance which is one of the motivating factors that pushes the researcher towards investigating the phenomenon. Thus, beliefs and attitudes of teachers towards teaching, particularly in teaching mathematics, is an issue that requires constant investigation due to the nature of beliefs and attitudes, as they are susceptible to change every now and then. For example, a teacher can have a certain

beliefs today on how to teach mathematics, what mathematics is supposed to teach, the idle way of teaching it and so on. The person can chose to change such beliefs within short period of time which will have implications on how the teacher continues his teaching of the subject and, by extension, will have implication on the performance of the students (Barkatsas & Malone, 2005).

A number of studies investigated teachers/students' mathematics beliefs and attitude, and teachers' performance or achievement. For instance, Ransome, Mohamed and Bridgemohan (2016); White et al. (2006); Beswick, Watson and Brown (2012); Macnab (2003); Negreiros (2017); Smith (2014); Liljedahl and Oesterle (2014); Zumbrun (2015); Karatas (2017); and Lamichhane (n.d) all studied various dimensions of mathematics' teachers beliefs and attitudes in various contexts. Despite many studies conducted on beliefs and attitudes in teaching mathematics in many contexts, not many studies found to have been carried out in the context of Saudi Arabian. However, some few studies were conducted in relation to teaching mathematics in Saudi Arabia. For example, Alharbi &Yang (2018) studied the problem of lack of motivation among Saudi students to study mathematics. In addition, there are other aspects of mathematics education studied by other studied such as perception of using social media (Albalawi, 2017), mathematics pre-service teachers' perceptions and practices of integrating technology (Alblaihed, 2016), problem-based learning of mathematics in Saudi Arabia (Alreshidi, 2016). In spite of their commendable efforts, none of these studies investigated the impacts of beliefs and attitudes in teaching mathematics in Saudi Arabia, particularly at the intermediate school level.

In Saudi Arabia context, the findings of previous studies revealed teachers' attitudes towards teaching mathematics were positive (Alharthi & Evans, 2017;

Hamadneh & Al-Masaeed, 2015; Mousa, 2016). However, teachers did not support co-teaching as a model for inclusion and they do not agree that they should share the responsibilities of regular education classrooms (Alharthi & Evans, 2017). Likewise, a large number of Saudi Mathematics educators concentrate on progressing their students through the textbook's exercises without proposing them chances for dialogue, even with the new textbook (Alanazi, 2016). Interestingly, by using e-learning, Albalawi (2013) found that there were no statistically significant differences in female math teachers toward e-learning when examined for the variables of academic degree, years of teaching experience, computer course training, and computer lab availability in Saudi Arabia. Moreover, there were no significant differences between teachers' attitudes according to their demographic attributes (i.e., gender, years of experience, qualification, they had worked as general education teachers, service delivery model) (Alharthi & Evans, 2017).

Several factors are likely to affect beliefs, attitudes and teachers' practices particularly in the field of mathematics. Some literatures on beliefs, attitudes and practices have identified gender as one of the factors affecting beliefs, attitudes and teaching practices of mathematics teachers (Samuelsson & Samuelsson, 2016; Ajai &Imoko, 2015; Ramtu, 2014; Zogheib, Zogheib & El Saheli, 2015). These studies have argued that gender differences affect teachers' practices. The Kingdom of Saudi Arabia has always been a society where differences of gender play a vital role in its social affairs. In a report published by Federal Ministry for Economic Cooperation and Development in 2014 on early mathematics education in the Arab countries showed that Saudi Arabia ranked 45 out of 50 countries, scoring 410 in mathematics average score. More importantly, there was a significant difference in terms of gender with the female score at 418 whereas their male counterpart scored 402 indicating 16 gender

differences according to the test (Matar & Brombacher, 2013). The effects of gender representation in Saudi Arabian in the context of mathematics teaching was noted by Aseeri (2015) who found that gender has a positive relationship with the extent of mathematics and science teachers' practices of professional development activities. Thus, whether gender differences affect teacher's practices directly or perhaps its influence is mediated by beliefs and attitudes is part of what this study intends to investigate particularly at the intermediate schools' level in Saudi Arabia.

In addition, teachers' experience is another factor often associated with teachers' beliefs, attitudes and practices (Zogheib, Zogheib & El Saheli, 2015; Chval et al., 2007; Page & Clark, 2010). Some argued that teachers' beliefs and attitudes are being formed from their teaching experiences and then translated into teaching practices (Page & Clark, 2010). It is therefore worthwhile to investigate the relationship between teachers' experiences and their beliefs, attitudes and practices of teaching mathematics particularly in the context of the intermediate schools' level of education in the Kingdom of Saudi Arabia.

On the basis of the stated significance of teachers' beliefs and attitudes, it is therefore relevant to investigate such problems in relation to teaching mathematics in a country like Saudi Arabia where the government has made great efforts and investments in education envisioned in its vision 2030. The system of education in the Kingdom is accused of being embedded in teacher-centered approaches and memorization of content knowledge (AlGhamdi & Al-Salouli, 2013). Understanding teachers' beliefs, values and attitudes are considered important factors that influence implementation, classroom teaching practices as well as student learning (AlGhamdi & Al-Salouli, 2013). Since the Saudi lower level of education is made up of three levels, this study focuses on intermediate schools from the ages 12 – 15. The study

investigates teachers' beliefs and attitudes at the intermediate schools' levels across the Kingdom of Saudi Arabia. In addition, it also investigates issues, beliefs and attitudes of mathematics' teachers based on gender and experience.

1.3 Research Objectives

The general objective of this study is to study mathematics teachers' beliefs and attitudes, particularly at the intermediate school level in Saudi Arabia. Other specific objectives of the study are:

1. To investigate level of mathematics teachers' beliefs on teaching mathematics at the intermediate schools in Saudi Arabia.
2. To investigate level of mathematics teachers' attitudes towards teaching mathematics at the intermediate schools in Saudi Arabia.
3. To determine the relationship between mathematics teachers' beliefs and attitudes, at the intermediate schools in Saudi Arabia.
4. To determine any significant difference in mathematics teachers' beliefs based on gender.
5. To determine any significant difference in mathematics teachers' beliefs based on teaching experience.
6. To determine any significant difference in mathematics teachers' attitudes based on gender.
7. To determine any significant difference in mathematics teachers' attitudes based on teaching experience

1.4 Research Questions

To achieve the aforementioned research objectives of the study, the following research questions are raised:

1. What are mathematics teachers' beliefs on teaching mathematics?
2. What are mathematics teachers' attitudes toward teaching mathematics?
3. Is there any statistically significant relationship between teachers' beliefs and attitudes?
4. Is there any statistically significant difference in the level of mathematics teachers' beliefs based on gender?
5. Is there any statistically significant difference in the level of mathematics teachers' beliefs based on teaching experience?
6. Is there any statistically significant difference in the level of mathematics teachers' attitudes based on gender?
7. Is there any statistically significant difference in the level of mathematics teachers' attitudes based on teaching experience?

1.5 Research Significance

This research is significant in many folds. Firstly, it is significant academically as it attempts to fill in a gap within the existing literature of mathematics education generally and mathematics education at intermediate school in Saudi Arabia in a specific way. This is significantly needed given the fact that Saudi Arabia is a developing country that aspires to become one of the developed nations latest by 2030. As pointed out earlier under the introduction section of this chapter, in pursuance of its aspiration of becoming a developed nation the Kingdom of Saudi Arabia has been investing heavily on improving its educational system with extra focus on science and

mathematics education. Therefore, given the time and the education policies focus of the Kingdom, this study is timely and should significantly serve as a valuable source of information on where the problem of mathematics teaching at the intermediate schools lies and what are needed to be done in order to solve such problems.

Secondly, the study is significant for curriculum developers and instructional designers so as to know the underlying teachers' beliefs and attitudes which will give a higher chance of success when trying to bring about any reform in relation to mathematics curriculum. As stated under the problem statement section, studies of this nature on the beliefs and attitudes of mathematics teaching at the intermediate school's level of education in Saudi Arabic are rare. This fact adds extra value and significance to this study particularly for curriculum developers and instructional designers who are responsible of reforming and developing new curriculum in the field of mathematics.

Thirdly, this study is significant to schools' administrators who are responsible for decision making and policy making with regards to education generally and mathematics teaching in particular. This is important because the impacts of beliefs and attitudes are usually overlooked by educational administrators when making policies, particularly at the lower educational levels in Saudi Arabia. Reason is likely due to the rare nature of studies on beliefs and attitudes of mathematics teachers, in particular, and teachers of other subjects, in general. Therefore, having an empirical study of this nature available to the administrators is likely to keep them informed while formulating policies and making policies regarding intermediate levels of education.

Finally, this study is significant to the Ministry of Education in Saudi Arabia by helping it understand underlying teachers' beliefs and attitudes towards teaching of

mathematics in the Kingdom and how to change such beliefs and attitudes when the need arises. With a study like this, the Ministry of Education in Saudi Arabia will be able to focus its attention on matters related to beliefs and attitudes of mathematics teachers when engaging them in professional development trainings and seminars that are usually designed to improve the teachers.

1.6 Theoretical Framework of Study

This section explains Bandura Model that perceived self-efficacy influences what coping behavior is initiated when an individual is met with stress and challenges, along with determining how much effort will be expended to reach one's goals and for how long those goals will be pursued

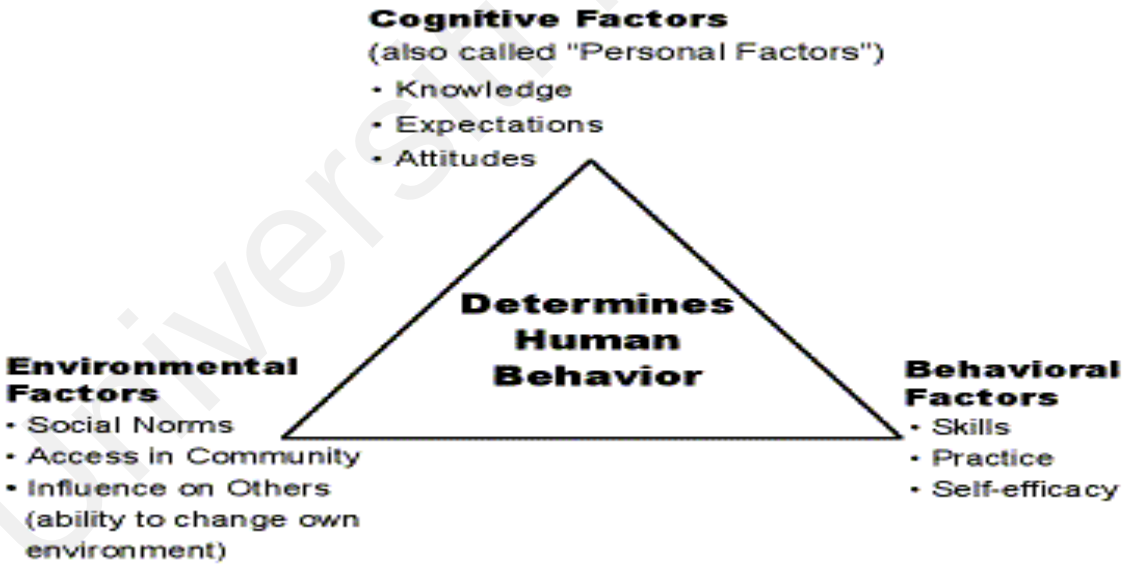

Figure 1.1 Bandora Thewrical Fremwork

Albert Bandura has defined self-efficacy as one's belief in one's ability to succeed in specific situations or accomplish a task. One's sense of self-efficacy can play a major role in how one approaches goals, tasks, and challenges (Bandura, 1997). Self-

Efficacy was developed by Albert Bandura's as part of a larger theory, Social Cognitive Theory (Levin, Culkin, & Perrotto, 2001).

Albert Bandura's Social Cognitive Theory emphasizes how cognitive, behavioral, personal, and environmental factors interact to determine motivation and behavior and human functioning is the result of the interaction among all three of these factors there are numerous factors that play a role in human behavior. Furthermore, the influencing factors are not of equal strength, nor do they all occur concurrently. For example, employee performances (behavioral factors) are influenced by how the workers themselves are affected (cognitive factors) by organizational strategies (environmental factors) (Bandura, 1989).

1.7 Conceptual Framework

This section of the research presents the variables of the study and the relationship among as conceived by this study. Model 1.1 below shows the variables identified by the research and how they relate to each other.

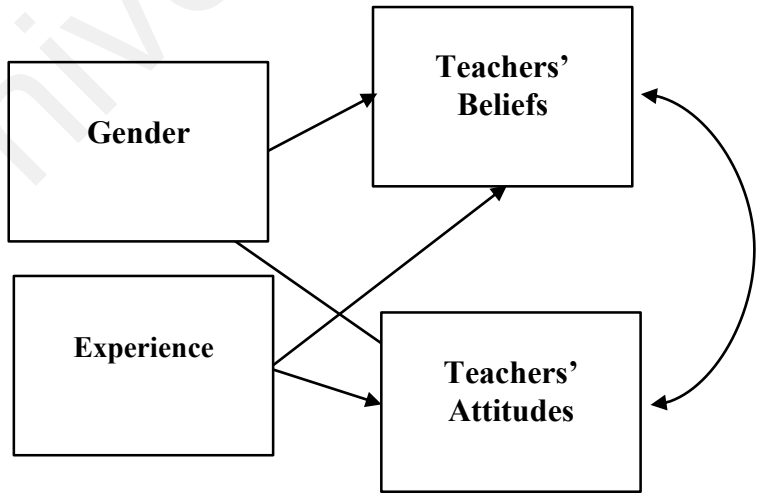

Figure 1.2 Conceptual Framework's Model of the Study

Figure 1.2 above shows the major constructs of the study and the relationship among them. Two variables of gender and experience (Richards, n.d.; Rienties, Brouwer, Lygo-Baker & Dekker, 2014) combined to affect teacher's beliefs and attitudes towards teaching mathematics (Li, 2006; de Kraker-Pauw et al., 2016; Throndsen&Turmo, 2012). By extension, teacher's beliefs and teacher's attitudes affect teacher's assessment (Bryan & Atwater, 2002; Anthony, 2014). As discussed in the previous section, teachers' beliefs can be divided into three categories namely, beliefs towards teaching, beliefs towards teacher's role and beliefs towards students' role. Teacher's beliefs directly affect their attitudes in classrooms as well as their attitudes towards their teaching practices in general. This relationship has also been studied by other studies (e.g. Richardson, 1996; Breiteig, Grevholm&Kislenko, 2005; Ernest, 2006; Gal & Ginsburg, 2017). Teacher's attitude is also shown to relate to the teachers' performance. Such relationship has also been considered by other studies (see Hooley & Jones, 2006; Soric, 2011; Omolara&Adebukola, 2015; Blazar, 2016).

1.8 Definition of Terms

Intermediate School: In Saudi system of education, intermediate school refers to the level after the elementary school, usually between the ages 12 and 15. This level is equivalent to 7-9 grades in the United States educational system (Kingdom of Saudi Arabia, Ministry of Higher Education, 2006).

Teacher'sBeliefs: Are psychologically held understandings, premises, or propositions about the world that the holder thought to be true. Beliefs are cognitive in nature and are thought to be more difficult to change than attitudes. Beliefs are also held with varying degrees of conviction (Philipp, 2007). The three (3) major aspects identified

by Beswick (2005) are used in this study that include: The first: beliefs about the role of the teacher. The second: beliefs about mathematics education. The third: beliefs about learning mathematics.

Teacher's Attitude: Is the way and the manner of acting, feeling or thinking that indicate a person's disposition or opinion. Attitude is described as more easily changeable than beliefs but more slowly changeable than emotions. Attitude is thought to be more cognitive than emotion but less cognitive than beliefs (Philipp, 2007). Attitude means the manner in which Saudi intermediate school mathematics teachers act, feel and or think that represent their opinion on teaching and learning mathematics. McDougall (2004) used ten (10) dimensions: program scope and planning, meeting individual needs, learning environment, student tasks, constructing knowledge, communicating with parents, manipulatives and technology, students' mathematical communication, assessment, and teacher's attitude and comfort with mathematics.

1.9 Conclusion

This chapter lays the foundation of this study by discussing the background that leads to the idea of conducting the research, what the problem is as well as stating the way this research proposes to solve the problem. The chapter also states the objectives of the study and raises questions that by answering them the study will achieve the objectives. In addition, the chapter delves into the justification or significance of the study, presents the conceptual framework of the study before finally defining the study's key terms. The conceptual framework as shown previous indicated the relationship between the variables of the study using arrows. In a nutshell, this chapter has laid the foundation upon which the rest of the chapters of the study are built.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter discusses available existing literature in relation to the topic under study. Through the review the chapter shows the gap in the existing literature which this research aims to fill. The chapter is divided into several sections. Section one gives a brief overview of the Kingdom of Saudi Arabia and its educational system. Section two provides gives a little introduction on teaching mathematics subject in the Saudi lower education. The section also reviews empirical studies on teaching mathematics in Saudi Arabia. Section three discusses the role of beliefs and attitude in teaching, beliefs and attitude in teaching mathematics, and beliefs and attitudes in teaching mathematics in Saudi Arabia. The final section theorises beliefs and attitude in teaching and finally discusses the conceptual framework of the study.

2.2 The Development of Teaching Mathematics in Saudi Arabia

The teaching of mathematics in the Kingdom of Saudi Arabia in the past has been following the old and traditional teaching style (Alanazi, 2016). It was a mixture of Western-style and best of practices of teaching in Saudi Arabia and other neighbouring Gulf countries which was aimed at helping to produce a qualitative shift in students' learning styles which used to be a rote learning and instead encourage them to be self-reliant as well as independent thinkers (G-Mrabet, 2012). The performance of Saudi students in Mathematics as reported by the Gulf Cooperation Council (GCC) Education Sector report that 'international student assessments like the Programme for

International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS) have repeatedly ranked public schools operating in the GCC amongst the lowest in the world' (Ahmad, Vig & Dhingra, 2012, p. 46). The 2003 TIMSS data generated increasing concern among Saudi educators and policymakers concerning the quality of teaching and learning of mathematics. The data released by TIMSS in 2004 and 2008 shows Saudi performance in mathematics and science:

Table 2.1
Trends in International Mathematics and Science Study (TIMSS) Report on Saudi Mathematics and Science Achievement

Study	Fourth Grade		Eight Grade		Rank among Participating Countries
	International Average	Saudi Achievement	International Average	Saudi Achievement	
TIMSS 2003	-	-	467	332	43 out of 45
TIMSS 2007	-	-	500	329	47 out of 48
TIMSS 2011	500	410	500	394	45 out of 50 (G4) 37 out of 42 (G8)

Generated from the Federal Ministry for Economic Cooperation and Development (2014).

Table 2.1 above shows the Saudi achievement in mathematics and science in relation to the international average score. In both 2003 and 2007 there was no Saudi achievement report for the grade 4. The 2011 report for grade 4 shows that the international average achievement was 500 for which Saudi achievement fell short of at 410. As a result, the Saudi achievement ranking for the year was 45 out of 500 participating countries. The achievement for grade 8 was not any better for all the three recorded years. In 2003 the international average score was 467 whereas the Saudi

score fell very much lower than that at 332. Likewise, in 2007 the international average was 500 whereas the Saudi achievement fell even lower than that of the previous time at 329. As for 2011, the international average score achievement remained 500 whereas the Saudi achievement score improved a little at 394. It is worth noting also that in 2003, Saudi Arabia ranked 43 out of 45 for grade 8 whereby in 2007 Saudi Arabia saw its ranking even further plummeted 47 out of 48 participating countries. The ranking did not change much in 2011, albeit slightly better than the previous years, as Saudi Arabia was ranked 37 out of 42. In short, this serves as proof to the poor performance of Saudi Arabia in terms of mathematics and science teaching and learning.

As a result of this poor performance of Saudi Arabia in terms mathematics knowledge, the Saudi Ministry of Education embarked on a mission to change the situation by focusing on teaching methods and strategies which was described as being too reliant on memorization as opposed to understanding of the taught concepts (Alanazi, 2016). This led to the decision of development of a new mathematics and science curriculum.

2.2.1 The Mathematics and Science Curricula Project (2008)

In 2008, the Mathematics and Science Curricular Project was introduced which applies to all school level and aims at bolstering students' ability in various areas that include building new concepts, problem-solving capabilities, engaging in product innovation and development, improving communication skills, and boosting the capacity of students to use technology in accordance with international standards. The major focus of the new curricular project is to prepare the country's citizens to be able to meet the needs of the developing labour market in the Kingdom of Saudi Arabia therefore

making it possible to compete at the global level. The following are some of the underlined aims of the curriculum project translated by Alanazi (2016) from the Ministry of Education (2008) as it relates to this current research:

1. To be able to challenge the dominance of indoctrination and the lack of attention to the development of cognitive and scientific skills needed by students which include analysis, critical ability, reasoning, problem-solving skills, decision making and the ability to understand other perspectives.
2. To improve on the poor educational outcomes in science and mathematics relative to other growing the developed countries around the world.
3. To embark on the improvement of teaching and learning environment in schools.
4. To improve the professional qualifications of science and mathematics teachers.

It is clear that the first point above, the dominance of indoctrination" is an indication of the Kingdom's willingness to move away its educational system and particularly teaching science and mathematics from "a rote-learning pedagogy" as has been the case for so long (Alanazi, 2016). This forms part of what the Kingdom envisioned to achieve in its vision 2030 and a gradual opening up of the society. The challenge to indoctrination has brought about tensions between traditional, authority-led cultural and social practices and the efforts of the Ministry of Education to modernize and improve the educational system of the country that will as the building block for the Kingdom's economic development (Alanazi, 2016).

2.2.2 The New Mathematics Curriculum

To embark on the project of the new mathematics curriculum project, the Ministry of Education in Saudi Arabia introduced series of new textbooks which were compulsory to be taught at all primary levels. The new primary and secondary mathematics textbooks were translated editions of the Math Connects series that set the standards in the United States (National Council of Teachers of Mathematics [NCTM], 1991, 2000) which was published by Macmillan/McGraw-Hill Education in the United States. The series are also part of the math curriculum based on the NCTM publication 'A Quest for Coherence' (NCTM, 2006).

The document contains the curriculum central points that represent important mathematics topic for all the grade levels. As stated by NCTM (2006, p.3), the major purpose of the document is to "provide one possible response to the question of how to organise curriculum standards within a coherent, focused curriculum by showing how to build on important mathematical content and connections identified foreach grade level, pre-K–8'.McGraw-Hill (2012) stated that the Math Connects series was aimed at assisting today's teachers to be able to face the challenge of aiding students become proficient in mathematics as accorded by NCTM 2000 standards. It should also be added that the goal of creating the Math Connects series was 'to reflect both the findings from key research on Mathematics instruction, instructional best practices and curricular focal points' (McGraw-Hill, 2012, p. 2). A prime example of such studies in the United States is Wilson and Kenney's (2003) research that focused on mathematical proficiency. In the research, the study found that sufficient dialogue between teachers and students is vital for classroom assessment. The study also emphasized that teachers should ask higher-level questions, which has not been the norm in classroom practices (cited in McGraw-Hill, 2012).

The Math Connects textbooks are designed to include problem-solving lessons that prepare students for the experience they need to develop adaptive reasoning skills as well as a productive disposition in relation to mathematics (McGraw-Hill, 2012). The text books give teachers instructions to solve a mathematical problem using a different approach in every lesson. This enables the teachers to open the door for discussion with regard to an alternative way and strategies to solve a particular problem. Thus, the new mathematics curriculum embraces a reform to teaching and learning mathematics. An additional interesting aspect of text books is the identification of a series of "talk tasks" to provide students with the opportunity to verbally explain what they understand as well as how they arrive at their answers.

2.3 Teaching Mathematics in Saudi Schools

Various scholars have studied teaching mathematics in the Kingdom of Saudi Arabia in different contexts particularly at the lower educational levels. This part of the literature review reviews such studies and point to the gap that this study aims to fill. Alshehri (2012) studied the influence of teachers' ability to integrate technology into their teaching on teaching effectiveness for the grades 7-12. The study used self-evaluating questionnaire in Riyadh public schools and also asked principals of schools to rate their teachers by using 14 items "Teacher Effectiveness" Survey. The study found no significant differences between mathematics teachers' 7 TPACK self-efficacy and the principals rating of teachers' effectiveness. It also found negative correlations between principals' ratings of teaching effectiveness and the teachers' evaluation of their professional preparedness in university courses and professional training programs.

Another study that looked at teaching mathematics and use of technology is Albalawi (2017) who studied the use of social media by mathematics teachers in their classrooms and their perceptions in doing so as well as the difference in their perceptions based on gender, experience, and the level at which they teach. The study selected 142 mathematics teachers (82 male and 60 female) teaching at various schools in Tabuk, Saudi Arabia. The study found moderate use of social media by teachers of mathematics who employ sometimes with no specific target in mind. Female also were found to be using social media more than their male counterpart, however, there was no significant difference in terms of experience and level of teaching. Similar study has also been carried out by Alshehri and Ebaid (2016) in which they studied the effectiveness of using interactive infographic in teaching mathematics at the elementary schools in Saudi Arabia. The study divided its sample into two groups: control group consisting of 17 students and experimental group consisting of 15 students. The study found that interactive infographics is an effective tool in teaching mathematics at the elementary schools in Saudi Arabia.

In a review paper, Alshehri (2014) also found that the integration of technology in teaching mathematics in Saudi Arabia has been given keen attention by various scholars and is an issue that is currently on the rise among scholars interested in mathematics education in the Kingdom. Alblaihed (2016) also studied the perceptions of pre-service primary school teachers of science and mathematics in Saudi Arabia. Using Technological Pedagogical Content Knowledge (TPACK) questionnaire, the study identified two different categories of pre-service teachers: users and non-users of technology. The study found that the users of technology were found to adopt traditional transmission strategy of teaching perceiving that their role is to transfer knowledge to passive learners through technology. The non-users on the other hand

assume more active role and thought that visual technologies are not appropriate tools for a learner-centered strategy of teaching.

Also, on the use of technology for teaching mathematics in the Saudi Arabia, Alotaibi (2014) examined how and why mathematics lecturers in Saudi Arabian universities use software applications for teaching. One hundred and fifty-one (151) mathematics and statistics lecturers at the eight (8) long standing public universities in the Kingdom responded to the questionnaires of the study. The study found that identification with the branch of mathematics was found to be a key factor in determining the lecturers who are most likely to be the users of software in their teaching. More particularly, it was found that statisticians and computational mathematicians were found to be more likely to be the users of software as a result of teaching courses that require the use of software.

In the context of using technology for the teaching of mathematics in the Kingdom of Saudi Arabia, one of the topics that have attracted numerous scholarly attentions is the use of e-learning for teaching mathematics. Amer and Alnaja (2017) argued that e-learning could be employed by teachers of mathematics to teach basic mathematics which uses multi-agent architecture to detect students' misconceptions and resolve them via the presentation of specific material and question dynamically chosen to adapt to the student's profile. The use of e-learning for teaching mathematics has also been investigated by Yamani (2014) who studied the effects of teaching mathematics through e-learning on performance in Saudi primary schools. The findings of the study showed that students are supportive of e-learning as the new method for teaching mathematics. However, the study was conducted in girls' schools

and given gender segregation in the Kingdom, gender difference might be a variable in the study.

The role of teachers in teaching mathematics in the Kingdom of Saudi Arabia has also been explored. Hussain (2007) examined teacher factors and its influence in students' performance in mathematics and science subjects in Saudi Arabia. The study found that the factors that influence students' achievements in the US had little explanatory power in the context of Saudi Arabia. Instead, high expectations of students' achievements were found to have had a significant positive impact on students' achievement. Elsewhere, Alanazi (2016) investigated the way Saudi Mathematics teachers develop their understanding of classroom dialogue via a reform oriented professional development program that has been modeled as a Community of Practice. The study found that teacher development occurs through the teachers' participation in teacher professional development program (TDP) which enables them to develop and implement new meanings and teaching strategies for them to be able to develop the quality of dialogue in their classrooms.

Al-Zahrani (2017) on his part studied strategies that could be used to overcome mistakes in geometry by new primary mathematics teachers in Saudi Arabia. To prepare for the study, he videos recorded grade 4-6 geometry lessons taught by 34 first year Saudi Arabia primary schools mathematics teachers to identify common mistakes. The findings showed 10 topics related four (4) lessons: segments and angles; classifying triangles; segments and distance; and angle pairs. Seventeen (17) of the new primary school mathematics teachers were informed about the mistakes made in the lessons to discover how they would act in rectifying them. The results indicated that, on average (13 of 17), the teachers became of and were able to avoid making the same mistakes in their lessons. This showed that highlighting common mistakes made

by new primary mathematics teachers is an effective strategy to use for preparing future mathematics teachers.

The fact that most of teaching and learning of mathematics occur in classrooms make classrooms the focus of many studies. Filemban (2013) studied the verbal behavior of Saudi Arabian elementary mathematics teachers. The study made a comparative analysis between Saudi teachers and American teachers' verbal behavior in classrooms. It was found that Saudi teachers used more direct statement than did American teachers whereas American teachers used more indirect statements than did their counterpart Saudi teachers. In another study, Al-mashaqba and Al-Khawaldeh (2016) attempted to measure the impact of using e-learning based on blackboard applications on the achievement of and skill of solving mathematical problems among preparatory year female students at the Najran University. The sample of the study consisted of eighty-three (83) preparatory year female students. Among the samples of the study forty (40) were put in the experimental group therefore were taught using the blackboard applications. The remaining forty-three (43) were treated in the control group therefore were taught using the traditional method of teaching. The results driven from the study showed that there were statistically significant differences at the level of (a=0.05) for the impact of teaching strategy adopted in the post achievement test and the skill of solving mathematical problems in favor of the experimental group students.

On the relationship between teaching method and the teaching of mathematics in Saudi Arabia, Gubbad (2010) investigated the effect of cooperative learning on the academic achievement and retention of mathematics concepts learning of sixth grade students in the Holy City of Makkah, Saudi Arabia. The study found that there is a statistically significant difference at the level (0.05) between the means of the

performance of the experimental group and that of the control groups on the achievement and retention test implying that the experimental group performed better than their counterparts. This study is similar to Laz and EidShafei (2014) who studied the effectiveness of using constructivist learning model in the teaching of mathematics. Sampling out a group of students in the preparatory year at the University of Tabuk, the study found that constructivist learning model has a great impact in the acquisition of concepts. The study also found statistically significant differences between the mean scores of students in the experimental group and the control groups.

The relationship between language and teaching of mathematics has also been studied. Yusha'u and Bokhari (2005) examined how a language barrier, particularly English language as a language of institution, could affect preparatory year mathematics students at the King Fahd University of Petroleum and Minerals, Saudi Arabia. The study found that language barrier brings dire consequences in goes unchecked by mathematics educators.

Admittedly, there is a relatively rich body of literature on mathematics education in the context of Saudi Arabia. However, none of this body of literature investigates the impacts of beliefs and attitudes and particularly in teaching mathematics at the intermediate school's level in Saudi Arabia. In addition, no study found that looked at the role of gender and teachers' experience in relation to teachers' beliefs and attitudes in teaching mathematics. Therefore, there is a clear gap in the extant literature and an attempt to fill in this vacant gap in the literature is what this study is set to do.

2.4 Theoretical of the Study

This study is set to employ Bandura's self-efficacy theory in addressing teachers' beliefs and cognitive consistency approach in addressing teachers' attitudes. These two theories are adopted by this research in order to help the study explain how beliefs and attitudes are formed and eventually reflect on the mathematics teachers' practices of teaching mathematics. The first theory, Bandura's self-efficacy, showed how people self-efficacy affects the way they think. This is very applicable to the context of this study by showing how the intermediate schools' mathematics teachers' self-efficacy reflects in their beliefs towards teaching mathematics and eventually affect the way they teach. The second theory, cognitive consistency, adopted is relevant to this research due to its power of explaining how attitudes are formed. The theory helps this research in understanding how the intermediate schools' mathematics teachers search for cognitive consistency which eventually reflects in their attitudes towards the teaching of mathematics.

Self-efficacy refers to a sense of control over one's environment and behavior. This theory originates from social cognitive theory. The theory came about after Bandura realized that there was a gap in social learning theory. Bandura stressed self-efficacy beliefs are essential to human functioning (Bandura, 1977). As Artino (2006) also stated that it is necessary for a person to possess the necessary knowledge and skills in addition to motivation and perception that are required for successful exhibition of the required behavior under difficult situations. According to Bandura (1977), perceived self-efficacy is the main factor in influencing how people think, feel and behave. The theory posits that people who are constantly faced with rejection are in absolute need of high self-efficacy or self-worth for them to be able to persist. The theory added that self-efficacy is based on one's judgment of his or her capacity to

execute on a given responsibility (Skaalvik & Skaalvik, 2007). People's beliefs in their efficacy usually have different effects as they influence the courses of action people opt for, the amount of effort they put in pursuing their chosen endeavors, how much they endure when they face obstacles and failures, how resilient they to adversity, whether they thought patterns and mindset are self-hindering or self-aiding.

According to Bandura (1997) the truth of the correlation between one's efficacy beliefs and the way it determines their performance and performance determined outcome. Self-efficacy is all about the belief in one's capability that he/she can organize and execute the courses of action which are required in managing prospective situations. There are four sources of self-efficacy: mastery experience, vicarious experience, verbal persuasion, and physiological and effective responses. As stated by Bandura (1982, 1986), mastery experience (performance accomplishments) are known to be the most effective way to develop a strong sense of efficacy. Successful performances serve as future positive reference point that one could refer to about future capability to perform the same or similar task again. The positive shaping of perceptions is what is considered by Bandura as improving self-efficacy. By contrast, failing at a task has the negative effect of weakening self-efficacy by negatively shaping perceptions about one's capability (Bandura, 1977).

Secondly, self-efficacy is also developed through vicarious experiences which are usually generated via social models. In this regard, observing others performing intimidating responses without any form of adversities can reduce fears and inhibitions, and motivate one into action (Bandura & Barab, 1973). This implies that by witnessing others performing intimidating actions without any form of negative consequences it is likely that one believes his/her chances at doing the same will yield similar success. Thirdly, self-efficacy is developed through verbal persuasion that is

commonly used to influence behavior because it is easily used and accessible. Sometimes, by having other people suggest that one can perform an action, one believes that he/she has the required capability to accomplish the task even if they previously felt ill-equipped to accomplish.

The final way to develop self-efficacy is through physiological and affective states as Bandura (1977) suggested that one's physical and mental states can have impact on their perception about performance and eventually affect performance outcomes. By contrast, emotional arousal to stressful situations is likely to lead to fear and anxiety which has negative impact on performance. Another important point pointed out by Bandura aside the four sources of self-efficacy is the distinction between efficacy expectation and outcome expectation. An outcome expectation refers to an individual's estimate that a particular behavior will yield certain outcomes whereas an efficacy expectation refers to conviction that an individual can successfully execute the behavior necessary in achieving the outcomes. This implies that a person may belief that a particular behavior will lead to a certain outcome. However, if the person seriously doubts his or her ability of being successful in performing the activity, outcome expectancy will not influence his or her behavior. This is most applicable to verbal persuasion where the words cannot be enough in influencing behavior unless the person's expectations match his or her outcome expectations (Bandura, 1977).

The second theory employed by this study is cognitive consistency approach which was described by Feldman (1985) as an approach that start with the existing attitudes vis-à-vis the way attitudes are acquired. Feldman stated that cognitive consistency theories view human beings as being active in information processing trying to make sense in what they think, feel and do, as well as actively constructing and interpreting the world to bring consistency to the inconsistencies that may take

place between and within attitudes. This corresponds with the views of Sears, Freedman and Peplau (1985) who all asserted that cognitive consistency approach stem out of cognitive tradition which portrays people as striving to be coherent and meaningful in their cognitive structure. Hence, the major idea of this theory is that inconsistency is cognitively and psychologically unpleasant state that forces people to seek consistency by decreasing inconsistency. There are several situations where inconsistency occurs which include that between cognition about and affect towards an attitudinal object, between affect towards an individual and his position on an issue, or between a person's cognitions, affect and behavior towards an attitudinal object (Feldman, 1985).

People are viewed as motivated to preserve consistency among their cognitions or facets of their cognitions, and attitude shift may be brought about by presenting an inconsistency among certain of these facets (Sampson, 1963). Cognitive consistency theories have in common the notion that people try to preserve harmony in their attitude structures. Individuals usually make shifts in their attitude arrangements in an effort to degrade the psychological stress and restore equilibrium. Under this theory, people are motivated to maintain consistent valences the interpersonal correlation that they have. People will have positive feelings towers counterpart, balance between the counterparts, if they distribute interpersonal ties. However, according to Cvencek, Meltzoff and Kapur (2014) cognitive consistency may be culturally general and a key mechanism for developmental shift in social cognition. Smith (1968) indicated that cognitive consistency theory has the benefits of (1) being inclusive enough to allow integrated empirical investigation on two diverse levels, the internal, psychological level, and the interpersonal, sociological level, and (2) being sufficiently appropriate that hypotheses of predictive strength are directly deducible from it.

2.4.1 Teacher Beliefs

The term belief has been defined "as a representation of the information someone holds with regards to an object or a person's understanding of himself and his environment" (Fishbein & Ajzen, 1975). A person's beliefs and belief's system is an embodiment of their understanding of the world and themselves (Pajares, 1992). According to Kagan (1992, p. 65), teacher beliefs could be defined as "a tacit, often unconsciously held assumptions about students, classrooms, and the academic material to be taught". Some of the major characteristics of teacher beliefs are affective, evaluative, and episodic processes (Van Driel et al. 2007). According to Sang et al. (2011), teacher beliefs can also be as varied as the teaching itself and highlight issues usually related to learners (for example, beliefs on inclusion or diversity), knowledge (epistemological beliefs), teaching components (beliefs about the curriculum, beliefs about what learning contents is important, beliefs about instructional media, teaching strategies, evaluation etc.), parents, context of instruction and organizational dimension.

They argued that teachers with traditional education beliefs are more likely to employ didactic instructional practices as they tend to perceive teaching as a direct and didactic way to disseminate information to students. Those with these beliefs perceive learning as a passive activity or a one-way traffic from the teacher to the students. On the other hand, teachers with constructivist beliefs perceived learning to be an active construction and reconstruction of knowledge and therefore their approach to teaching is to guide and facilitate learners in the process of knowledge construction.

In addition to the above dichotomy of beliefs and attitudes, cultural experiences can also shape teachers' beliefs, attitudes and eventually their practices.

Teachers develop shared beliefs informed by their culture about what constitute good practices of teaching and learning (Sang et al., 2012). Likewise, previous research suggests that the beliefs, practices and attitudes of female and male teachers can systematically differ (e.g. Singer, 1996; Sang et al., 2012). This, therefore, brings the issue of gender differences and its roles into the debate. Other factors found interestingly related to teachers' beliefs, practices and attitudes are type of training, certification and professional development, subject taught, employment status (e.g. part time as against full time) as well as length of tenure (TALIS, 2009). It is argued that the combination of any of these factors might lead to different form of beliefs, attitude and practices (TALIS, 2009).

One of the most widely used model of teacher's beliefs is that of Rokeach (1968). The model consists of four major elements: existential versus non-existential beliefs, shared versus unshared beliefs, derived versus underived beliefs, and beliefs concerning matter of taste. Existential versus non-existential beliefs are those beliefs related to existence in the physical and social world. Shared versus unshared beliefs are those beliefs shared with others. Derived versus underived are those internalized beliefs but not directly from encounter with a particular object. Finally, the beliefs that are a matter of taste are those representing a matter of choice albeit in an arbitrary way (Galvis, 2012).

A complimentary dichotomy of beliefs proposed by Rokeach (1968) is stated in the following way: primitive beliefs (type A), primitive beliefs (type B), authority beliefs (type C), derived beliefs (type D), and inconsequential beliefs (type E). This can be understood by separating changeable beliefs and unchangeable beliefs. Changeable beliefs are what Rokeach (1968, p. 6)) referred to as primitive beliefs. These forms of beliefs are made up of 100% subjective interpersonal agreement. The

origin of such beliefs come from direct encounters with determined objects and possess what he termed "taken-for-granted character". These beliefs are not open to discussion or change and are rather originated from the most inner-core type of beliefs. Thus, the changeable beliefs (type A) beliefs are related to self-identity and when they are disturbed, they it is likely to cause instability within an individual. Primitive beliefs (type B) only justify their existence within an individual and their raison d'être is not affected by external factors. Authority beliefs (type C) originate from various spheres of society such as family, peer groups, religion and political groups and country (Galvis, 2012). Derived beliefs (type D) are the sort of beliefs that are obtained through second hand experiences, particularly through "institutionalized ideology" (Rokeach, 1968, p. 10).

The final category of beliefs is called by Rokeach inconsequential beliefs (type E). The source of such beliefs is from indirect experiences with an object. These beliefs when changed have few implications for other beliefs which positions them as direct opposite to type A and type B beliefs that cannot be changed at all (Galvis, 2012). Rokeach dichotomies of beliefs helps this study defines the concept of beliefs and how beliefs can be understood. It helps this study specifies core beliefs of its participants and the acquired beliefs which are subject to change and when changed will not create any form of disharmony in the person. Therefore, this framework will help this study explain teachers' beliefs and attitudes at the intermediate school in the Kingdom of Saudi Arabia.

2.4.2 Teachers' Mathematics Beliefs

There is a dearth of literature on mathematics teachers' beliefs majority of which focused on beliefs in learning and teaching mathematics (e.g., Philipp, 2007;

Richardson 1996; Thompson, 1992). Leder, Pehkonen and Törner (2002) studied various aspects of mathematics teachers' beliefs that include students' beliefs, beliefs about self and general beliefs in relation to the teaching of mathematics and mathematics learning. Their findings showed that beliefs are connected to the holder. However, what is left to be determined is the connection between diverse beliefs (Goldin, Rösken, &Törner, 2009). The concept of beliefs is usually "applied to a number of different notions" (Goldin et al., 2009, p.1). For instance, as done by Boaler (2001) who connected knowledge and beliefs and emphasized that "formany years educational theories have been based upon the assumption that knowledge isrelatively stable, individual characteristic that people develop and carry with them, transferring from place to place" (p. 3). As for Törner (2001), students' knowledge structures are belief structures which implies beliefs can be described as knowledge.

Lerman (2001) opined that there are two areas of research in relation to beliefs which include analysis and classification of beliefs and monitoring change in beliefs over time. Some examples of the studies that have been carried out on the first area include Rokeach (1968), Green (1971) and Conney (2001). Moreover, some beliefs are considered more central than others hence more difficult to change (Green, 1971). More contemporary studies conducted on this area include De Corte, Op 'tEynde, &Verschaffel, 2002; Pehkonen, 1995; Rösken, Hannula, Pehkonen, Kaasila, &Laine, 2007).

The second area tried to connect cognitively-grounded theory and beliefs (e.g. Liljedahl, Rolka, &Rösken, 2007b; Murphy & Mason, 2006; Pehkonen, 2006). Various studies do not use more established classifications of beliefs in order to document changes in individual beliefs on the nature of mathematics, teaching and learning. Contemporary researches on beliefs are more elaborate and advanced, and

more articles and conferences have been considering beliefs although beliefs identification and classification in mathematics education is still being debated (Goldin et al., 2009).

In addition to the dimensions or areas of beliefs, some theoretical aspects of the concept of beliefs which are definitions of beliefs, a constitutive framework that can guide the discussion of beliefs and how beliefs interact with different approaches to the characterization of mathematics teaching and learning. It is pertinent here to note that there is no single definition of beliefs that connect the various theories and is widely accepted by mathematics education researchers. The more recent authors propose a framework that is consistent with various possible definitions and shows important cognitive and affective aspects of beliefs and does not adopt a definition. This includes ontological aspects, enumerative aspects, normative aspects and affective aspects. The ontological aspects are connected to objects of belief. In this regard for one address a belief, he or she must identify the corresponding belief object. For instance, the philosophy of mathematics can be identified as the object of belief and the object can be also be anything. When there is a discussion on beliefs, the object must be defined in order for the discussion to be meaningful. The object can be personal, domain specific, social or epistemological in nature (Goldin et al., 2009).

The second aspect, the enumerative aspects, is beliefs that can be thought of as groupings of mental states. In this view, "beliefs objects can be assigned a (subjective) content set of various possible perceptions, characteristics, suppositions, philosophies, and/or ideologies, which are often simply referred to as beliefs or better, beliefs states. The third aspect is normative aspects which are described as highly individualized). The fourth aspect is affective aspects.

According to Goldin et al. (2009), the roles of beliefs in teaching and learning mathematics can be summed up in three important approaches: 1) “Problem solving approaches to mathematics teaching and learning” (p. 4); 2) “Change and development approaches to mathematics teaching and learning” (p. 7); and 3) “Sense-making approaches to mathematics teaching and learning” (p. 8). The problem-solving approaches has been considered by Halmos (1980) as the “essence of mathematics”. Ernest (1989) emphasized that reforms of that nature depends to a large extent on institutional reform making changes in the overall mathematics curriculum. They are even more dependent fundamentally on individual teachers altering their approaches toward the teaching of mathematics. It is evident that teaching reforms cannot be effectively implemented without changing held beliefs about mathematics teaching and learning (p. 99).

However, there are also some researches on the negative influence of beliefs that focus on problem solving and make problem solving a significant part of teaching and learning mathematics. Goldin et al (2009) also emphasized that there are various situations in which beliefs have positive influences and support mathematics teaching and learning such as the example below. In such situation’s beliefs can be “guiding and inspiring” and are in support of positive changes in mathematics teaching and learning. For example, Fishbein (1987) contended that: The issues of mathematical reasoning in particular and every kind of other scientific reasoning encompass several psychological components such as beliefs and expectations, analogies and paradigms, and pictorial prompts. All these are not mere primitive forms of reasoning rather they are genuinely productive and active ingredients of every form of reasoning (p. 212).

The second role of beliefs is what is referred to as change and development approaches to mathematics teaching and learning. Regarding this role, learning occurs

with revisions in internal mental states. This is because beliefs are difficult to alter due to the following reasons: Green (1971) stresses that it is impossible for beliefs to occur in single entities rather they happen in group or clusters. This implies that a person cannot simply uproot a particular belief. Instead he/she must change a bunch or a set of beliefs. Beliefs are by nature mutually stabilizing due to their interconnected nature with other beliefs. However, the implication for didactical processes is the fact that beliefs act like inertia (see Pehkonen & Törner, 1996). Inertia's role in daily life seems neutral which is exactly the nature of beliefs in teaching and learning.

In both approaches of roles of beliefs, the problem-solving approaches and change and development approaches, the conflict occurs amidst instructional activities, and the teachers' role in making learning takes place. There are some literatures that argue that teachers' beliefs can be altered through socialization and experience. However, Nespor (1987) and Pajares (1982) contested that view by arguing that beliefs cannot change unless a "conversion or gestalt shift" occurs.

The final approach is sense-making approaches to mathematics education, In these approaches learning is considered "making-sense, finding meaning, and/or acquiring or constructing understanding" (Goldin et al., 2009, p. 9). Both sense and meaning are deemed important in mathematics (Thom, 1973) and beliefs are identified as important part of meaning by a number of studies (e.g. Litwiller& Bright, 2002; Verschaffel, Greer & De Corte, 2000; Moschkovich, 1992). In this regard, beliefs are often determined by norms and have various functions: Beliefs, often framed by norms, is likely to function as basic modules for understanding and interpretation of virtual entities. The fact that a person's perceptual and information processing capacity is limited means that beliefs help in reducing and structuring information to align with constrained patterns. In brief, beliefs lie at the very center of meanings. In a figurative

way, beliefs are filed with epistemological information (e.g.Moschkovich, 1992; Verschaffel et al., 2000; Litwiller& Bright, 2002). Occasionally, the information reduction cannot be acceptable hence changing a belief or a system of beliefs registers as a potential obstacle to learning. However, Schommer (1990) highlighted the relationship between epistemological beliefs and mathematical text comprehension while pointing out to the role of productive beliefs. In this sense, epistemological beliefs can be decisive for students' or learners' motivation (Goldin et al., 2009, p. 10).

2.4.2.1 Gender and Teacher Beliefs

A number of studies have investigated the relationship between gender and teacher's beliefs and attitudes in the context of mathematics teaching particularly and teaching in general. In a study carried out by Li (2006), it is found that gender teachers have different beliefs about male and female students, albeit there is no yet conclusive evidence. Teachers tend to stereotype mathematics as a male domain leading to the teachers' tendency to overrate male students' mathematics capability. They also tend to have high expectations for male students. However, the study admitted that some other studies found no substantial differences found in teachers' beliefs.

In a similar study, Throndsen and Turmo (2012) examined differences in male and female teachers' beliefs on their math instruction, and the relationship between boys and girl's math achievement and teachers' beliefs. The study identified primary mathematics teachers and year 2 and 3 students from 127 schools as the sample of the study. Using a questionnaire, the study examined teachers' goal structure for students, approaches to instruction and personal teaching efficacy. The findings made by the study showed that teachers were generally oriented toward mastery goals and mastery

approaches towards instruction and also reported high personal teaching efficacy. However, female teachers were found to have somewhat higher levels of mastery goal structure for students and mastery approaches to instruction. In addition, the study also found positive relations between students' math performance and teachers' mastery orientation, mastery approaches to instruction and teaching efficacy. The relations were also found to be stronger for girls than for boys.

A different dimension of the relationship between gender and teachers' beliefs in mathematics has also been investigated by Ghosh (2004) in a southeastern United States school. The study selected five high school's mathematics teachers out of whom two were selected for case study. Employing questionnaires, teacher interviews, classroom observations and video tapes of instruction documenting teacher and students, the study found that held some gender-related beliefs toward male and female some of which were lower ability female students making in relatively similar efforts to that of the male students; girls are more emotional than boys; girls are less competitive than boys; female students in the higher ability courses are less confident than their counterpart male students. The study concluded that the beliefs claimed by the participants are not consistent with their instructional practices and classroom interactions. Of whether gender differences affect teacher's beliefs and career choices, Kraker-Pauw et al. (2016) found that gender do not affect career choices in a study they carried out in the Netherlands where 107 participants of both students and teachers were investigated.

The effect of gender has also been investigated in the context of students' achievement. Using a randomized experiment, Antecol, Eren and Ozbeklik (2012) looked at the impact of having a female mathematics teacher on the students' mathematics scores in primary school. The study found that female students who were

assigned to a female teacher with a weak mathematics background experienced low mathematics scores at the end of the academic year. However, female students assigned to a female teacher with a strong mathematics background showed positive scores in their mathematics test scores.

2.4.3 Teachers' Attitude

In studies conducted on principals, teachers and teacher education students have shown that they possess a positive attitude towards the notion of inclusion (Avramidis, Bayliss & Burden, 2000). However, they usually become reluctant in terms of the actual implementation (Campbell, Gilmore &Cuskelly, 2003). Teacher attitude has been found to have significant impact on their performance (Moran, 2007). Teacher attitude has also been found to be influenced by other factors such as teacher training, teachers' experience, gender, type of disability, physical environment, materials and resources, as well as class size (Singal, 2011; Coşkun et al., 2009; Ernst & Rogers, 2006).

2.4.4 Role of Beliefs and Attitudes in Teaching Practice

Beliefs and attitudes play an important role in learning and teaching practices. In the early researches, Brown and Webb (1968) have found that specific fundamental philosophic beliefs held by teachers are more consistent in predicting classroom behavior of teachers than are their educational beliefs. In the 1990s, Richardson (1996) examined the roles of beliefs and attitudes in the education of teachers. The studied argued that there are two roles of beliefs and attitudes in the education of teachers namely, 1) beliefs and attitudes as facets of individual pre-service and in-service which affect the way they process new information, react to the possibilities of change, and

teach 2) beliefs and attitudes as the focus of change in teacher education programs. The study revealed that pre-service students who began their teacher preparation program do so initially with their both positive and negative beliefs about teaching, learning, subject matter, and students. These pre-service teachers are mostly different in their beliefs on the basis of the level of education they will teach, traditional and non-traditional students, and males and females.

The attitude of teachers in relation to their teaching practices has also been studied by previous studies. Mazieres (2016) examined the attitudes of elementary school teachers in identifying and setting goals to improve their mathematics teaching. The study used the framework of the Ten Dimensions of Mathematics Education. The study further investigated the beliefs and attitudes of four Grade 6 teachers through the collection of data from interviews and surveys. The study found an existing relationship between teachers' beliefs and attitudes towards teaching mathematics, their professional learning goals, their instructional practices and students' achievement. Another major finding made by the study stated that teachers' beliefs on constructing knowledge are not aligned with current mathematics education thinking.

In another study carried out by Ramirez, Cañedo and Clemente (2011) on the attitudes and beliefs of secondary school teachers on the use of Internet resources in their teaching practices, found that attitudes are very important in explaining the use of Internet resources in classroom practices. In addition, the study also found that teachers' perceptions or beliefs about their digital competencies also has a positive effect on the possibility to use Internet resources in their classroom practices. Childcare teachers' attitudes, knowledge and beliefs regarding science and their impact on early childhood has also been investigated by Schneider (2005). The study found that teachers' attitudes and beliefs have positive impact children's early

childhood learning opportunities. Likewise, Yildrim and Tezci (2016) developed a scale to measure teachers' beliefs and attitudes along self-efficacy on multicultural education. The study developed 9 items and 2 factors for belief, 16 items and 3 factors for attitude and 13 items and 3 factors for self-efficacy.

Sabrina and Sansrisna (2017) explored teachers' beliefs in practicing inclusive education and the factors influencing the teachers' beliefs in practicing inclusive education in elementary schools in Banda Aceh. The results of the study revealed that the teachers' beliefs in practicing inclusive education in elementary schools in Banda Aceh is still low which have been underpinned by the teachers' level of self-efficacy and lack of support from the external factors such as government support at both district and national level. In addition, the results also showed that teachers held various kinds of beliefs that helped them practice inclusive education such as beliefs in experiences, knowledge, self-reflection and awareness, and other beliefs that related to religion.

2.4.4.1 Saudi Mathematics Teachers' Beliefs and Attitudes

Although as has been shown in the previous section, there have been quite a number of studies on mathematics teachers' beliefs and attitudes in general, what seems to be in scarce are works on Saudi mathematics teachers' beliefs and attitude. Some studies studied attitude of Saudi teachers in general without specifically looking into mathematics teachers. For example, Alothman and Robertson (2015) examined the attitude of Saudi teachers towards computers as well as their skills and usage of it. The study found several factors that affect teachers' attitudes towards using computers that include computer experience, confidence, the teachers' perceptions of the role of computers in their life and teaching, and a good experience in computer use. This study

shows that the attitudes and beliefs of teachers in Saudi Arabia have been studied but rarely in relation to mathematics teaching and learning.

One of the rare studies on Saudi mathematics teachers' beliefs and attitudes is Alghamdi and Al-Salouli (2013) in which they investigated Saudi science and mathematics elementary schools' teachers' beliefs about the process of teaching and learning of their subjects. The study used interviews to identify and assess common themes of the teachers' beliefs and the associations between their beliefs and self-reported classroom practices. The study found that there is difference between teaching the old and the new science and mathematics curricular and that the teachers were challenged by available class time, the student-teacher ratio, and the lack of laboratory space, equipment and administrative support.

2.4.4.2 Beliefs and Attitudes in Teaching Mathematics Abroad

Beliefs and attitudes in teaching mathematics have also been studied in various other contexts which is because teaching mathematics is an omnipresent endeavor worldwide. Its omnipresence nature makes it an enticing proposition for researchers in the field of mathematics education. A point that should be stressed right from the outset is the absence of an agreed upon definition of beliefs by scholars of mathematics education (Goldin, Rosken & Torner, 2009). According to Goldin, Rosken and Torner (2009), researchers on beliefs used the term for a number of different meanings and apply it to various notions. There are two major strands of research with regards to beliefs: analysis and classifications of beliefs and monitoring of beliefs over time. According to Cooney (2001), beliefs structure is very crucial for the fact that information on how beliefs are formed can possibly help us understand how they can be changed.

Handal (2003) argued that teachers' mathematical beliefs can be categorized into various dimensions and they originate from the previous learning experiences gained during schooling and reproduced in classroom instruction. The study also further argued that due to the conservative nature of educational environments the traditional instructional beliefs are fostered and further reinforced.

Some studies examined the impact of beliefs on the teaching practices of mathematics. In relation to this, Yates (2006) investigated beliefs on teaching mathematics, learning, teaching practices as well as curriculum reform experiences in 127 elementary classroom teachers in 21 schools. All teachers were instructed to use constructivist approach to mathematics teaching since 2001. The study found that teachers' beliefs differed, those with stronger beliefs were found to be making greater use of some constructivist teaching practices. Those teachers utilized more computers and the internet more often in their lessons and were seeking after constructive information about students' mathematics learning more frequently.

On a different note, Barkatsas and Malone (2005) investigated Greek mathematics teachers' beliefs regarding the nature of mathematics and mathematics teaching and learning as well as the links between these beliefs and instructional practice. The study identified two distinct orientations that characterized secondary school mathematics teachers' beliefs: a contemporary constructivist orientation on the one hand and a traditional (transmission) information processing orientation. The study found that a classroom can be complex sites of political, historical, social and cultural influences. Sometimes, beliefs are investigated in relation to a particular practice. Golafshani (2013) investigated teachers' beliefs in relation to the use of manipulatives into mathematics instruction. The study found that teachers found more desire to use

manipulatives in their teaching following the teachers' participation in the training and the project of the use of manipulatives in teaching mathematics.

2.5 Empirical Research in Level of Mathematics Teachers' Attitude and Beliefs

A substantial number of studies have explored level of mathematics teacher belief toward teaching mathematics. Aljaberi and Gheith (2018) investigated the beliefs of elementary (grades 1-3) and middle school (4-6 grades) math teachers about teaching, explored their teaching practices of mathematics, studied the impact of their educational qualifications, years of experience, major on their beliefs toward teaching, learning and nature of mathematics, and tested the relationship between their beliefs about teaching learning and nature of mathematics and their teaching practices. Teachers' beliefs were classified on the scale into three groups. Constructive beliefs are 75% and higher, 50-74.9% are mixed in between, and less than %50 constitutes to traditional ones. Using analysis of variance (ANOVA) and t test, the research employed 101 teachers who teach in 11 private schools located in Amman, Jordan. The findings of the study revealed that (65.7%) of the study sample had mixed in between beliefs regarding the nature of mathematics, and (26.4%) of teachers had constructive beliefs on the same dimension. The study results also revealed that (57.4%) of the sample study had constructive beliefs on the teaching mathematics dimension. Meanwhile (39.6%) of teachers had mixed in between beliefs on the same dimension. Results also showed that (59.4%) of teachers had constructive beliefs on the learning mathematics dimension, while (35.6%) of teachers had mixed in between beliefs on the same dimension.

In a study byGolafshani (2013), the teachers' beliefs about the use of manipulatives in teaching mathematics were examined. The research indicated that the

teachers have suggested the use of manipulatives in teaching mathematics in the pre-test; however, they showed more interest in the use of manipulatives in the post-test. The teachers disagreed with no use of manipulatives in teaching from the beginning to the end of the project. Interestingly, the teachers showed a stronger preference for the use of physical manipulatives over virtual manipulatives in the pre-test than they showed in the post-test. In other words, it showed teachers' preference for physical manipulatives reduced to neutral in the post-test. In other word, teachers showed more desire (positive trend) to use manipulatives in their teaching.

Other researchersinvestigated mathematics teachers' views about the meaning of instructional coherence and the ways to achieve instructional coherence (Cai, Ding & Wang, 2014). The purpose of this study is to test how exemplary U.S. and Chinese mathematics teachers view instructional coherence in the classroom. The majority of U.S. teachers paid attention to connections between teaching activities, lessons, or topics, and the majority of Chinese teachers emphasized the interconnected nature of mathematical knowledge beyond the teaching flow. U.S. teachers expressed their views about ways to achieve instructional coherence through managing a complete lesson structure. In contrast, Chinese teachers emphasized pre-design of teaching sequences, transitional language and questioning based on the study of textbooks and students beforehand. Moreover, they emphasized addressing student thinking and dealing with emerging events in order to achieve "real" coherence.

Zikre and Eu (2016) investigate the beliefs in the nature teaching and learning among the secondary (Form 1) mathematics teachers in Malaysia. The population of research consisted of39 mathematics teachers who were randomly selected from all the secondary schools in Malaysia. The results showed that in general Malaysian mathematics teachers had stronger constructivist beliefs then directed transmission

beliefs for both male and female teachers. Male teachers had stronger direct transmission beliefs than female teachers. For the constructivist beliefs, the males sample mean of 13.10 (M =13.10, SD =1.73) while the female sample means of 13.37 (M=13.37, SD =1.42). Female teachers had higher constructivist beliefs when compared to male teachers. When comparing the two beliefs constructs, male and female teachers had a stronger constructivist belief than the direct transmission beliefs.

Borhan and Zakaria (2016) investigate the perception level of novice teachers about mathematics belief, teachers' attitude towards mathematics and teaching practices of mathematics in the classroom. Using structural equation modeling (SEM), a total of 263 primary novice teachers throughout the country were involved in this study were selected randomly. The findings of research showed that the perception of mathematics belief among novice teachers as a whole is very high with an average mean score of 4.44. At the same time, the level of perception of teachers' attitudes towards mathematics as a whole also stated a very high with an overall mean value of all sub-construct is 4.29. Mean perception of teaching mathematics practices is 4.29, which indicated very high.

Yildirim (2012) examine whether teacher candidates' attitudes toward teaching profession differs according to their ages, genders, types of education program, types of high school graduated or not. The sample of the study consists of 176 teacher candidates from different programs: Guidance and Psychological Counseling Program, Elementary Mathematics Education Program, English Language Education Program, Preschool Education Program of Maltepe University, Faculty of Education. According to the results, teacher candidates generally appear to have positive attitude toward teaching profession. It implies that, teacher candidates have positive judgments about teacher profession. A significant difference was found only between

boys and girls in terms of attitude toward teaching profession. The results indicated that there is no significant difference between three age groups in terms of attitudes toward the teaching profession. The results indicated that there is no significant difference between types of education program in terms of attitudes toward the teaching profession.

In Saudi Arabia context, Albalawi (2013) examined high school female math teachers' attitudes toward the use of e-learning in teaching mathematics in selected high schools in Tabuk, Saudi Arabia. The analysis of the responses to the questionnaire revealed that the female high school math teachers' attitudes toward the use of e-learning were highly positive. The mean responses to the questionnaire items revealed that the teachers believed that e-learning made teaching more effective, more interesting, and enhanced the quality of teaching. There was general agreement that e-learning helped them meet the individual needs of the learners. The results of the study revealed that there were no statistically significant differences in teachers' attitudes toward e-learning when examined for the variables of academic degree, years of teaching experience, computer course training, and computer lab availability.

Aly and Abdulhakeem (2016) assessed the training programs for Mathematics teachers at elementary stage on developed Curricula and attitudes toward teaching at Najran educational administration in Saudi Arabia. The research used (72) male and female Mathematics teachers at elementary stage. The results also showed Math teachers have positive attitudes towards teaching the developed Curricula, and further concluded that there are no statistically significant differences due to teacher's experience, while there are statistically significant differences attributed to gender in favor of female teachers.

Aly and Abdel- Hakim (2013) indicated that Mathematics teachers have positive attitudes towards Mathematics teaching; while there are statistically significant differences due to gender in the dimension of teacher prestige in favor of female Mathematics teachers. However, there is no impact of the experience in teachers attitudes.

2.5.1 Gender and Teachers' Attitude

Gender has been found by some studies to influence teachers' performance. For example, Avramidis et al. (2000) argued that female teachers have greater tolerance for having children with special needs in their classes than their counterpart male teachers. This is consistent with a number of other studies, Avramidis and Norwich (2002), who also found that female teachers have a positive attitude when it comes to inclusion of disabled children in mainstream schools which is thought to be due female being mothers and they are therefore more likely to be sympathetic towards the disabled (Alghazo & Gaad, 2004). However, Forlin (2001) found that female teacher are reported to have greater stress and difficulties in perceived professional competency when compared with the male. Other studies with similar findings include Alghazo and Gaad (2004), Avramidis et al. (2000) and Leyser and Tappendorf (2001).

However, some recent as well as past studies have also made mixed findings with sometimes male teachers revealing more positive attitudes than their female counterpart (Ernst & Rogers, 2006; Rakap & Kaczmarek, 2010). Also, Batsiou, Bebetsos and Antoniou (2008) found that male teachers from Cyprus had positive attitude when compared to their female counterpart. Likewise, Forlin et al. (2009), in a study of pre-service students, found that male students reported positive attitudes following their experience. By contrast, a study carried out by Hodge (1998) in seven

colleges and universities in the US found that male teachers, even the experienced ones among them, had no positive attitudes.

There are some other studies that did not find much difference between the genders (Memisevic & Hodzic, 2011; Chireshe, 2011; Carroll, Forlin & Jobling, 2003; Opdal et al., 2001). Another study by Alghazo et al. (2003) found that both male and female teachers had no positive attitudes towards teaching. These set of studies therefore show that there is no consistent relationship between gender and teacher attitude towards teaching.

According to Oskamp (1991), the concept of attitude is perhaps the most distinctive and indispensable concept in social psychology. Attitude is considered a learned and stable predisposition to react to a given situation, person or other set of cues in a consistent manner (Corsini, 1991). It is believed that attitudes guide and influence people's behaviours in their daily lives (Parasuram, 2006).

2.5.2 Gender Segregation in Saudi Arabia

Given the culture and religion in the Kingdom of Saudi Arabia, there is gender segregation in the educational environments in all level of education in the Kingdom with the exception of kindergarten classes and few medical school classes (Ministry of Education, 2006). The underlining reason for such segregation is due to the Kingdom following the Qur'an (the Islamic Holy Book) and the tradition of the Prophet Muhammad (Peace be upon Him) and the makes the two the basis of its constitution. It is pertinent here to note that the Qur'an awards female equal but not identical rights with their counterpart male on personal, social, economic and political spheres. The Holy Book assigns duties to both male and female to an equal degree.

There is no prohibition from both Qur'an and the tradition of the Prophet Muhammad on female preventing them from taking part in public life (AlMunajjed, 1997).

In fact, the Qur'an and the tradition of the Prophet Muhammad (PBUH) emphasize on mandatory education for both males and females. Furthermore, there are evidences from the Qur'an reporting that females have the right to work in agriculture, commerce and industry providing that the work does not disadvantage themselves or their family (AlMunajjed, 1997). In spite of that, the Qur'an warns that the mixing of gender could possibly lead to seduction among opposite sexes which could then lead to evil consequences (AlMunajjed, 1997). It is on the basis of Qur'an instruction that boys and girls are segregated in Saudi Arabia and are designed to attend separate schools where male teachers teach male students and female teachers teach the same gender.

2.6 Conclusion

This chapter has reviewed various studies in relation to mathematics teachers' beliefs and attitudes, particularly in the context of Saudi Arabia. The underlining reasons for this review are of two folds: to highlight the trend of research on the topic under research and to indicate a research gap where this study aims to fill. The chapter first gives overview of the Kingdom of Saudi Arabia, its educational system, mathematics education and the new curriculum of mathematics adopted by the Kingdom. The chapter then reviews empirical studies on the teaching of mathematics, the role of beliefs and attitudes in teaching generally, the role of beliefs and attitudes in teaching mathematics, teaching mathematics in the Kingdom of Saudi Arabia and Saudi mathematics teachers beliefs and attitudes.

Although the final part of the chapter is on mathematics teachers' beliefs and attitudes, it differs with the current study in various fronts. Firstly, Alghamdi and Al-Salouli (2013) study focused on elementary school whereas the current study focused on intermediate school level. Secondly, this study focuses only on mathematics not mathematics and science together. Finally, methodologically this study employs quantitative and survey questionnaire method for the collection of data as opposed to Alghamdi and Al-Salouli's qualitative interview method.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the methods employed to investigate Saudi mathematics teachers' beliefs and attitude and their influence on the teachers' teaching practices and students' performance and achievement in the mathematics. The chapter lays down the background of the methodology used in conducting this current study (e.g. the population, the sample, instruments, procedure, data collection and analysis). In addition, the chapter also explains the criteria for the selection of study's participants and the type of data intended to be collected for the study.

Furthermore, as proposed by Cohen, Manion and Morrison (2007) that research design must be guided by research objectives ad research questions. As in the case of this study, the major objective is to study mathematics teachers' beliefs and attitude particularly at the intermediate school level in the Kingdom of Saudi Arabia and their influence on teachers' practices in teaching mathematics. Thus, the research design explained herein this chapter will guide towards responding to the research questions of this study as well as achieving the stated objective.

3.2 Research Design

The underpinning philosophical background of the current study is based on a positivist paradigm. The study completely relies on quantitative data obtained through survey questionnaires designed to help achieve the stated goals and objectives of the study. Quantitative research design is a commonly used method in conducting and

collecting empirical evidence for research (Kothari, 2004; Cohen, Manion & Morrison; 2007). Quantitative research design is described as a type of research that gives a higher degree of external validity possible to be generalized to similar populations (Saundars et al., 2007). Moreover, quantitative research design enables the collection of primary datasets with which hypothesis can be tested and the questions raised by the researcher can be answered. The research design of this study is aimed at collecting data related to the mathematics teachers' beliefs and attitude in Saudi intermediate schools. Figure 3.1 below shows the diagrammatic representation of the research design adopted by the current study.

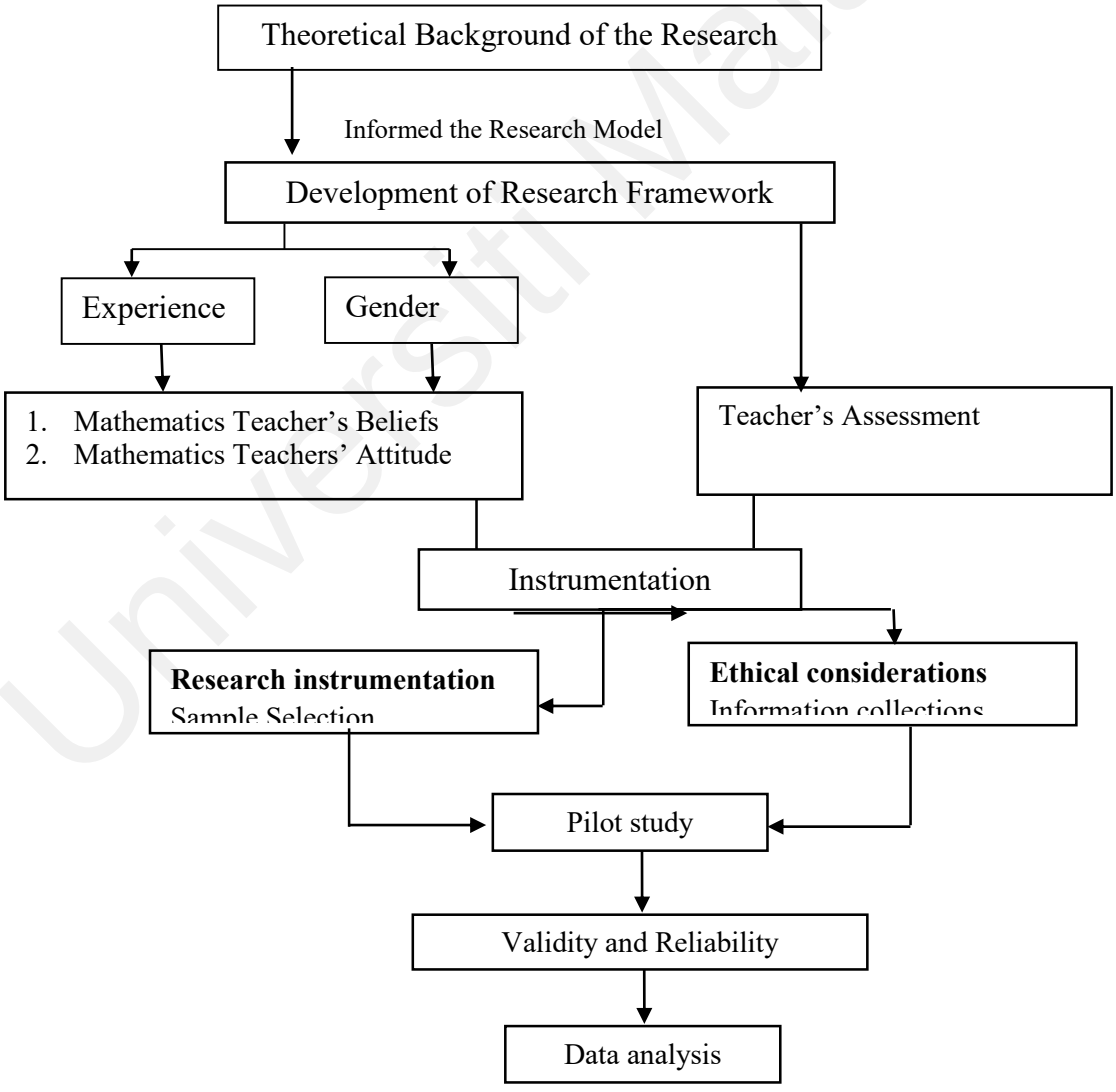

Figure 3.1 Research Design

3.3 Research Approach

This study employs a quantitative research approach in its attempt to answer the research questions and achieve the objectives. A quantitative research approach based on survey questionnaire is convenient to analyse and subject to measurement using charts, figures, tables and graphs. In addition, the numerical data generated through a questionnaire is quantifiable when a statistical scale is used. The research approach employed in this research is suitable in determining the relationship between several variables (MacKinnon, 2008).

3.4 Sampling Method

3.4.1 Population

The population of any study are all the people, things and events under the investigation of the study (Sekaran & Bougie, 2010). Therefore, the ideal population of the current research are intermediate school mathematics teachers in Saudi Arabia, the population under study are intermediate school mathematics teachers in the capital city of Saudi Arabia, Riyadh. There are about 400 intermediate mathematics teachers in the capital City, therefore, the population of the study is (n= 400). Due to gender segregation in all public spheres of the Kingdom, this study considers both male and female teachers at the intermediate schools in the various schools within the capital city Riyadh.

The underlined reason for focusing on Riyadh is due to its being the capital city where there is a conglomeration of people from the rest of the Kingdom, as often the nature of capital cities. This makes the City relatively diverse than the rest of the cities in the Kingdom. Another reason is because of its being the largest city by population in the Kingdom. Riyadh city is estimated to be the home of 4,205,961 people, almost twice the population of Jeddah (2,867,446) which stands as the second

largest city in the Kingdom (World Population Review, 2018). Being the capital City, virtually all the government ministries, foreign embassies and other national, regional and international institutions, both private and public schools and higher institutions are all located in the City. The diverse nature of the City makes it somehow representative of teachers across the Kingdom.

3.4.2 Sample Size Determination

For determining the sample size of the study, Krejcie and Morgan's (1970) guidelines for determining the minimum sample size which is shown in Table 3.1 below. Based on the guidelines, 196 sample is the minimum number for a population of 400 in order to provide satisfactory statistical power in the analysis of power. The detail of the guidelines can be seen in Table 3.1.

Table 3.1
Krejcie and Morgan's (1970) Sample Size Guidelines

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127*	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Note:“N” is the population size. “S” is the sample size. The sample size range for the study is highlighted and asterisked

In addition, the study also considers the minimum margin of error which in social science and education research, the tolerable margin should not exceed 5% whereas 3% margin of error is considered for continuous data (Krejcie & Morgan, 1970). Thus, the acceptable margin of error herein considered is 5% margin against 95% confidence level. As seen in the numeric description in Table 3.1, for the population of 400 the study requires the minimum of 196 sample size which will make up for the possibility of missing data (Hair et al., 2010). The large sample will also enable the study to be more like the given population. This is in line with the general rule postulated by Creswell (2012) where he stated that the larger the sample the more likely the sample is similar to the given population.

3.4.3 Sampling Procedure

The sampling technique deemed suitable for the current study is simple random sampling. The list of intermediate school mathematics teachers based in the City of Riyadh was obtained from the City's Ministry of Education office. Using the list, the teachers are selected through the random selection of their staff numbers. The questionnaire was then distributed by the researchers to every one of the teachers whom their staff numbers were selected.

3.5 Research Instruments

This study will use two different instruments in measuring teacher's beliefs and attitudes of intermediate school teachers in Saudi Arabia. The beliefs questionnaire is specifically about teaching and learning mathematics. The questionnaire contains questions for which teachers are asked to indicate the extent of their agreement based on a 5-point Likert scale that range from 1 (strongly disagree) to 5 (strongly agree).

This questionnaire is modified by Beswick (2005). By responding the questions of the questionnaire, the extent to which teachers held a traditional view or standards-based view of mathematics are captured. By traditional view of mathematics, it means content-focused teaching approach that emphasizes on performance and skill mastery. Likewise, the standards-based view approach of mathematics refers to a more learner-focused teaching approach that emphasizes on mathematical sense-making and understanding of concepts and procedures. The two approaches (traditional and reformed-oriented views of mathematics) were proposed based on factor analysis, and the corresponding reliability scores for these clusters were 0.78 and 0.77 respectively (Beswick, 2005). The survey questionnaire contains a total of 24 items out of which 11 are scored in reverse because the aim is to capture contrasting views of problem solving. The scores range from 1 to 5 for which the highest score indicate greater consistency with a standards-based view of teaching and learning mathematics. Furthermore, the 24 items are divided into three (3) aspects:

First: Beliefs on the role of mathematics teacher is elaborated on by Biswick (2005) through five (5) indicators:

1. The teacher has a responsibility to maintain ultimate control of the classroom discourse. This does not mean that the teacher has to control everything that happens within the classroom. It rather implies that the teacher has the responsibility to ensure that the classroom is productive and effective.
2. The teacher has a responsibility actively to facilitate and guide students' construction of mathematical knowledge. This is part of the role of the teacher from the constructivist perspective in which the teacher does not just impart knowledge.

3. The teacher has a responsibility to induct students into widely accepted ways of thinking and communicating in mathematics. This is similar to the statement above and is part of the constructivist conception of teacher's role.
4. The teacher is the authority with respect to the social norms that operate in the classroom. This implies that the teacher compounds his authority with respect to the classroom's social norms.
5. Teachers have a professional responsibility to engage in ongoing learning. This refers to the teacher's commitment of the teacher in seeking out second voices.

Thus, in the questionnaire, this belief is represented by items 1, 2, 3, 7, 9, 12, 14, 15, 16, 19, and 20.

Second: Beliefs on teaching mathematics is represented by two statements. Firstly, mathematics is about connecting ideas and making sense. Secondly, mathematics is fun. This implies that the teacher's enjoyment of the discipline of mathematics is important as it conveys a sense of confidence and playfulness in relation to mathematics. This belief is represented by items 8, 10, 11, 17, 18, and 22.

Third: Beliefs about mathematics learning is represented by two statements as described by Beswick (2005). Firstly, students' learning is unpredictable and, secondly, all students can learn mathematics. This belief is prerequisite for the creation of a constructivist classroom environment. The second statement is necessary to teacher's understanding of his/her role as a mathematics teacher. This implies that students' failure to progress in their mathematics learning process must be interpreted as the teacher's failure. However, it should be noted that some teachers believe that not all students can learn mathematics therefore placing the responsibility of learning solely on the shoulder of the students. Beliefs on learning mathematics are represented in the questionnaire by items 4, 5, 6, and 13.

This researcher validated the instrument by presenting the questionnaire to a group of experts to know their views on the extent of the suitability and the clarity of the items of the questionnaire in terms of education and language of the topic of this research. This is in order to verify the reliability and the validity of the instrument.

The second instrument employed for this research is Attitude and Practices for Teaching Mathematics which came from the Survey (McDougall, 2004). This questionnaire contains 20 questions, using a 6-point Likert scale whereby the extent to which a participant agreed with each statement was described from strongly disagree to strongly agree. The survey questions directly touch on the following ten dimensions:

1. Program Scope and Planning represented by items 4, 8, and 13.
2. Meeting Individual Needs represented by items 2, 6, 7, 15, and 16.
3. Learning Environment represented by items 3, 5, and 6.
4. Student Tasks represented by items 1, 2, 11, 15, and 16.
5. Constructing knowledge represented by items 5, 11, 14, 15, and 16.
6. Communicating with parents represented by items 19.
7. Manipulatives and technology represented by items 10, and 18.
8. Students' mathematical communication represented by items 3, 6, 10, and 17.
9. Assessment represented by items 8, 11, 12, and 19.
10. Teacher's Attitude and Comfort with Mathematics represented by items 4, 7, 13, 15, and 20.

For statements 1–5, 7–10, 12–14, and 17 using these scores

A	B	C	D	E	F
1	2	3	4	5	6

For statements 6, 11, 15, 16, using these scores

A	B	C	D	E	F
6	5	4	3	2	1

It has also been stated that this instrument shows a high degree of internal consistency (Cronbach's alpa was in the region of .88). The researcher also sent the questionnaire for interrater reliability in order to validate the questionnaire after the translation of the questionnaire into Arabic language, the mother tongue of the sample of this study. The questionnaire was sent to three interrater in total, two of them were language experts and one was a content expert. All three experts positively assessed the questionnaire and gave their approval for its use for this study.

3.5.1 Validity and Reliability

Validity and reliability are necessary principles of a scientific research. Validity focuses on how well a test measures what it is supposed to measure. Reliability on the other hand is the degree to which an evaluation (assessment) produces stable and consistent results. Every reliable test must be valid. The methods employed here in the process of this study are believed to be valid in achieving the overall objectives of the study. The beliefs are based on the following grounds:

1. Both instruments of teachers' beliefs and attitude are believed to have covered the theoretical and empirical issues raised and discussed in the literature review section. This will help in building informative insights on the Saudi middle schools' Mathematics teachers' beliefs and attitude which will enhance reliability and validity of the findings of the study.

2. The use of the two instruments is believed to help in achieving the aims and objectives of the study. The instruments cover all the questions raised by the research.
3. The instruments have been used by various studies in the field of mathematics education. For example, studies that used ATMI include Abdul Majeed, Darmawan and Lynch (2013); Abosalem (2015); Tapia and Marsh (2002); Huang and Lin (2015); Jacobs and Spangenberg (2014); and Slavik (2015). Also on teachers' beliefs studies such as Furner (1996); Memnun and Katranci (2012); and Smith (2015).
4. The creators of Attitudes Towards Mathematics Inventory (ATMI), Tapia and Marsh (2004), stated that the instrument shows a high degree of internal consistency (Cronbach alpa was in the region of .88).

In addition, the questionnaire instrument employed in this research was translated into Arabic language. After the translation, the translated questionnaire was then submitted to three (3) experts for validation. The three experts comprise of one 91) content expert and two (2) language experts to validate both the language and the contents of the questionnaire. All three experts checked and approved of the questionnaire and stated that the questionnaire is relevant and proper for the purpose of the research.

3.5.2 Pilot Study

The aim of a pilot study is to examine the construct validity and reliability of the items presented in the questionnaire. Pilot study is defined as a trial or small-scale version of the instruments of the main research (Polit et al., 2001). It is considered an instrumental study in which the researcher embarks on the modification of the

instrument after the trial version of the study has been completed and the results obtained have been examined (Creswell, 2012). It is on the basis of this that the researcher aims to conduct a pilot study before embarking on the main data collection of the research.

Prior to conducting pilot study, the questionnaire was submitted to three experts for validation: 1 content expert and 2 language experts. The pilot study was conducted prior to the distribution of the main questionnaire of the study. The selection of the participants for pilot study was made by getting the teachers' contacts information via social media mathematics teachers' group (see Appendix B for the copy of the permission of conducting pilot study obtained from the Ministry of Education, Saudi Arabia). In total, thirty (30) intermediate schools mathematics teachers were selected from the main population of the study i.e. from the entire population of intermediate school mathematics teacher within the province of Riyadh. Out of the thirty (30) participants, 15 (50%) percent were female whereas the remaining 15 (50%) were male. These thirty (30) participants involved in the pilot study were not included later in the main study. The result showed that there is agreement among experts on the instruments used.

Table 3.2

Cronbach alpha value

Construct	Number of Items	Cronbach Alpha
Belief	30	0.82
Attitude	30	0.83

3.6 Research Procedures

Prior to the distribution of questionnaires to the intermediate school mathematics teachers in Riyadh province, Saudi Arabia, a clarification letter was obtained from the office of the Faculty of Education, University Malaya. The letter was sent to the Schools Board in Saudi Arabia seeking their permission to conduct the study. Following approval from the Schools Board, the questionnaires was then distributed to the selected teachers mainly by hand during a two weeks period for the data collection procedure. The questionnaires were translated into Arabic language, being the lingua franca throughout the Kingdom of Saudi Arabia. As stated under the validity section, after the translation of the questionnaire, the translated version was sent to language and content experts for validation. The language of the questionnaire was made easy and straightforward to facilitate the participants' understanding.

The data of the study was collected through the distribution of the questionnaire to the selected sample of the study. A cover letter which entails the purpose of the research was attached to the survey for the responds to be clear about the questionnaire. In addition, the respondents were informed in the letter that their information and responses are going to be confidential and the researcher will only use it for the purpose of the study. Also, the letter entails some personal details of the researcher including her name, status, phone and email address in case the respondents need more information or further clarification on the survey. Another important information contained in the letter was to inform the respondents that the research was undertaken for the partial fulfillment of the degree of Master at the University Malaya.

Since the selected teachers were not located in the same school or compound, three different ways were used in distribution the questionnaires. The researcher established prior contact with most of the teachers prior to sending them the

questionnaires. Some of the teachers requested for the questionnaire to be sent through postal service and promised to send it back once completed. Another group of teachers requested the researcher to scan the questionnaire and send via email. Most of these teachers followed the same channel in re-sending the completed questionnaires back. For some of the teachers, the researcher had to track them in person to their respective schools and requested the completion of the questionnaires promptly. Doing so helped the researcher in getting most of the distributed questionnaires back.

3.7 Data Analysis

This study consists of both dependent and independent variables:

1. Independent Variables:
   i. Gender
   ii. Experience
2. Dependent Variables:
   i. Mathematics Teacher's Beliefs
   ii. Mathematics Teacher's Attitude

Once the questionnaires are returned, the data will then be prepared for analysis. The data preparation process proposed by Sekaran and Bougie (2010) will be followed which entails coding of the data, by assigning numerical value to each response in the collected questionnaires. This raw data will be entered into SPSS application immediately once the coding is completed. Then, a unique identification is given to each questionnaire which will be entered into the first column of the SPSS Data Editor Spreadsheet. Also, a unique short and easily understood abbreviation will be given to each of the five constructs of the study using the initial of the name of the constructs. For instance, gender = GD, belief = BLF, attitude = ATT, and so on. The columns in the SPSS spreadsheet will then be labelled BLF 1, BLF 2, BLF 3, or ATT 1, ATT 2, and so on. The same abbreviations will be maintained throughout the analysis for the sake of consistency and the ease of understanding.

In addition, two types of tests will be used in analysing the data of the study. Prior to the analysis of the data, the data's normality was tested using skewness and kurtosis. The first is Pearson correlation test (r) which is a parametric test used because the variables are measured on an interval or ration scale and are continuous in nature. The value of r is significant at r=0.5 meaning that a correlation of 0.5 below indicates a significant positive correlation whereas more than the 0.5 indicates the lack of significant positive correlation between the variables. The second test employed for the analysis of the data of this research is t test. The independent t test and one-way ANOVA were used to analyse the data on the two divisions of the study's population i.e. male and female intermediate schools mathematics teachers. This aspect of the analysis is descriptive in nature where a correlation analysis was applied to determine the availability of a relationship between independent variable (s) and dependent variable (s).

Table 3.3:
Data analysis

No	Research Question	Data analysis
1	What are mathematics teachers' beliefs on teaching mathematics?	Descriptive statistics
2	What are mathematics teachers' attitudes toward teaching mathematics?	Descriptive statistics
3	Is there any statistically significant relationship between teachers' beliefs and attitudes?	Pearson Correlation
4	Is there any statistically significant difference in the level of mathematics teachers' beliefs based on gender and experience?	Independent t test
5	Is there any statistically significant difference in the level of mathematics teachers' beliefs based on teaching experience?	One-way ANOVA
6	Is there any statistically significant difference in the level of mathematics teachers attitudes based on gender?	Independent t test
7	Is there any statistically significant difference in the level of mathematics teachers attitudes based on teaching experience?	One-way ANOVA

3.8 Conclusion

This chapter has laid down the methodology intended to be used in conducting this research. The chapter presents the quantitative approach to the research design and the form of survey method adopted. The chapter provides a succinct presentation of the population of the study, participants and the sampling technique and procedures adopted by the research. The chapter also discusses the instruments used and the procedures entailed in collecting the data of the study. Furthermore, the chapter explains the data analysis procedures and the process aimed to be used by the study.

CHAPTER FOUR

RESULTS

4.1 Introduction

While the third chapter of this research delineated and explained in step by step the procedures and analyzing the data with the suitable statistical means, the obvious purpose of this chapter is to present the findings according to the objectives and research questions which in turn were built as outlines for the research problem. In the meantime, all these were done based on the recommendation from the literature review related to the issue of this study. Therefore, the general objective of this study is to study mathematics teachers' beliefs and attitudes on teaching mathematics, particularly at the intermediate school level in Saudi Arabia. The present study is guided by the following research questions.

Research Questions

8. What are mathematics teachers' beliefs on teaching mathematics?
9. What are mathematics teachers' attitudes toward teaching mathematics?
10. Is there any statistically significant relationship between teachers' beliefs and attitudes?
11. Is there any statistically significant difference in the level of mathematics teachers' beliefs based on gender?
12. Is there any statistically significant difference in the level of mathematics teachers' beliefs based on teaching experience?

13. Is there any statistically significant difference in the level of mathematics teachers attitudes based on gender?
14. Is there any statistically significant difference in the level of mathematics teachers attitudes based on teaching experience?

4.2 Response Rate

The number of distributed survey questionnaires was 196. Of the 196 survey, 166 questionnaires were returned which represented approximately 84.6% response rate. However, 20 questionnaires were excluded from the analysis due to incomplete answer; thus, a total of 146 usable questionnaires were utilized with 74.48% response rate. The sample size of n=146 was considered as sufficient for this study. The study sample size (N=146) achieved the ratio of 10:1 as recommended by (Kline 2011). Table 4.1 shows the summary of data collection and response rate.

Table 4. 1

Summary of Data Collection and Response Rate

Responses	Total
Distributed questionnaires	196
Unreturned questionnaires	30
Returned and entered questionnaires	166
Unstable questionnaires	20
Usable questionnaires	146
Response rate	74.48%

4.3 Participants' Demographic Characteristics

The study includes the demographics characteristics of the mathematics teachers in the intermediate stage in Saudi Arabia, which are their gender, evaluation and

experience. These categorical variables of the participants are discussed in details below.

4.3.1 Gender

Regarding gender of the mathematics teachers of the intermediate stage in Saudi Arabia who took part in this study, the number of the female mathematics teachers is 100 while the number of male mathematics teachers is 46, which accounted for 68.5% and 31.5% respectively. Obviously, there is a very big difference which shows that the number of female mathematics teachers who participated in the questionnaire of this study is more than their male counterpart, these results are shown in the below table 4.2.

Table 4.2
Gender (n=146)

Gender	Frequency	Percent
Male	46	31.5
Female	100	68.5
Total	146	100.0

4.3.2 Teachers Teaching Experience

The detail distribution of participants by teaching of experiences can be seen in Table 4.3.It is obvious that the majority of the teachers had long teaching experience since 44 teachers which account for 30.1% out of the total sample size which is 146 had more than 15 years of experience. It is followed by those teachers who had less than 5 years presented by 38 teachers at (26.0%).In contrast, the minority of mathematic

teachers presented by only 30 teachers at (20.5%) had 10-15 years of experience. This is followed by those who have less than 5 years teaching experience as it can be seen from the table below that 34 teachers at (23.3%).

Table 4.3

Experience (n=146)

Experience	Frequency	Percent
Less than 5 years	34	23.3
5-10 years	38	26.0
10-15 years	30	20.5
More than 15 years	44	30.1
Total	146	100.0

4.4 Mathematics Teachers' Beliefs on Teaching Mathematics

The first research question intended to find out "What are mathematics teachers' belief on teaching mathematics?". Accordingly, the descriptive analysis (using frequency, percentage, mean and standard deviation) shows the answer in levels as well as discussing the general result at the end. This research question presents information about the level of mathematics teacher's beliefs on teaching mathematics. The 24 items for the three dimensions of Saudi mathematics teachers' belief (beliefs on roles, beliefs on teaching and beliefs on learning) were given a rage of five-point Likert scale with 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; and 5 = Strongly Agree. The level of their will be decided based on mean scores interpretation where (1-2.33) is low, (2.34-3.67) is moderate, and (3.68-5) is high (Bagheri & Pihie, 2014; Pihie et al., 2011). The percentage scores were computed for each item, to indicate the level of beliefs on teaching mathematics. This section presents the distribution of the respondents' responses to all items representing each factor of mathematics teachers' beliefs on teaching mathematics. The findings were revealed according to

mathematics' teachers' dimensions namely, school beliefs on roles of mathematics, beliefs on teaching mathematics and beliefs on learning mathematics.

4.4.1 Beliefs on Role

As seen in Table 4.4 below, out of the 21 items in the level of beliefs on teaching mathematics, 11 items (1, 2, 3, 7, 9, 12, 14, 15, 16, 19 and 20) as shown in Table 4.4 below were used to in the first dimension (beliefs on role of teaching mathematics).

Table 4.4

Level of beliefs on role of teaching mathematics (n=146)

No	Items	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	SD
1	A vital task for the teacher is motivating children to solve their own mathematical problems.	1.8	0.9	0.0	43.6	53.6	4.46	.73
2	Ignoring the mathematical ideas that children generate themselves can seriously limit their learning.	17.3	7.3	0.0	41.8	33.6	3.67	1.45
3	It is important for children to be given opportunities to reflect on and evaluate their own mathematical understanding	1.8	1.8	0.0	38.2	58.2	4.49	0.76
7	Teachers of mathematics should be fascinated with how children think and intrigued by alternative ideas.	1.8	0.0	0.0	32.7	65.5	4.60	0.68
9	Allowing a child to struggle with a mathematical problem, even a little tension, can be necessary for learning to occur.	1.8	9.1	0.0	48.2	40.9	4.17	0.96
12	Justifying the mathematical statements that a person makes is an extremely important part of mathematics.	1.8	2.7	0.0	41.8	53.6	4.43	0.80
14	Teachers can create, for all children, a non-threatening environment for learning mathematics.	3.6	10.9	0.0	43.6	41.8	4.09	1.09
15	It is the teacher's responsibility to provide children with clear and concise solution methods for mathematical problems.	1.8	15.5	0.0	38.2	44.5	4.08	1.11
16	There is an established amount of mathematical content that should be covered at each grade level.	4.5	8.2	0.0	46.4	40.9	4.11	1.07
19	Telling the children, the answer is an efficient way of facilitating their mathematics learning.	7.3	22.7	0.0	42.7	27.3	3.60	1.30
20	I would feel uncomfortable if a child suggested a solution to a mathematical problem that I hadn't thought of previously.	6.4	30.0	0.0	48.2	15.5	3.36	1.24
	Average Total	4.54	9.92	0.00	42.31	43.22	4.10	1.02

Note: SD – Strongly disagree, D – Disagree, N – Neutral, A – Agree, SA – Strongly agree.

Beliefs on role of teaching mathematics in high level (M = 4.10 and SD = 1.02). Items of beliefs on role of teaching mathematics with highest mean is Teachers of mathematics should be fascinated with how children think and intrigued by alternative ideas. The total mean score for this item is M = 4.60 and SD = 0.68. The highest percentage (65.5%) of teachers strongly agreed. The second highest percentage (32.7%) reported agree. On the other hand, none of the teachers reported disagree. While, (1.8%) of teachers strongly disagreed. Overall, result for this item indicates that the majority of the participants expressed agreement that teachers of mathematics should be fascinated with how children think and intrigued by alternative ideas. The lowest mean of item is I would feel uncomfortable if a child suggested a solution to a mathematical problem that I hadn't thought of previously. The total mean score for this item is M = 3.36 and SD = 1.24. 48.2%of teachers agreed with the statement. In contrast, (30.0%) of teachers disagreed. (15.5%) reported strongly agree. However, the minority, (6.4%) strongly disagreed with the statement. (33.6%). Overall, result for this item indicates that the majority of the participants expressed agreement in regard to the above statement.

4.4.2 Beliefs in Teaching

As seen in Table 4.6 below, out of the 21 items in the level of beliefs on teaching mathematics, 6 items (8, 10, 11, 17, 18 and 22) as shown in Table 4.5 below were used to in the second dimension (beliefs on teaching mathematics).

Table 4.5

Level of beliefs on teaching mathematics (n=146)

No	Items	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	SD
8	Providing children with interesting problems to investigate in small groups is an effective way to teach mathematics.	3.6	0.9	0.0	46.4	49.1	4.36	0.85
10	Children always benefit by discussing their solutions to mathematical problems with each other.	1.8	9.1	0.0	47.3	41.8	4.18	0.96
11	Persistent questioning has a significant effect on children's mathematical learning.	0.9	5.5	0.0	50.0	43.6	4.30	0.81
17	It is important that mathematics content be presented to children in the correct sequence.	0.9	1.8	0.0	54.5	42.7	4.36	.67
18	Mathematical material is best presented in an expository style: demonstrating, explaining and describing concepts and skills.	0.9	5.5	0.0	47.3	46.4	4.33	.81
21	Listening carefully to the teacher explain a mathematics lesson is the most effective way to learn mathematics.	1.8	6.4	0.0	40.9	50.9	4.33	.91
	Average Total	1.65	4.87	0.00	47.73	45.75	4.31	0.84

Beliefs on teaching mathematics in High level (M = 4.31 and SD = 0.84). Result showed that the highest mean of item is providing children with interesting problems to investigate in small groups is an effective way to teach mathematics (M = 4.36 and SD = 0.85). The majority of the teachers reported strongly agree with the statement (49.1%) followed by agree (46.4%). However, the minority responded disagree (0.9%) and strongly disagree (3.6%) respectively. The result of this item indicates that the majority of the participants expressed agreement in regard to the above statement. Also, same result with item it is important that mathematics content

be presented to children in the correct sequence (M = 4.36 and SD = 0.67). The majority reported agree with the statement (54.5%) and strongly agree (42.7%). On the other hand, the minority responded strongly disagree (0.9%) followed by disagree (1.8%). Result for this item indicates that the majority of the respondents expressed agreement in regard that it is important that mathematics content be presented to children in the correct sequence.

4.4.3 Beliefs on Learning Mathematics

As seen in Table 4.6 below, out of the 21 items in the level of beliefs on teaching mathematics, 4 items (4, 5, 6 and 13) as shown in Table 4.6 below were used to in the third dimension (beliefs on learning mathematics).

Table 4.6

Level of beliefs on learning mathematics (n=146)

No	Items	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	SD
4	It is important for teachers to understand the structured way in which mathematics concepts and skills relate to each other.	1.8	1.8	0.0	34.5	61.8	4.53	0.76
5	Effective mathematics teachers enjoy learning and 'doing' mathematics themselves.	3.6	1.8	0.0	40.9	53.6	4.39	0.89
6	Knowing how to solve a mathematics problem is as important as getting the correct solution.	2.7	5.5	0.0	39.1	52.7	4.34	0.94
13	As a result of my experience in mathematics classes, I have developed an attitude of inquiry.	1.8	10.9	0.0	45.5	41.8	4.15	1.00
	Average Total	2.48	5.00	0.00	40.00	52.48	4.35	0.90

Beliefs on learning mathematics in high level (M = 4.35 and SD = 0.90). Item with highest mean is It is important for teachers to understand the structured way in which mathematics concepts and skills relate to each other (M = 4.53 and SD = 0.76). The majority reported strongly agree with the statement (61.8%) and agree (34.5%). On the other hand, the minority responded equally for both strongly disagree and disagree (1.8%). Result for this item indicates that the majority of the respondents expressed agreement in regard that it is important for teachers to understand the structured way in which mathematics concepts and skills relate to each other. The lowest mean of item is as a result of my experience in mathematics classes, I have developed an attitude of inquiry (M = 4.15 and SD = 1.00). The majority of the teachers reported agree with the statement (45.5%) followed by strongly agree (41.8%). However, the minority responded strongly disagree (1.8%), obviously(10.9%) of teachers disagree with the statement. Result for this item indicates that the majority of the participants expressed agreement in regard to the above statement.

4.4.4 Overall Result of Teachers' Belief

Table 4.7 presents the result of current level of mathematics teachers' beliefs on mathematics. In order to identify the current level of perceived three dimension; the mean scores were categorized into three:

- From 1.00 – 2.33 is low
- From 2.34 – 3.66 is moderate
- From 3.67 – 5.00 is high

These categorizations were made in order to help identify the level of perception of these the teacher' is low, moderate or high based on perceived by respondents. It can

be clearly identified from the Table 4.7 that the three dimensions of belief have high level. The majority of the mathematic teachers participating in this study expressed high agreement that the beliefs towards teaching mathematics. In line with the mean scores interpretation this trend can be noted from the overall mean score to all the 21 items is 4.06 which indicate that mathematic teachers participated in this study have high level of beliefs towards teaching mathematics as they mostly answered with agreement in this regard.

Table 4.7

The Result of the Current Level of Teachers' Beliefs on Teaching Mathematics

Dimension	N	Mean	SD	Level
Belief on the Role of Mathematics	146	4.10	1.02	High
Belief on Teaching Mathematics	146	4.31	0.84	High
Belief on Learning Mathematics	146	4.35	0.90	High

4.5 Mathematics Teachers' Attitudes toward Teaching Mathematics

The first research question intended to find out "What are mathematics teachers' attitudes towards teaching mathematics?" Accordingly, the descriptive analysis (using frequency, percentage, mean and standard deviation) shows the answer in levels as well as discussing the general result at the end. This research question presents information about the level of mathematics teacher's attitudes on teaching mathematics. The 22 items were given a range of five-point Likert scale with 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; and 5 = Strongly Agree. The level of their will be decided based on mean scores interpretation where (1-2.33) is low, (2.34-3.67) is moderate, and (3.68-5) is high (Bagheri&Pihie, 2014; Pihie et al., 2011). The percentage scores were computed for each item, to indicate the level of beliefs on teaching mathematics.

Table 4.8

Level of attitudes towards teaching mathematics (n=146)

No	Items	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	SD
1	I like to assign math problems that can be solved in different ways.	0.9	0.9	10.0	54.5	33.6	4.19	.72
2	I regularly have all my students work through real-life math problems that are of interest to them.	1.8	5.5	10.9	52.7	29.1	4.02	.89
3	When students solve the same problem using different strategies, I have them share their solutions with their peers.	2.7	1.8	4.5	58.2	32.7	4.16	.82
4	I often integrate multiple strands of mathematics within a single unit.	4.5	16.4	15.5	43.6	20.0	3.58	1.12
5	I often learn from my students during math because they come up with ingenious ways of solving problems that I have never thought of.	2.7	5.5	21.8	47.3	22.7	3.82	.94
6	It's often not very productive for students to work together during math.	10.9	39.1	20.0	20.9	9.1	2.78	1.17
7	Every student should feel that mathematics is something he or she can do.	0.9	2.7	1.8	45.5	49.1	4.39	.74
8	I plan for and integrate a variety of assessment strategies into most math activities and tasks.	0.9	0.9	10.9	56.4	30.9	4.15	.72
9	I try to communicate with my students' parents about student achievement on a regular basis as well as about the math program.	3.6	3.6	13.6	46.4	32.7	4.01	.97
10	I encourage students to use manipulatives to communicate their mathematical ideas to me and to other students.	0.9	0.0	10.0	48.2	40.9	4.28	.72
11	When students are working on problems, I put more emphasis on getting the correct answer rather than on the process followed	14.5	44.5	12.7	18.2	10.0	2.65	1.22
12	Creating rubrics is a worthwhile exercise, particularly when I work with my colleagues	2.7	2.7	12.7	57.3	24.5	3.98	.86

13	It is just as important for students to learn probability as it is to learn multiplication.	0.9	6.4	14.5	53.6	24.5	3.95	.85
14	I don't necessarily answer students' math questions, but rather ask good questions to get them thinking and let them puzzle things out for themselves.	5.5	30.0	10.0	37.3	17.3	3.31	1.22
15	I don't assign many open-ended tasks or explorations because I feel unprepared for unpredictable results and new concepts that might arise.	7.3	30.9	15.5	31.8	14.5	3.15	1.22
16	I like my students to master basic operations before they tackle complex problems.	0.9	1.8	4.5	44.5	48.2	4.37	.74
17	I teach students how to communicate their math ideas.	0.9	0.0	5.5	60.9	32.7	4.25	.64
18	Using technology distracts students from learning basic skills.	4.5	23.6	16.4	30.9	24.5	3.47	1.22
19	When communicating with parents and students about student performance, I tend to focus on student weaknesses instead of strengths.	10.0	31.8	19.1	27.3	11.8	2.99	1.22
20	I often remind my students that a lot of math is	27.3	37.3	10.0	16.4	9.1	2.43	1.30
	Average Total	5.44	14.97	12.10	41.97	25.49	3.69	0.96

Note:SD – Strongly disagree, D – Disagree, N – Neutral, A – Agree, SA – Strongly agree.

As seen in Table 4.8 above, there are 22 items in the level of beliefs on teaching mathematics. Item with the highest mean is Every student should feel that mathematics is something he or she can do (M = 4.39 and SD = 0.74). Respondents reported agreed with the statement, where around (94.6%) of the respondents either choose strongly agree or agree with the statement. Item with the lowest mean is I often remind my students that a lot of math is (M = 2.43 and SD = 1.30). The majority of participants who either choose agree or strongly agree were the highest in item 18 (55.4%) followed by the second highest in item 19 (39.1%), lastly, they were around (25.5%).In general, it can be noted from Table 4.5 above that the majority of the mathematic

teachers participating in this study expressed high agreement that the attitudes towards teaching mathematics. In line with the mean scores interpretation this trend can be noted from the overall mean score to all the 20 items is 3.69 which indicate that mathematic teachers participated in this study have high level of attitudes towards teaching mathematics as they mostly answered with agreement in this regard.

4.5.1 Relationship between Teachers' Beliefs and Attitudes

Regarding the third research question of this study, a Pearson Correlation analysis was performed to explore any statistically significant relationship between mathematics teachers' beliefs and their attitudes towards teaching mathematics. The study was conducted among 146 mathematics teachers of the intermediate schools in Riyadh, Saudi Arabia.

Table 4.9

Relationship between mathematics teachers' beliefs and attitudes towards teaching mathematics

Beliefs	Result	Attitudes
Roles	Pearson Correlation	.433**
	Sig. (2-tailed)	.000
	N	146
Learning	Pearson Correlation	.186*
	Sig. (2-tailed)	.024
	N	146
Teaching	Pearson Correlation	.324**
	Sig. (2-tailed)	.000
	N	146
Beliefs	Pearson Correlation	.517**
	Sig. (2-tailed)	.000
	N	146

Firstly, regarding relationship between beliefs on the role of mathematics teacher and their attitudes towards teaching mathematics, the results show that there is a statistically significant at r = .433, sig = .000, p< .05. The relationship is a moderately positive one. The result suggests that an increase in mathematics teachers' beliefs on the role would increase their attitude towards teaching mathematics.

Secondly, regarding relationship between mathematics' teachers' beliefs on teaching mathematics and their attitudes towards teaching mathematics, the results show that there is a statistically significant at r = .324, sig = .000, p<.05. The relationship is a moderately positive one. The result suggests that an increase in mathematics teachers' beliefs on teaching mathematics would increase their attitude towards teaching mathematics.

Thirdly, regarding relationship between mathematics' teachers' beliefs on learning mathematics and their attitudes towards teaching mathematics, the results show that there is a statistically significant at r = .186, sig = .000, p<.05. The relationship is a level positive one. The result suggests that an increase in mathematics teachers' beliefs on learning mathematics would increase their attitude towards teaching mathematics.

Finally, the results Pearson correlation show that there is a statistically significant relationship between mathematics teachers beliefs and attitudes towards teaching mathematics at r = .517, sig = .000, p<.05. The relationship is a moderately positive one. The result suggests that an increase in mathematics teachers' beliefs would increase their attitude towards teaching mathematics.

4.5.2 Difference in the Level of Mathematics Teachers' Beliefs Based on Gender

Independent t test analysis was performed to investigate the differences in Saudi mathematics teachers' beliefs in teaching mathematics (beliefs on rules,beliefs on teaching and beliefs on learning) based on their gender. There are few assumptions that need to achieve before proceed to the analysis of independentt test. Normality and homogeneity of variance were test for the assumption of independent t test.

4.5.2.1 Normality

Normality distribution refers to the scores on a scale or measure fall in a nice symmetrical, bell-shaped curve that has the greatest frequency of scores in the middle with smaller frequencies towards the extremes. Normality can be assessed to some extent by examine the skewness and kurtosis values. Skewness and kurtosis values of 0 indicate that the distribution is perfectly normal, which is uncommon in reality. However, Byrne (2010) define that the acceptable range for skewness and kurtosis are between -3 and +3. The results of skewness and kurtosis showed as in Table 4.10.

Table 4.10
Skewness and Kurtosis of Teachers' Beliefs based on Gender

Beliefs Dimension	Gender	Skewness	Kurtosis
Role	Male	-.178	-.925
	Female	-1.951	-.629
Teaching	Male	-.184	-.681
	Female	-.173	-.730
Learning	Male	-.436	-.371
	Female	-.137	-.446

Table 4.10 showed the skewness and kurtosis of Saudi mathematics teachers' beliefs based on their gender. Males demonstrated (-.178, -.925) for their beliefs on the role of mathematics, (-.184, -.681) for their beliefs on teaching mathematics and (-.436, -.371) for their beliefs on learning mathematics. Whereas, female students showed (-1.951, -.629) for their beliefs on the role of mathematics, (-1.951, -.629) for their beliefs on teaching mathematics and (-.137, -.446) for or their beliefs on learning mathematics. Based on the analysis finding, the values of skewness fall between -1.951 and -.137. While, the values of kurtosis fall between -.925 and -.371. In short, both skewness and kurtosis values fall within the acceptable range which are between -3 and +3. Thus, the belief among Saudi mathematics teachers achieve the assumption of normality and considered as normally distributed.

4.5.2.2 Homogeneity of Variance

Test of Equality of variance was used to test the homogeneity of variance. The Levene's test should be non-significant with the sig. value larger than .05. The analysis of Levene's can be showed as in Table 4.11.

Table 4.11
Levene's Test of Equality of variance for Teachers' Beliefs Based on Gender

Variable	F	Sig.
Rules	.027	.871
Teaching	.706	.402
Learning	2.729	.101

The results of Levene's test in Table 4.11 showed a non-significant differencefor Rules ($F = .027$, sig = .871, $p>.05$), Teaching ($F = .706$, sig = .402, $p>.05$) and learning ($F = 2.729$, sig = .101, $p>.05$). In other words, Levene's tests the statistical

hypothesis that the observed variance of the dependent variables are equal across groups. Thus, the assumption of homogeneity of variance was acceptable.

4.5.2.3 Independent Sample t Test

The results of independent t test showed as below in Table 4.12. Regarding the beliefs on the roles, males have higher beliefs (M=4.20, SD=.48) than their females counter parts (M=4.06, SD= .57). Similarly, concerning the beliefs on teaching, males have higher beliefs (M=4.42, SD=.42) than their females counterparts (M=4.22, SD=.60). Regarding the beliefs on learning, males have higher beliefs (M=4.47, SD=.47) than their females counterparts (M=4.29, SD= .77). Table 4.12 showed the result of independent sample t test comparison of teachers' beliefs based on their gender.

Table 4.12
Independent sample t test

Belief	Gender	N	M	SD	t	Df	Sig.
Rules	Male	46	4.20	.48	1.370	144	.173
	Female	100	4.06	.57			
Teaching	Male	46	4.42	.42	2.076	144	.040
	Female	100	4.22	.60			
Learning	Male	46	4.47	.47	1.420	144	.158
	Female	100	4.29	.77			

Results showed there is significant difference between belief of teaching based on gender ($t = 2.076$, sig = .040, $p<.05$). Male teachers have highest belief of teaching rather than female teachers. However, there are no significant difference between male and female teachers on belief of Roles and Learning ($p>.05$).

4.5.3 Difference in the Level of Mathematics Teachers' Beliefs Based on Experience

One-way ANOVA was performed to investigate the differences in Saudi mathematics teachers' beliefs in teaching mathematics (beliefs on rules, beliefs on teaching and beliefs on learning) based on their experience. There are few assumptions that need to achieve before proceed to the analysis of one-way ANOVA. Normality and homogeneity of variance were test for the assumption of one-way ANOVA.

4.5.3.1 Normality

Normality was examined by the analysis of skewness and kurtosis. The values of skewness and kurtosis were range in between -3 and +3, which are in acceptable range refer to Byrne (2010). The results of skewness and kurtosis showed as in Table 4.13.

Table 4.13
Skewness and Kurtosis of Mathematics Teachers' Beliefs

Belief	Experience	Skewness	Kurtosis
Roles	< 5 years	-.592	-.662
	5-10 years	-.712	-.532
	10-15 years	-.439	-.642
	> 15 years	-.861	-.746
Teaching	< 5 years	-.453	-.066
	5-10 years	-.422	-.876
	10-15 years	-.543	-.764
	> 15 years	-.087	-.132
Learning	< 5 years	-.432	-.902
	5-10 years	-.654	-.444
	10-15 years	-.768	-.765
	> 15 years	-.321	-.043

Table 4.13 showed the skewness and kurtosis of Saudi mathematics teachers' beliefs in teaching mathematics (beliefs on rules, beliefs on teaching and beliefs on learning) based on their experience. There are four group of years of experience which are less than 5 years, 5-10 years, 10-15 and more than 15 years. Teachers who have less than 5 years of experience demonstrated (-.532, -.662) for beliefs on role, (.432, -.902) for beliefs on teaching and (.453, -.066) for beliefs on learning. Meanwhile, teachers who have 5 to 10 years of experience demonstrated (-.712, -.532) for beliefs on role, (.654, -.444) for beliefs on teaching and (.428, -.867) for beliefs on learning. Whereas, teachers who have 10-15 years of teaching experience showed (-.439, -.642) for beliefs on role, (.768, -.765) for beliefs on teaching and (.543, -.763) for beliefs on learning. Finally, for teachers who have more than 15 years teaching experience (-.861, -.746) for beliefs on role, (.453, -.066) for beliefs on teaching and (.087, -.123) for beliefs on learning. Based on the analysis finding, the values of skewness fall between -.861 and .087. While, the values of kurtosis fall between -.902 and .043. In short, both skewness and kurtosis values fall within the acceptable range which are between -2 and +2. Thus, the beliefs of mathematics teachers in four group of years of teaching experience achieve the assumption of normality and considered as normally distributed.

4.5.3.2 Homogeneity of Variance

Homogeneity of Variance was assessed by Homogeneity of Variance. Levene's Test of Equality of Covariance was used to test the homogeneity of variance. The Levene's should be non-significant with the sig. value larger than .05. The analysis of Levene's test can be showed as in Table 4.14.

Table 4.14

Levene's Test of Equality of Covariance for Students' beliefs towards Mathematics Based on Years of Teaching Experience

Variable	F	Sig.
Rules	1.324	.269
Teaching	1.831	.144
Learning	0.717	.543

The results of Levene's test in Table 4.14 showed a non-significant difference for Rules (F = 1.324, sig = .269, p>.05), Teaching (F = 1.831, sig = .144, p>.05) and learning (F = .717, sig = .543, p>.05). In other words, Levene's tests the statistical hypothesis that the observed variance of the dependent variables are equal across groups. Thus, the assumption of homogeneity of variance was acceptable.

4.5.3.3 Descriptive Statistics

Regarding the beliefs on the roles, those who have teaching experience between 10 to 15 years come first with mean 4.18 and SD=.51. They are followed by those who have teaching experience between 5 to 10 years (M=4.15, SD=.41). However, those who have the least working experience (less than 5 years) have the lowest beliefs on the roles (M=3.99, SD=.71). Furthermore, those who have teaching experience more than 15 years come at the second least group (M=4.11, SD=.53).

Similarly, regarding the mathematics teachers the beliefs on teaching, those who have teaching experience between 5 to 10 years come first with mean 4.36 (SD=.38). They are followed by those who have teaching experience more than 15 years (M=4.34, SD=.54). Nevertheless, those who working experience between 10 to 15 years have the lowest beliefs on the teaching (M=4.17, SD=.54). Furthermore,

those who have teaching experience less than 5 years come at the second least group (M=4.25, SD=.75).

However, concerning the mathematics teachers the beliefs on learning, those who have teaching experience between 10 to 15 years come first with mean 4.48 (SD=.77). They are followed by those who have teaching experience between 5 to 10 years (M=4.45, SD=.44). However, those who have the least working experience (less than 5 years) have the lowest beliefs on learning (M=4.17, SD=.82). Furthermore, those who have teaching experience more than 15 years come at the second least group (M=4.31, SD=.71).

Table 4.15
Descriptive statistics

Belief	Experience	N	M	SD
Roles	< 5 years	34	3.99	.71
	5-10 years	38	4.15	.41
	10-15 years	30	4.18	.51
	> 15 years	44	4.11	.53
Learning	< 5 years	34	4.17	.82
	5-10 years	38	4.45	.44
	10-15 years	30	4.48	.77
	> 15 years	44	4.31	.71
Teaching	< 5 years	34	4.25	.72
	5-10 years	38	4.36	.38
	10-15 years	30	4.17	.54
	> 15 years	44	4.34	.54

4.5.3.4 One-Way ANOVA Test

Based on table 4.16, the one-way ANOVA test results showed that there were no statistically significant differences of years of teaching on Rules [F(3,142) = .734, sig

= .533 (p> .05)), Teaching [F(3,142) = .849, sig = .469 (p> .05)] and Learning [F(3,142) = 1.449, sig = .231 (p> .05)]. Thus, there are no statistical significant differences among mathematics teachers based on their teaching experience (less than 5 years, 5 to `10 years, 10 to `5 years and more than 15 years) in Saudi Arabia regarding their beliefs in teaching mathematics. Even though there are no statistical significant difference in the three dimensions.

Table 4.16

One-way ANOVA of Teacher' Beliefs in teaching Based on experience

		Sum of Squares	df	Mean Square	F	Sig.
Rules	Between Groups	.662	3	.221	.734	.533
	Within Groups	42.683	142	.301		
	Total	43.345	145			
Teaching	Between Groups	.781	3	.260	.849	.469
	Within Groups	43.550	142	.307		
	Total	44.331	145			
Learning	Between Groups	2.073	3	.691	1.449	.231
	Within Groups	67.724	142	.477		
	Total	69.797	145			

4.5.4 Difference in the Level of Mathematics Teachers Attitudes Based on Gender

Regarding the difference in Saudi mathematics teachers' attitudes based on their gender, independent sample t-test analysis was conducted to examine any statistical significantdifference between males and females mathematics teachers of the intermediate schools of Riyadh, Saudi Arabia.

4.5.4.1 Normality

The results of skewness and kurtosis of Saudi mathematics teachers' attitudes based on their gender showed as in Table 4.17.

Table 4.17

Skewness and Kurtosis of teachers' attitudes based on gender

Gender	Skewness	Kurtosis
Male	1.47	.35
Female	2.21	.69

Table 4.17 showed the skewness and kurtosis of Saudi mathematics teachers' attitudes based on their gender. Males demonstrated (1.47, .35) for their attitudes and female teacher showed (2.21, .69). In short, both skewness and kurtosis values fall within the acceptable range which are between -3 and +3. Thus, the attitudes among Saudi mathematics teachers achieve the assumption of normality and considered as normally distributed.

4.5.4.2 Homogeneity of Variance

Test of Equality of variance was used to test the homogeneity of variance. The Levene's test should be non-significant with the sig. value larger than .05. The analysis of Levene's can be showed as in Table 4.18.

Table 4.18

Levene's Test of Equality of variance for Teachers' Attitudes Based on Gender

Variable	F	Sig.
Attitudes	.268	0.606

The results of Levene's test in Table 4.18 showed a non-significant difference for Rules ($F = 0.268$, sig = 0.606, $p>0.05$). In other words, Levene's tests the statistical hypothesis that the observed variance of the dependent variables are equal across groups. Thus, the assumption of homogeneity of variance was acceptable.

4.5.4.3 Independent Sample Test

The results of independent sample t-test show no statistically significant difference among both males and females mathematics teachers in the intermediate stage of Saudi schools as t(144) = .840, sig = 0.403, p>.05). Even though male mathematics teachers (M = 3.79, SD =.46) have higher attitudes regarding teaching mathematics than their males counterparts (M = 3.71, SD =.52), the difference in the mean score of mathematics teachers beliefs is not large enough so that the results are not statistically significant as shown in Table 4.19 below.

Table 4.19

Independent Sample t-test regarding teachers' attitudes based on Gender

Gender	N	Mean	SD	Df	t	Sig
Male	46	3.79	.46	144	.840	.403
Female	100	3.71	.52			

4.5.5 Difference in the Level of Mathematics Teachers Attitudes Based on Teaching Experience

Regarding the differences in mathematics teachers' attitudes based on their teaching experience, One Way ANOVA was performed to explore any statistical significant differences. The assumptions of normality and Homogeneity of Variance were checked.

4.5.5.1 Normality

The results of skewness and kurtosis of Saudi mathematics teachers' attitudes based on their teaching experiences showed as in Table 4.20.

Table 4.20

Skewness and Kurtosis of teachers' attitudes based on teaching experiences

Experience	Skewness	Kurtosis
< 5 years	-1.17	2.23
5 – 10 years	.61`	.17
10 – 15 years	1.35	2.37
> 15 years	1.11	1.27

Table 4.20 showed the skewness and kurtosis of Saudi mathematics teachers' attitudes based on their experience. Less than 5 years demonstrated (-1.17, 2.23) for their attitudes, 5 – 10 years' experience showed (.61, .17), 10 – 15 years' experience (1.35, 2.37) and more than 15 years' experience (1.11, 1.27). In short, both skewness and kurtosis values fall within the acceptable range which are between -3 and +3. Thus, the attitudes among Saudi mathematics teachers achieve the assumption of normality and considered as normally distributed.

4.5.5.2 Homogeneity of Variance

The results showed that Levene test results in Table 4.21 were not significant [F = .203, sig = .894, p>.05] a cross mathematics teachers of the intermediate schools in Riyadh, Saudi Arabia teaching experience. This implies that there were no significant differences among the variances according to the teaching experience of the mathematics teachers.

Table 4.21

Homogeneity of Variance

Levene Statistic	df1	df2	Sig.
.203	3	142	.894

4.5.5.3 Descriptive Statistics

Moreover, even though the differences in the level of attitudes towards teaching mathematics between the working experience groups is small and not statistically significant, the mean and standard deviation are shown in Table 4.22 below. First, those who have teaching experience between 10 to 15 years have the highest attitudes (M= 3.79, SD= .48). They are followed by those who have teaching experience more than 15 years (M= 3.78, SD= .47). However, those who have the least teaching experience (less than 5 years) have the lowest attitudes (M= 3.63, SD= .66). Further, those teachers who have teaching experience between 5 to 10 years have the second lowest attitudes towards mathematics (M= 3.74, SD= .39).

Table 4.22

Descriptive statistics for Teachers' Attitudes

Experience	N	M	SD
< 5 years	34	3.63	.66
5-10 years	38	3.74	.39
10-15 years	30	3.79	.48
> 15 years	44	3.78	.47

4.5.5.4 One-Way ANOVA Test

Furthermore, the results from Table 4.23 illustrate that there are no statistical significant difference in mathematics teachers' attitudes based on their teaching experience [F(3,142) = .703, sig = .552, p>0.05].

Table 4.23

One-way ANOVA for Teachers' Attitudes

Source	Sum of square	DF	F	Sig.
Between Group	.539	3	.703	.552
Within group	36.287	142		
Total	36.826	145		

4.6 Conclusion

This chapter of the study provided the results and explanation of the five research questions of this descriptive study for the study mathematics teachers' beliefs and attitudes on teaching mathematics, particularly at the intermediate school level in Saudi Arabia. These research questions were analysed with descriptive statistics (frequency, percentage, mean and standard deviation), Pearson Correlation, independent sample T-test and One-way ANOVA. The results of descriptive analysis were run in order to get information, firstly regarding the demographic characteristics of, particularly at the intermediate school level in Saudi Arabia, namely their gender and self-assessment and teaching experience. Secondly, descriptive statistics was used in order to see the study mathematics teachers' beliefs and attitudes on teaching

mathematics. Thirdly, Pearson correlation was conducted to examine the relationship between mathematics teachers' beliefs and their attitudes towards teaching mathematics. Fourthly, independent simple t-test was conducted to examine any possible statistical significant differences in mathematics teachers' beliefs and attitudes on teaching mathematics based on their gender. Additionally, One Way ANOVA was conducted to examine any possible statistical significant differences in mathematics teachers' attitudes on teaching mathematics based on their teaching experience. Finally, One Way ANOVA was conducted to examine any possible statistical significant differences in mathematics teachers' beliefs (roles, learning and teaching) on teaching mathematics based on their teaching experience. Consequently, the results of analysis of each research question are clarified and discussed in chapter five.

CHAPTER FIVE

DISCUSSION AND CONCLUSION

5.1 Summary of the Research

This last chapter is devoted on discussing the results shown in the previous chapter. It summarizes the findings in answering the research questions. Some recommendations for further research and other practical implications concerning the Saudi mathematics teachers' beliefs and attitude towards teaching Mathematics also highlighted here. Since the main purpose of this quantitative research that was to investigate the to study mathematics teachers' beliefs and attitudes, particularly at the intermediate school level in Saudi Arabia, hence, it is now useful to recapitulate the findings and answers to the research questions of this research.

The respondents in this research consist of 146the number of the female mathematics teachers is 100 while the number of male mathematics teachers is 46, which accounted for 68.5% and 31.5% respectively. Obviously, there is a very big difference which shows that the number of female mathematics teachers who participated in the questionnaire of this study is more than their male counterpart. Regarding mathematics teachers' self-assessments, it is obvious that the majority of the mathematics teachers in the intermediate stage in Saudi Arabia participating in this study assessed themselves as excellent teachers 79.5% (116). Concerning their teaching of experience, it is obvious that the majority of the teachers had long teaching experience since 44 teachers which account for 30.1% out of the total sample size which is 146 had more than 15 years of experience. In contrast, the minority of

mathematic teachers presented by only 30 teachers at (20.5%) had 10-15 years of experience.

All the demographic profile, mathematics teachers' gender and self-assessment as well as their teaching experiences have certain implications and had influenced the respective patterns in terms of their beliefs and attitudes. The following research questions guided the study and demonstrated, the findings clearly.

1. What are level of mathematics teachers' beliefs on teaching mathematics?
2. What are level of mathematics teachers' attitudes toward teaching mathematics?
3. Is there any statistically significant relationship between teachers' beliefs and attitudes?
4. Is there any statistically significant difference in the level of mathematics teachers' beliefs based on gender and experience variables?
5. Is there any statistically significant difference in the level of mathematics teachers attitudes based on gender and experience variables?

5.1.1. Level of Mathematics Teachers' Beliefs on Teaching Mathematics

Research question one was aimed at finding out the current level of mathematics teachers' beliefs on teaching mathematics, it was discovered that the majority of the mathematics teachers participating in this study expressed high agreement and high level of beliefs towards teaching mathematics which is in line with the mean scores interpretation where (1-2.33) is low, (2.34-3.67) is moderate, and (3.68-5) is high (Bagheri & Pihie, 2014; Pihie et al., 2011). This trend can be noted from the overall mean score to all the 24 items 4.06 which indicate that mathematics teachers who participated in this study have high level of beliefs towards teaching mathematics as

they mostly answered with agreement in this regard. One of the likely reasons for the high level of beliefs among the teachers is perhaps to the Saudi teachers' view of mathematics subject as the most important subjects of all. As a mathematics teacher in the Kingdom for the past ten years, from experience as a mathematics teacher the researcher can make a claim that mathematics teachers usually taunts their fellow teachers and joke about being the teachers of the most important and the best subject of all. The high level of teachers' beliefs found by this study is supported by Aljaberi and Gheith (2018), Zikre and Eu (2016), Borhan and Zakaria (2016), Stipek, Givvin, Salmon and MacGyvers (2001), and Voss, Kleickmann, Kunter and Hachfeld (2017) who found substantial coherence among teachers' beliefs and their classrooms' practices. However, the findings slightly differ from that made by Zakaria and Maat (2012) who found in their study a moderate level of teachers' beliefs towards teaching mathematics.

In addition, it is also likely to be due to the approach used by the teachers in teaching mathematics as Yates (2006) found that different approaches to teaching mathematics determine the level of teachers' beliefs towards teaching. For example, teachers who apply more of some of the constructivist teaching practices are found to have stronger beliefs and they tend to utilize more computers and the Internet in their lessons. Based on the experience of the researcher as a mathematics teacher in the Kingdom of Saudi Arabia, mathematics teachers and the teachers of other subjects, particularly in Saudi Arabia, tend to use more computers and the Internet nowadays. However, this is an area that requires further investigation in order to find out the relationship between the use of constructivist approach to teaching mathematics and the tendency of mathematics teachers to employ computers and the Internet in their lessons.

5.1.2 Mathematics Teachers' Attitudes toward Teaching Mathematics

Research question two was aimed at finding out the current level mathematics teachers' beliefs on teaching mathematics, it was discovered that the majority of the mathematics teachers participating in this study expressed high agreement that the attitudes towards teaching mathematics. This trend can be noted from the overall mean score to all the 20 items is 3.69 which indicate that mathematics teachers who participated in this study have high level of attitudes towards teaching mathematics as they mostly answered with agreement in this regard. In a recent research, Tabuk (2018) also made similar findings where he found in the case of prospective teachers a positive attitude towards teaching mathematics. One of the possible explanation is because of teacher experience in the schools. This correspond to Aly and Abdulhakeem (2016) that found that teacher experience play vital role to form teacher attitude toward teaching mathematics. Contrary to that, Sweeting (2011) found mixed results on teachers' attitudes towards teaching mathematics which often developed from the early school years as students of the teachers.

This finding made in the context of Saudi Arabia is plausible for a number of reasons. Firstly, based on the experience of the researcher as an intermediate school mathematics teacher in Saudi Arabia, the intermediate and secondary mathematics teachers in Saudi Arabia take pride in their job and they are mostly mathematics teachers by their self-design and choice vis-à-vis by chance or by the government design. Secondly, intermediate and secondary schools mathematics teachers regard the acquisition of mathematics skills as worthwhile and necessary, enjoy mathematical problem-solving and challenges. Thirdly, the mathematics teachers at the intermediate and secondary schools possess the desire to learn more about mathematics and achieve their role of being mathematics teachers. This has also been found out to be the case in

a study carried out by Jacobs and Spangenberg (2014) on mathematics teachers' attitude towards the subject in South Africa. Therefore, this can be one of the reasons why the mathematics teachers in this study showed high agreement in relation to attitude towards mathematics. In addition, also this perhaps has to do with the teachers' training, experience, materials and resources as claimed by Singal (2011); Coşkun et al. (2009); Ernst & Rogers (2006). This requires further investigation as to why the Saudi teachers' attitude towards teaching mathematics is high.

5.1.3 Relationship between Teachers' Beliefs and Attitudes

Regarding the third research question of this study, a bi-variate correlation analysis was performed to explore any statistical significant relationship between mathematics teachers' beliefs and their attitudes towards teaching mathematics. The study was conducted among 146 mathematics teachers of the intermediate schools in Riyadh, Saudi Arabia. The results show that there is a statistically significant relationship between mathematics teachers' beliefs and attitudes towards teaching mathematics and the relationship is a strong positive one. The result suggests that an increase in mathematics teachers' beliefs would increase their attitude towards teaching mathematics. This is consistent with the literature as it has been found by Wilkins (2008) that teachers' attitudes affect their beliefs towards instructional practice. This has also been supported by Xie (2014) in his study of the relationship between teachers' knowledge, attitude and beliefs. In addition, Gilakjani and Sabouri (2017) also found that teachers' beliefs affect their achievement in their classrooms, their attitudes, and their learners' beliefs. It is obvious therefore, that teachers' attitudes and beliefs affect each other in their relationship with other factors such teaching performance and practices. One possible reason for this finding is Bandura's self-

efficacy theory used in the current research. People's beliefs in their efficacy usually have diverse impacts as they affect the courses of action people opt for, the amount of effort they put in chasing their chosen endeavors, how much they hold when they face barriers and failures, how resilient they to adversity, whether they thought patterns and mindset are self-hindering or self-aiding Moreover, teachers that held various kinds of beliefs usually activate experiences, knowledge, self-reflection and awareness, and other beliefs that related to religion. This statement is in line with Sabrina and Sansrisna (2017) who indicated that teachers beliefs always assist personal experiences, knowledge, self-reflection and awareness, and other beliefs that related to religion.

These results are in line with the previous studies, on of this studies by Mazieres (2016) found an existing relationship between teachers' beliefs and attitudes towards teaching mathematics, their professional learning goals, their instructional practices and students' achievement. Another major finding made by the study stated that teachers' beliefs on constructing knowledge are not aligned with current mathematics education thinking. Brown and Webb (1968) have found that specific fundamental philosophic beliefs held by teachers are more consistent in predicting classroom behavior of teachers than are their educational beliefs. In the 1990s, Richardson (1996) examined the roles of beliefs and attitudes in the education of teachers. The studied argued that there are two roles of beliefs and attitudes in the education of teachers namely, 1) beliefs and attitudes as facets of individual pre-service and in-service which affect the way they process new information, react to the possibilities of change, and teach 2) beliefs and attitudes as the focus of change in teacher education programs.

5.1.4 Difference of Mathematics Teachers' Beliefs Based on Gender and Experience

The finding of the fourth question asked about the issue of differences in the mathematics teachers' beliefs based on their demographic characteristics, namely their gender and teaching experience, the following are this research's findings. Firstly, regarding the difference in Saudi mathematics teachers' beliefs based on their gender, independent sample t-test analysis was conducted to examine any statistical significant difference between males and females mathematics teachers of the intermediate schools of Riyadh, Saudi Arabia. The study consisted 146 mathematics teachers of the intermediate schools in Riyadh, Saudi Arabia who took part in this study. The results of independent sample t-test show no statistically significant difference among both males and females mathematics teachers in the intermediate stage of Saudi schools. Even though male mathematics have higher beliefs regarding teaching mathematics than their female counterparts, the difference in the mean score of mathematics teachers' beliefs is not large enough so that the results are not statistically significant.

The result is supported by some studies such as Kraker-Pauw et al. (2016) who found that gender do not affect teachers' beliefs. Similarly, Tabuk (2018) also found that gender and grade level had no significant impact on attitudes towards teaching mathematics. One of possible explanation is role of teacher in mathematics education classroom. This explanation correspond to statement of Jungwirth (1991) who suggested that over long periods the gender of the participants in the mathematics class does not play a role in classroom interaction. Moreover, the previous study also suggested that only few is known about the type of beliefs that is significant (Yazici & Ertekin, 2010). For example, they indicated that no differences were determined in the subcategories of the use of math and the nature of math, one of the sub-construct

teacher belief. In other word, there is inconsistent finding of teacher gender that influences their teaching in mathematics education classroom. However, the result contradicts the findings of Throndsen and Turmo (2012) whose study found that gender is significantly related to teachers' beliefs. The results are also in contrast with the study carried out by Li (2006), it is found that gender of teachers have different beliefs about male and female students, albeit there is no yet conclusive evidence. Teachers tend to stereotype mathematics as a male domain leading to the teachers' tendency to overrate male students' mathematics capability. They also tend to have high expectations for male students.

Therefore, the result indicates that there is a mixed result on the relationship between gender and teachers' beliefs. This was true in relation to all three dimensions of teacher's beliefs. With regard to the first dimension of teacher beliefs, teacher beliefs on teaching mathematics, the result of this study is consistent with the findings of Rayyan (2010) who found no significant influence of gender on teacher beliefs. This was also found to be the case with regard to the second and the third teacher beliefs' dimension i.e. teacher beliefs on mathematics learning and teacher beliefs on the role of the teacher. Therefore, the findings of this study on this aspect are consistent with some of the findings of some studies whereas other studies within the literature seem to go contrary to the findings of this study on this aspect.

Secondly, regarding the differences in mathematics teachers' beliefs based on their teaching experience, One Way ANOVA was performed to explore any statistical significant differences Results of this research showed that no statistical significant differences were found. This is contrary to some findings of the literature. For example, Han, Shin and Ko (2017) found that teaching experiences increased pre-service teachers' self-efficacy regardless of their teacher's beliefs. One of the possible

reason is that strong beliefs among teachers varies over the years. For example, there is a decline in teacher beliefs through the year. This statement is in line with Isiksal-Bostan, Sahin & Ertepinar (2015) who found that in first five-year period of teaching experience teachers have strong beliefs regarding using of inquiry based approaches. However, in their second five year period of teaching, there is a decline in their beliefs, but after spending more than 16 years in teaching, their beliefs regarding use of inquiry reaches the highest level. This implies that regardless of which dimension of teacher beliefs, teaching experiences have significant influences on teachers' self-efficacy and self-beliefs. Likewise, Berger et al. (2018) found that teaching experience was positively related to self-efficacy and beliefs in constructivism approach but found no impact on practices. With regard to the different dimensions of teacher beliefs and their individual and collective relationship with teacher experiences, there has not been any study found available that look deeper into this relationship. Therefore, future researches can fill this gap within the existing literature.

5.1.5 Difference of Mathematics Teachers Attitudes Based On Gender And Experience

The finding of the last question asked about the issue of differences in the mathematics teachers' attitudes based on their demographic characteristics, namely their gender and teaching experience, the following are this research's findings. Firstly, regarding the difference in Saudi mathematics teachers' attitudes based on their gender, independent sample t-test analysis was conducted to examine any statistical significant difference between males and females mathematics teachers of the intermediate schools of Riyadh, Saudi Arabia. The study consisted 146 mathematics teachers of the intermediate schools in Riyadh, Saudi Arabia who took part in this study. The results of independent sample

t-test show no statistically significant difference among both males and females mathematics teachers in the intermediate stage of Saudi schools. Even though male mathematics have higher beliefs regarding teaching mathematics than their female counterparts, the difference in the mean score of mathematics teachers' beliefs is not large enough so that the results are not statistically significant. A possible reason is that the Saudi cultural profile and belief system being a male dominated society where male are expected to take the center stage in virtually every facets of the Saudi society. The female usually assume a supportive role for male or are found in areas where only female are expected to be (AlMunajjed, 1997). This result is in line with what has been found by Kraker-Pauw et al. (2016) found that gender does not have differences in teacher's attitudes and career choices, career choices in a study they carried out in the Netherlands where 107 participants of both students and teachers were investigated.

Secondly, regarding the differences in mathematics teachers' attitudes based on their teaching experience, One Way ANOVA was performed to explore any statistical significant differences. Results of this research showed that no statistical significant differences were found. This result is surprising given the fact that teaching experience is likely to affect the attitude of teachers towards their profession. However, there is mixed results with regards to the impact of teaching experience on teachers' attitudes. As found by Mackenzie, Hemmings and Kay (2011) that general teaching experience was not found to be significantly related to teacher attitude. This study's findings support the findings made by the current research. One of the possible explanation is that content literacy instruction also remains stable. This is in line with expression of Marsh (2007) who found that the teaching effectiveness of university teachers in the university studied was generally stable with increasing years of experience. Moreover, He also pointed out that teachers are unaware of how to

improve the effectiveness of their teaching without feedback from students' evaluations of their teaching effectiveness and consultation that is external. However, a study conducted by Shatri (2017) found that experience affects teachers' attitudes towards the inclusion of children with special educational needs in the ordinary and comprehensive schools. However, it should be highlighted that this study was carried in a non-mathematical teaching context which might also.

5.2 Findings from Discussion

From the discussion in Chapter Four, summarily this research comes up with the following findings:

1. Regarding the level of mathematics teachers' perception of their beliefs in teaching mathematics, trend can be noted from the overall mean score to all the 24 items is 4.06 which indicate that mathematic teachers participated in this study have high level of beliefs towards teaching mathematics as they mostly answered with agreement
2. Similarly, the level their attitudes towards teaching mathematics, trend can be noted from the overall mean score to all the 20 items is 3.69 which indicate that mathematics teachers participated in this study have high level of attitudes towards teaching mathematics as they mostly answered with agreement
3. As regards the relationship between Saudi mathematics teachers' beliefs and attitudes towards teaching mathematics, in general there the relationship is a strong positive one. The result suggests that an increase in mathematics teachers' beliefs would increase their attitude towards teaching mathematics.
4. Regarding Saudi mathematics teachers' differences in level of beliefs based on their gender and experience variables. Even though there are differences in

teachers' beliefs but the difference not large enough so that the results are not statistically significant

5. Regarding Saudi mathematics teachers' differences in level of attitudes based on their gender and experience variables. Even though there are differences in teachers' beliefs but the difference not large enough so that the results are not statistically significant

5.3 Implications

In this age of computer and information technology, mathematics is one of the major educational subjects in schools which is due to its overwhelming relevance and application to human life and progress. The issue of teachers' beliefs and attitude is a concern everywhere due to its central role in teaching practices of mathematics. The way teachers implement new methods, curriculum or programs in their classrooms depends largely on whether their beliefs and attitudes towards teaching mathematics is compatible with the newly proposed methods, curriculum or programs. Thus, beliefs and attitudes have significant influence on teachers' classroom practice, the way they perceived teaching, learning and assessment, and also the ways they perceive students' potential, abilities, dispositions, and capabilities.

5.3.1 Implication to Teacher

However, simply 'ignoring' mathematics teachers' beliefs and attitudes lead to negative results. This is significantly needed given the fact that educational system, particularly the teaching of mathematics should be dramatically improved in order to realize this goal. The findings of this study may help teachers and researchers alike academically in understanding how teachers' beliefs and attitudes are formed and their

relationship with other factors. The findings may help mathematics teachers in keeping them relevant and competitive given the increasing competition of the current job environment. In addition, the findings of the study may also help the teachers in achieving their teaching objectives of helping their students master the knowledge of mathematics and be able to apply that knowledge in adding value to themselves, their local societies and the country as a whole.

5.3.2 Implication for Curriculum Developers

Curriculum developers and instructional designers have a huge responsibility on their shoulders which designing and reforming educational system when there is need for that. This study can be of tremendous value to them in their quest to understand the underlying teachers' beliefs and attitudes which will give a higher chance of success when trying to bring about any reform in relation to mathematics curriculum. As stated under the problem statement section, studies of this nature on the beliefs and attitudes of mathematics teaching at the intermediate schools level of education in Saudi Arabic are rare. This fact adds extra value and significance to this study particularly for curriculum developers and instructional designers who are responsible of reforming and developing new curriculum in the field of mathematics.

5.3.3 Implication to the Ministry of Education

This study can be of significant implication to the ministry of education and its schools' administrators who are responsible for decision making and policy making with regards to education generally and mathematics teaching in particular. This is important because the impacts of beliefs and attitudes are usually overlooked by educational administrators when making policies, particularly at the lower educational

levels in Saudi Arabia. Reason is likely due to the rare nature of studies on beliefs and attitudes of mathematics teachers, in particular, and teachers of other subjects, in general. Therefore, having an empirical study of this nature available to the Ministry of Education and schools' administrators is likely to keep them informed while formulating policies regarding intermediate levels of education.

5.4 Limitation of the Study

The present study had several limitations. The first limitation is that it was conducted on mathematics teachers' beliefs and attitudes in Riyadh City. Hence, the results may not be representative to the mathematics teachers' beliefs and attitudes teacher in other parts of Saudi Arabia. Secondly, the information of the study may not be similar and different from other mathematics teachers' beliefs and attitudes elsewhere. Thirdly, time constraint becomes a limitation. Since the study was conducted in a limited period of so most likely there are many more data which cannot be collected which will provide more information regarding this research topic. Therefore any generalization regarding the results should be made with caution.

5.5 Recommendations for Further Research

Based on the current results and owing to the limitations of the study, it could be better if future research related to the mathematics teachers' beliefs and attitudes take heed for forthcoming suggestion. New areas of research which expands from this one could be explored especially relating to mathematics teachers' beliefs and attitudes in Saudi Arabia where the government has made great efforts and investments in education envisioned in its vision 2030. This research has produced valuable results and implications on aspects relating to teachers and curriculum designers and educational

administrators. Several recommendations regarding further research pertaining to these aspects are now proposed here. Firstly and more importantly, since this study concentrated only on the perception mathematics teachers' beliefs and attitudes, there is a need for examining the factors the influence mathematics teachers attitudes towards teaching mathematics and this may include mediator variables as well as moderators so that more valuable results could be found. This type of studies when conducted could use the multiple regression analysis or structural equation modeling and could provide comparative data on the same variables as used by this research.

Secondly, it is recommended that another study be undertaken to mathematics teachers' beliefs and attitudes in Saudi Arabiaat the secondary school level as there could be different beliefs and attitudes compared to the mathematics teachers' beliefs and attitudes. Thirdly, this research was done by employing the descriptive quantitative research method. Further studies in this similar area may employ qualitative methodology focusing on interviews or even mixed-method research designs to integrate the qualitative and quantitative approaches. Such combined methods which may contain questionnaires and interviews would allow a researcher to go in-depth on the topic at hand.

Furthermore, since this study was conducted at only in the capital city of the Kingdom (Riyadh), so another area of study that needs to be undertaken is studying the mathematics teachers' beliefs and attitudes in Saudi Arabia. Finally, conducting further longitudinal research in this area of research regardingmathematics teachers' beliefs and attitudes is recommended as these particular aspects assess how scores would fluctuate or remain constant over an expanded period of time.

5.6 Contribution of This Study

As discussed in Chapter 2 of this research, even though there is no scarcity with regards to teachers' beliefs and attitudes in general however, there are still gaps within the existing literature on mathematics teachers' beliefs and attitudes towards teaching the subject of mathematics. This study is unique in its way as it investigates the impact of gender and experience on teachers' beliefs and attitudes towards the teaching of mathematics knowledge. The study also examined the impacts of teachers' beliefs and attitudes towards the teachers' performance. Thus, this study, first, contributes to the larger body of literature on the impact of gender and experience on teachers' beliefs and attitudes on the one hand and the impact of teachers' beliefs and attitudes on teachers' performance on the other.

In addition, the study also contributes to the specific literature of mathematics education in the context of Saudi Arabia. As elaborately discussed in the Chapter 2 of this research, there is limited number of studies of this nature carried out on the relationship of the variables identified by this study particularly in the context of Saudi Arabia. Therefore, the contribution of this study cannot be overstated given the recent emphasis put by the authorities of the Kingdom of Saudi Arabia on improving its educational system in general and particularly the education of science and mathematics as highlighted by its Vision 2030.

5.7 Conclusion

Beliefs and attitudes are very important concept when trying to understand the thought processes and classroom practices of teachers. They also drive classroom actions and trigger teachers' change process. This research was primarily conducted to investigate the mathematics teachers' beliefs and attitudes, particularly at the intermediate school

level in Saudi Arabia. Consequently, it was found out that mathematic teachers participated in this study have high level of beliefs and attitudes towards teaching mathematics as they mostly answered with agreement. Furthermore, generally a high positive relationship was found between mathematics teachers at the intermediate school level in Saudi Arabia beliefs and attitudes. Meanwhile, regarding Saudi mathematics teachers' differences in level of beliefs and attitudes based on their gender and experience variables. Even though there are differences in teachers' beliefs and attitudes but the difference not large enough so that the results are not statistically significant. In this regard, in order to ensure continuous success in the area of teaching mathematics in the long run, the factors that influence their beliefs and attitudes should be studied and improved and serve as a model for all other educational institutions to emulate.

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