INVESTIGATION OF TEACHER-RELATED FACTORS CONTRIBUTING TO STUDENTS' PERFORMANCE IN MATHEMATICS AT SECONDARY SCHOOL LEVEL

BY

Zahid Mahmood Rana

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Zahid Mahmood Rana

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NATIONAL UNIVERSITY OF MODERN LANGUAGES FACULTY OF SOCIAL SCIENCES

THESIS AND DEFENSE APPROVAL FORM

The undersigned certify that they have read the following thesis, examined the defense, are satisfied with the overall exam performance, and recommend the thesis to the Faculty of Social Sciences for acceptance.

Thesis Title: Investigation of Teacher-Related Factors Contributing to Students' Performance in Mathematics at Secondary School Level

Submitted by: Zahid Mahmood Rana **Registration #:** 1498-MPhil/Edu/S18

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Degree name in full

Education
Name of Discipline

Dr. Khushbakht Hina
Name of Research Supervisor

_____
Signature of Research Supervisor

Ms. Sundas Kashmeeri
Name of Research Co-Supervisor

_____
Signature of Research Co-Supervisor

Prof. Dr. Mustafeez Ahmad Alvi
Name of Dean (FSS)

_____
Signature of Dean (FSS)

Prof. Dr. Muhammad Safeer Awan
Name of Pro-Rector Academics

_____
Signature of Pro-Rector Academics

_____
Date

AUTHOR'S DECLARATION

I Zahid Mahmood Rana

Son of Rana Muhammad Ramzan

Registration # 1498-MPhil/Edu/S18

Discipline Education

Candidate of **Master of Philosophy** at the National University of Modern Languages do hereby declare that the thesis **"Investigation of Teacher-Related Factors Contributing to Students' Performance in Mathematics at Secondary School Level"** submitted by me in partial fulfillment of MPhil degree, is my original work, and has not been submitted or published earlier. I also solemnly declare that it shall not, in future, be submitted by me for obtaining any other degree from this or any other university or institution.

I also understand that if evidence of plagiarism is found in my thesis/dissertation at any stage, even after the award of a degree, the work may be cancelled, and the degree revoked.

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December , 2021
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ABSTRACT

Title: Investigation of Teacher-Related Factors Contributing to Students Performance in Mathematics at Secondary School Level.

The basic purpose of conducting this study was to explore teacher-related factors contributing to students' performance in Mathematics at secondary school level. The research objectives were: to explore teacher-related factors contributing to students' performance in Mathematics at secondary school level, to examine the influence of teaching methodology on the performance of Mathematics students at secondary school level, to describe influence of teachers' subject knowledge and assessment practice on the performance of Mathematics' students at secondary school level, to identify the effect of teachers' professional attitude on the performance of the Mathematics students at secondary school level, to determine the effect of teacher professional training on the performance of Mathematics students at secondary school level. The study was conducted in descriptive research design and qualitative research approach. A self-developed open-ended instrument, the Focus Group Discussion Guide was used for data collection. From Population of 84 Mathematics teachers, teaching at Islamabad Model College and Islamabad Model Schools for boys, 09 teachers were selected by using the purposively sampling technique. A session of focus group discussion was held at Research Library, Dawah Academy, International Islamic University, Islamabad. Discussion was continued more than an hour with the participants. Views and suggestions of the entire participants were recorded and noted by the researcher. Collected data was analyzed by using thematic analysis technique. Each theme was analyzed separately and got the meaning from their expressions and elaborated their perception into discussions and extracted the findings of this study. Findings indicated that in service Mathematics teachers have insufficient subject knowledge and their pedagogical skills are not very strong. They are less motivated to students and not very skillful to assess the performance. They have less chances to avail teacher training programs. Based on findings it could be argued that teacher's subject knowledge, pedagogical skills, assessment practices, professional attitude and professional training are the factors which influenced the performance of Mathematics students at secondary school level. The study recommended that in service teachers training programs may be conducted for teachers.

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LIST OF ABBREVIATIONS

B. Ed	Bachelor of Education
B.S Ed	Bachelor of Science Education
CT	Certificate in Teaching
FBISE	Federal Board of Intermediate and Secondary Education
IMSB	Islamabad Model School for Boys
IMCB	Islamabad Model College for Boys
M. Ed	Master of Education
NCSM	National Curriculum Standards for Mathematics
NRC	National Research Council
NEAS	National Education Assessment System
PTC	Primary Teaching Course
PISA	Program for International Students Assessment
SSC	Secondary School Certificate
UNESCO	United Nation Educational Scientific and Cultural Organization
USA	United States of America

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Zahid Mahmood

DEDICATION

This thesis is dedicated to my late father for his love, endless support, and encouragement. Although, he has parted with me, in body, two years back but his spiritual presence has always been a source of motivation and inspiration to face the hardships of life.

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Education is considered as leading element that is used for combination of individuals with the civilization, for the sake of developing national goals and achieving high level of expansion, raise of unity, self-actualization attempt for social, economic welfare, cultural awareness, technological developments, scientific standards (Abdalgani & Eshan, 2019). Bright future of a nation depends upon the educational system that construct behavior and integrity of its nationals (Jameel & Ali, 2016). Education is a continuous process which continues from cradle to grave. In short, education is a well-balanced and harmonious personality development. In education, every subject has its own scope and importance, but Mathematics is unique in playing a significant role by helping multi subject skills development. For acquiring such multi tasks Mathematics is studied as a fundamental component of education. A well-known philosopher, Ibne-Khaldun says “Education should be started with Mathematics”.

In 21stcentury learning of Mathematics is most important and provide major mechanism for future advancement in science and technology. Hence the progress of a society is highly linked and depends upon the development of mathematical education. Educationists have been gone through a long way in recognizing phobic behavior until an objective of removing problems and enhancement of better and meaningful learning, which is to be required compulsory for acceptable future adjustment and development.

The identify phobia is cause to improver teaching and learning process. Mathematics is an important subject and it's learning is incredible in academia. The purpose of this subject is to develop the learning, reasoning, creativity, and high order thinking skills of the students (Samo et al, 2017). Learning of Mathematics gives the solution of the problems with an ability to solve the problems with logical thinking. Learning of Mathematics is life skill and helpful to investigate the problem and to explore its better solution in a better way (Rizki & Priatna, 2019). Hence, it is important to assess students learning outcomes and performance with reliable manners. The importance of learning of Mathematics has been considered and accepted universally. Its role is crucial in individual and society of all the nations. It is equally important for daily scheduled applications in most of the subjects concerned to natural sciences, Computer Sciences, management, and social sciences. In human life, learning of Mathematics is considered a mandatory and basic element of recognized education from earliest period to the existing time (Lambert, 2020). Historically, the development of Mathematics is very traditional. Starting from the ancient period to the 21st century, much advancement has taken placed in this field. The Babylonian, Greek, Egyptian, Chinese, and Indian mathematicians have played an important role in this field. In early 9th century a well-known mathematician Muhammad Ibn-Musa Al- Khwarizmi belongs to Persia made an invaluable contribution to study of Mathematics. In 11th century another well-known Persian Muslim mathematician Ibn al-Haytham worked on algebra, geometry, optics, and Physics (Dadach, 2019). In an ancient time, some Mathematicians namely Pythagoras, Fibonacci, Aryabhata, Euclid, Archimedes, and Rene Descartes have provided significant contribution in the field of Mathematics. During the sixth century, Pythagoreans (Pythagoras and his followers) coined the term Mathematics. Mathematics came from Greek word "Ganita" which shows the meaning of 'inclined

to learn (Kumar,2018). An anthropologist Galileo defined the importance of Mathematics in a unique way, he stated that universe is a grand book, and this book cannot understandable unless come to understand its alphabets which are written in the language of Mathematics, a triangle, circle, and geometric figures are its characters without which it is not possible for human to understand a single word of it (Ilic & Sadikovic, 2018).

Greek Philosopher Plato stated about Mathematics "Thought is peak and pure form of Mathematics" Similarly the Aristotle stated about Mathematics "the mathematical sciences principally show order, summary, limitation and these are the greatest forms of the beautifulness (Lehoux, 2019). Mathematics is one of the most important fields that affects the life of the individual. It is expressively effects on learner and student's learning both in term of mathematical knowledge and ethical education. With the help of quality education interest can produce in Mathematics because it is a part of our routine life. It influences the value of our life and the quality of professionalism directions (Hodanova & David, 2016). It has been observed in some international research papers that Mathematics' presentation is miserable at primary and secondary levels. According to Program for International Students Assessments of Mathematics report- 2018 (PISA) an overall Mathematics performance up to age of 15 years old students has been evaluated for 78 countries. Mathematics performance means score calculated in China, Singapore, Macao, Taiwan, Japan, South Korea, Estonia, Netherland, and Poland respectively fall in the ranking of top ten countries. On the other hand, developed countries namely Canada, Germany, France, United Kingdom, Austria, Australia, and United States could not attain this position which may cause the frustrating for all the educationists (Schleicher, 2019). Nearly ninety percent of high school graduates in the United States of America have bored by learning

of Mathematics and having no interest to study science and engineering as well. They buy costly smarts phones and tablets to solve mathematical problems but do not try to learn the required skills to make them perfect in Mathematics. Educationist belief that no one can make progress in any profession until having the basic knowledge of Mathematics. Most of the students do not take interest and find it difficult and boring subject to study at secondary level. Even they showed feelings of inferiority, hesitation and complex to study it. Such kind of situation directly gets in the way of their learning progress (Akhtar & Akhtar, 2018).

In entire education system the secondary school level plays a significant role in the development of education. It works like a bridge and ultimately link to the higher secondary level which is helpful to provide middle level workers of economy and acts as provision of feed for the higher level of learning (Garcia et al, 2020). The value of secondary level is likely to produce quality professionals in the several educational fields like economics, management, political science, natural science, and technical education. Secondary level of education is required to organize in the better approach that it must be prepared youngster for acquire of higher studies and make them enable to regulate in their practical life successfully. It is an opportunity for the educationist and stake holders to launch such kind of activities which are aim fully bring change in the behavior and attitude of learners in future (Suleman & Hussain, 2014). Similarly, curriculum provide a road map for teacher and learner with clear goal and desire objectives. It is planned according to framework which present a professional practice (Rind & Mughal, 2020). The curriculum of Mathematics is designed in Pakistan at national level and more importance has been given to elementary and secondary level of education (Govt of Pakistan, 2006).

A study carried out by the National Education Assessment System (NEAS), Islamabad, an overall performance of Grade 6 to 8 levels Mathematics students has been evaluated and found unsatisfactory (Chatha & Zahid, 2016). After completion of grade-8 these students promoted to grade-9 (Secondary Level) where Mathematics is compulsory subject up to grade-10 in both disciplines' science and arts, but the problem is that after learning of 10 years, still there is a weakness in our students to perform analytically and creative individual. In Pakistan, students' academic performance assesses by the Boards of Intermediate and Secondary Education at secondary and higher secondary levels. Regional Boards of all the four provinces, include Federal Board of Intermediate designated to conduct the annual and supplementary examinations for grade 9-10 and intermediate level accordingly. After successful completion of examinations grades 9-10 from respective Regional Boards of intermediate and secondary educations, students are awarded a Secondary School Certificate (Shah, 2019).

Provision of quality education directly linked to the performance of teachers (Akareem & Hossain, 2016). Having better teaching skills, subject beliefs, professionalism, hardworking, devotions, motivations and enthusiasm are the key elements to enhance performance of the students and bring development in education. In any system of education, the teachers as well as learners are the main stake holders and the excellency of students in the academic achievements represent the quality and performance of the teachers (Parsons & Adhekar, 2016). Several factors are involved which may affect the academic performance of students in many ways but the role of teacher, his subject knowledge, teaching methodology, assessment practices, professional attitude and professional training in the teaching learning process cannot be ignored. Moreover, in an education system the quality of students learning, score in

examination and test are the real output which mean to instrument the excellence of institutions as well as teachers.

In technological and scientific development of a country, Mathematics plays a basic and crucial role. With the passage of time Mathematics takes part in every position of life, business, technical, scientific, social, economic and management studies. Performance refers to pupil achievement in Mathematics as indicated by his/her score. In teaching and learning process diverse factors are involved to affect the student's academic performance at secondary phase. Over the past 03 year's students' Mathematics performance in annual examination of Federal Board, Islamabad has observed and found not rich whereas in other subjects rather than Mathematics they achieved good score. Mathematics annual result of boards examination at secondary level to achieve low performance of students, there is need to be investigate its causes (Lowrie et al., 2017).

Annual examination results notified by the Federal Board, Islamabad in gazette, the unsatisfactory performance of students in 9^{th} class Mathematics subject indicated that the learners at secondary level do not take interest and pay attention to their learning. They learn it to keep in mind just for the sake of promotion to the next higher class. Over the years, neither development in Mathematics curriculum, nor change in the teaching methodology and assessment practices of the teachers, even then no progress has been noted in the students' performance in learning of this subject (Behlol et al.,2018). Unfortunately, in Pakistan overall performance of the students in Mathematics subject at secondary level has been evaluated and found unsatisfactory. (Abdullah & Bhatti, 2018). This unsatisfactory achievement of students in Mathematics is a big issue for teachers, head teachers, educationist, parents, stake holders and the

government. Based on unsatisfactory students' performance at secondary level and keeping in view the limitations, researcher designed this study.

1.2 Rationale of the Study

Mathematics is believed an important subject in academic world. It is helpful for students growing logically thinking by working like an instrument which learners may use in all spheres of life. Eventually, it provides base to all other subjects, therefore, it is logically to say that science and technology are imperfect in their narratives without Mathematics. The nation intends to put itself in the race of developed countries it is important for the nation to give importance to this subject. Using maximum possible resources in teaching learning process a rewarding result can be achieved. It is helpful to boost the learning level of other subjects. In education field the importance of Mathematics cannot be denied. Being a compulsory subject up to secondary level, the student performance at primary and middle levels is also has been assessed and found not good. Similarly, at secondary school level students' performance of Mathematics is not very satisfactory in Pakistan as per declaration of boards' annual results. In different studies many factors have been discussed to explore learners Mathematics performance.

However, mostly students do not perform well in annual examinations or terminal exams in many countries of the world included Pakistan. This unsatisfactory performance of the students raised concerns and efforts have been made to investigate the reasons behind it. In Pakistan, the Board of Intermediate and Secondary Education at Federal level and provincial levels are deputed to arrange the exams of matriculation and intermediate as well.

According to announcement of Federal Board of Intermediate and Secondary Education, Islamabad results in shape of gazette notification available on boards' website, the respective board for the years 2017, 2018 and 2019, students' performance in Mathematics at grade IX in both the disciplines (science/arts) is not very admirable and comparatively lowest in Mathematics subjects. Similarly, performance of grade X is comparatively better than grade IX. Results shown in the below tables for 9th and 10 classes are not as per desirability. Near about 50-55 percent passing ratio can be shown in Mathematics paper 1.

Table 1.1

SSC Mathematics-1 annual exams results

S.No.	Years	Subject	Grade	Discipline	Pass%	CGPA
1	2017	Mathematic	IX	Science	57.41	1.47
2	2017	Mathematics	IX	General	58.44	1.08
3	2018	Mathematics	IX	Science	55.47	1.35
4	2018	Mathematics	IX	General	51.20	0.85
5	2019	Mathematics	IX	General	51.50	1.28
6	2019	Mathematics	IX	General	49.98	0.83

Source: Annual gazette results issued by FBISE, Islamabad

Table 1.2

SSC Mathematics-1I annual exam results

S.No.	Years	Subject	Grade	Discipline	Pass%	CGPA
1	2017	Mathematic	X	Science	87.29	3.76
2	2017	Mathematics	X	General	75.11	2.22
3	2018	Mathematics	X	Science	90.90	3.92
4	2018	Mathematics	X	General	78.88	2.51
5	2019	Mathematics	X	General	92.65	4.42
6	2019	Mathematics	X	General	72.54	2.45

Source: Annual gazette results issued by FBISE, Islamabad

Education system designed for students and teacher is an imperative element of this system which aspire to build the future of students to bring a positive change amongst them and to make a productive part of the nation. Teachers are given a unique task to achieve. It is responsibility of teachers to update their subject knowledge and teaching methodology. They must be familiar with that how to apply their knowledge and professional skills which they have. To achieve this goal and bring improvement in teaching learning process, teachers are supposed to educate with poise in their

domains with the help of latest pedagogical skills which will be supportive to enhance their capabilities. All of this depend upon their professional qualification, subject knowledge, professional attitude, professional training courses and assessment practices in the classroom. The current study was designed to investigate teacher-related factors contributing to students' performance in Mathematics at secondary school level. This study is helpful for head of the schools, Mathematics teachers, trainers, policy makers and curriculum developers.

1.3 Statement of the Problem

Mathematics is important for all the fields of life. Its expertise is necessary not only for the professionals, economists, accountants, bankers but also for the teachers, students, and common gentlemen. It is one of the essential in science subjects which assists in the development process of Technology and engineering (Deepika, 2021). To achieve an excellent academic grade in Mathematics is the main concern of stakeholders, educationists, and policy makers to focus on testing, assessing, teachers' quality and school choice (Nasser, 2017). The most important manifestation of quality education must be link with literary, cognitive abilities and performance to higher levels of learning (Moyano et al, 2017). It is necessary for all students to achieve learning objectives successfully but unfortunately only some of them can meet the prescribed criteria.

For the last three years 2017, 2018 and 2019, the average results of annual examinations of Federal Board of Intermediate and Secondary Education, Islamabad in Mathematics subject at secondary level for grade-IX has been only (50-55%). These Mathematics results remain constant from last three years and critical to find out causes behind the students' low performance in this subject. Therefore, different queries raised as to what factors are making these results lag in performance of Mathematics.

Regardless of key role that Mathematics plays publicly, it is very awful for teachers, principals, and stake holders there has been found unsatisfactory performance in public examinations. Teachers are blamed to show this performance of the students. It is fact that some additional elements may also be involved in this performance of Mathematics' students but generally teachers are also liable to this performance in annual scores.

Students' achievement at the secondary level is influenced by a variety of factors including nature of the school, motivation of the students, family background social and demographic factors of student's environment and above all, the standard of the teachers in schools. Sum of all these factors determines the heights of the students' academic achievement. Students cognitive and affective development is the major aim of education thus, understanding of factors that affect students' academic achievement and performance development is necessary, hence, the problem is to be investigated in this study was teacher-related factors contributing to academic achievement of students in the subject of Mathematics at secondary school level.

1.4 Research Objectives

To attain the purpose of study, the following objectives were developed: -

1) To explore teacher-related factors contributing to students' performance in Mathematics at secondary school level.

2) To examine the influence of teaching methodology on the performance of Mathematics students at secondary school level.

3) To describe influence of teachers' subject knowledge and assessment practice on the performance of Mathematics' students at secondary school level.

4) To identify the effect of teachers' professional attitude on the performance of Mathematics students at secondary school level.

5) To determine the effect of teachers' professional Training on the performance of Mathematics students at secondary school level.

1.5 Research Questions

Keeping in view of review the literature and objectives of the study the following research questions were formulated for this research: -

1) How does teachers' subject knowledge influence the performance of Mathematics students at secondary school level?
2) What is the impact of teaching methodology on the performance of Mathematics students at secondary school level?
3) Do the teachers' assessment practice effect the performance of Mathematics students at secondary school level?
4) Does the professional attitude of the teacher influence the performance of Mathematics students at secondary school level?
5) Does the teacher professional training effect the performance of Mathematics students at secondary school level?

1.6 Theoretical Framework

This section describes the theories that grounded the foundation of this research. To explain the achievement of students at school level, anthropologist introduced many theories such as pedagogical psychology, economics as well as sociology. Similarly, in the present decade, in context of the sub classroom research, several different theories have developed by the anthropologists' e.g., teaching style, personality paradigm, process product paradigm, expert paradigm and systematic model. The theoretical

framework followed by this study was that of constructivism. While this theory had been discussed by many researchers earlier in the context of learning of Mathematics. This theory was taken as a theoretical background. It refills under the limited circumstances. Many psychologists think about the mind as a kind of perspective instrument to the genuine world. Constructivists consider that the mental ability channels contribution from the world to create its own unmistakable truth. Constructivism as a perspective theory that learning procedure happens completely through an active procedure. The student is considered as data constructor and the people offer implication to their encounter by themselves. They relate existing data to the past learning of the students. In such way intellectual procedure happens. Bada & Stave (2015) indicated that constructivism represents one of the big ideas in education. Its implications for how the teachers teach and learn to teach are massive. The constructive view of learning considers the learners as an active agent in teaching learning process. Driscoll (2000) narrated that constructivist theory claimed that knowledge can only exist within the human mind and that it does not have to match in any real-world reality. Theory of constructivism is the philosophy of learning whose basis are laid on concepts. These concepts reflecting in the expression of learners. In this approach of learning, teachers performed as a guide and facilitate to students. Role of the learners must be active, efficient and as a thinker, interpreter, and energetic constructer of knowledge. In the present study the researcher followed constructive approach to develop the teaching learning process of teachers and the students.

1.7 Conceptual Framework

A conceptual framework is not simply group of concepts but relatively it is a paradigm in which each concept plays a vital role (Kanger et al.,2020). This conceptual framework provides a guide to the design of the study and as a result to refine decision

about what to collect and how to analyze these factors (Camacho et al., 2020). Their presented framework focuses on relationship between the school, class, and students' level. The framework shows how the national level assumed to influence the school and teachers' levels as well as students' outcomes. These relations may be in both ways direct and indirect because of diversity in educational systems, cultural context, educational values, policies, and organizational feature of school system. The relationship of the indicators examined at lower levels, such as schools, classes, and students, vary substantially within the countries. Given below is a brief outline of how crucial constructs were operationalized.

1.7.1 Teacher Quality

According to this framework teacher quality included both teacher qualifications and characteristics that influence teachers' instructions and students' outcomes. In Mathematics teacher quality has been shown to be of importance for students' achievements in a few with in county studies (Blomeke & Delaney, 2014).

1.7.2 Instructional Quality

Instructional quality is a construct that reflects those features of instructional practices well known to be positively related to student outcomes, both cognitive and affective ones.

1.7.3 School Climate

While teacher quality and instructional quality may directly influence students learning and motivation, school climate creates the foundation for instructional and may hence influence learning both directly and indirectly (Wong a& Degol, 2015).

1.7.4 Student Outcomes

Students do not just need knowledge in Mathematics but must also be able to apply knowledge and conceptual understanding in different contexts, and to analyze, and reason to solve problems.

1.7.5 Student Affective Outcomes

In addition to achievements several studies also include interest, motivation, and self-beliefs as a student outcome (Eccles &Wigfield, 2002). These constructs reflect students' motivational states.

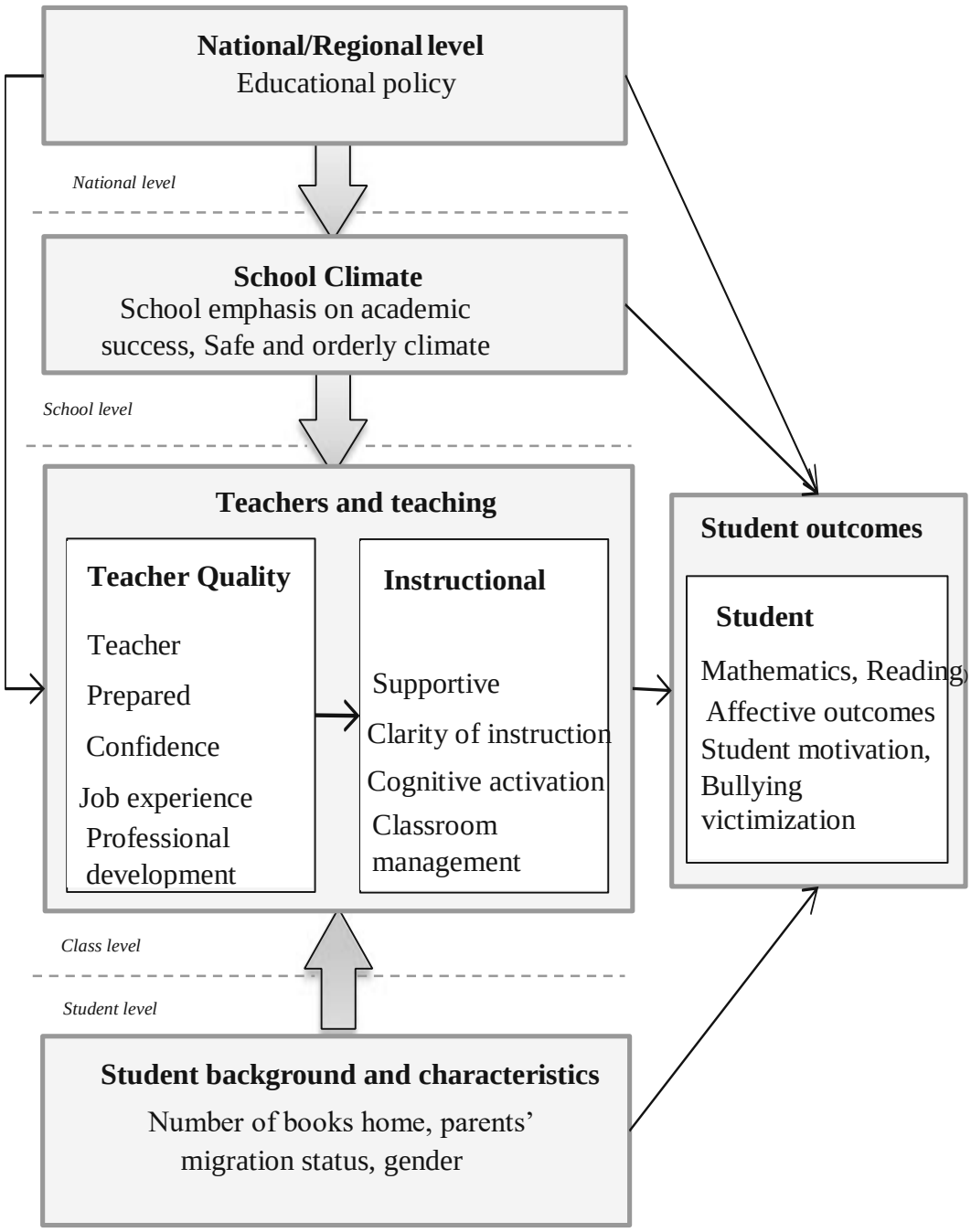

Figure 1 Model of determinants of student outcomes examined

Presented by Nilsen, Trude, Gustafson, JanEric and Blomeke (2016)

The conceptual framework in the figure shown below is an attempt to show variables involve in this study and these are also discussed independently. The Conceptual Framework showing in Figure. 2 representing the relationship of the variables for the study. Mainly two types of variables in this framework, the student's Mathematics performance is dependent variable. On the other side teacher-related factors, subject knowledge, teaching methodology, assessment practice, professional attitude and professional training are in-dependent variables (Nilsen et al., 2016). This conceptual framework has derived from the models presented by Nilsen, Trude, Gustafson, Jan-Eric and Blomeke. Based on review of the related literature this is derived conceptual framework representing the teacher's performance affecting the performance of the students in Mathematics studies at secondary level.

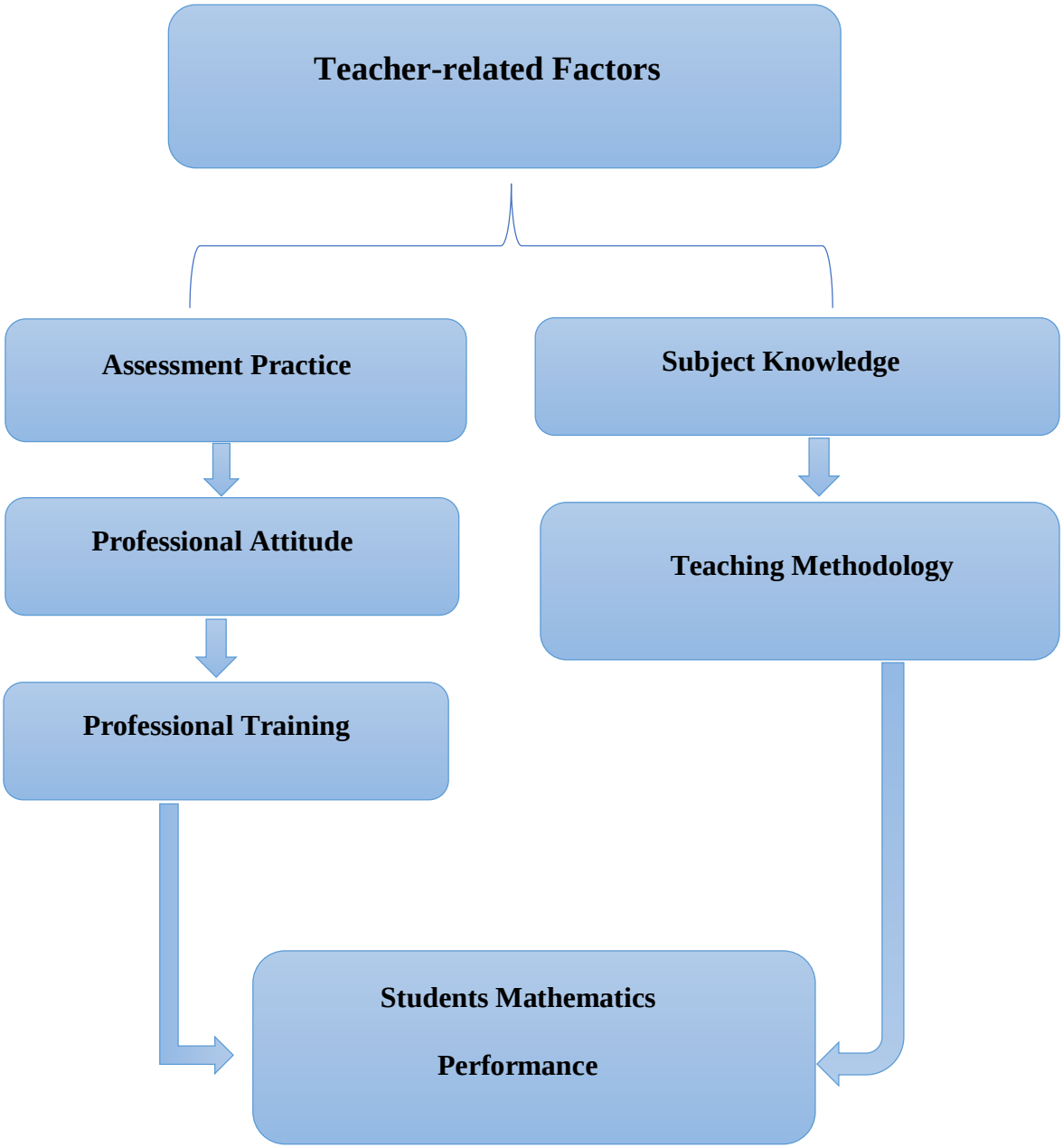

Figure .2 Conceptual Framework derived from the models of Nilsen, Trude, Gustafson, JanEric and Blomeke (2016)

1.8 Significance of the Study

To enhance quality of education in Pakistan, many efforts have been made, the curriculum evaluation, examination evaluation system, change in management but all these measures couldn't bring the fruitful outcomes. Mathematics is considered as mother of all the sciences. It involves in Physics, Chemistry, Biology, and Information Technology. Without good standards of Mathematics good standards of science education are not possible.

The foundation of all science development is based on Mathematics. If the foundation of the study is weak how the building can be strong? Keeping in view of the results of this study, it provides proper directions to enhance the relationship between teacher and students. Findings of the study are helpful for the management as well as for planners to plan and make a strategy to improve the pupils' performance in Mathematics. Moreover, the findings of this study may also be able to understand teaching methodology, lecture preparation and to develop the level of confidence of the teacher. This study is helpful in rising the standards of Mathematics education in Pakistan at secondary level.

The results of this study attract themselves to conduct research about efforts of teacher related factors in science education. Many students scared from Mathematics and chose other subjects rather than it. This study tried to reduce their fear and attract them towards Mathematics to study. This study will help to improve the standards of science education in Pakistan. This study is helpful for head of the school, teachers of Mathematics, teacher trainers, parents of the students, and educationist. This study provides response to the Curriculum Developers.

1.9 Methodology

This study was based on qualitative approach and focus group discussion technique was used for data collection.

1.9.1 Research Design & Approach

In this study the researcher used descriptive research design and qualitative research approach. Focus group discussion method was used for data collection. An Open-ended instrument focus group guide was used for discussion with the participants. Data was collected from 09 Mathematics teachers teaching Mathematics at Islamabad model schools and Islamabad model college for boys.

1.9.2 Population

All the Mathematics teachers teaching Mathematics at Islamabad model college and Islamabad model school for boys were the population of this study.

1.9.3 Sampling Technique

In this study researcher used purposive sampling technique for extraction of sample. From population, 09 Mathematics teachers have had 10-15 years teaching experience of Mathematics were selected purposively.

1.9.4 Research Instrument

In this study a self-developed open-ended instrument was used by the researcher to collect the data. Focus group discussion guide was used to collect the data. This guide was developed by researcher after thoroughly review of literature. This focus group discussion guide was comprising on 10 items.

1.9.5 Data Collection

After completion of validity and reliability procedure of focus group discussion guide researcher started data collection procedure. The researcher got departmental permission to collect the data and personally visited some of principal offices at Islamabad model schools and Islamabad model college for boys. Afterward, researcher thoroughly explained the objectives of study and requested to the Principals/Vice principals/head of the school to provide the name of Mathematics teacher have had more than 10 years' Mathematics teaching experience.

1.9.6 Data Analysis

Obtained data was analyzed by using the thematic analysis technique. It is an important analysis technique. A popular qualitative primarily textual date analysis approach.

1.10 Delimitations of the Study

Due to Covid-19 pandemic situation, shortage of time, financial constraints and to follow the Covid-19 standard operating procedure (SOPs) the researcher delimited this study was only for subject of Mathematics. Only teacher-related factors contributing to students' performance in Mathematics at secondary school level have been investigated. This study was limited to boy's secondary schools only. Data was collected only from teachers at Islamabad Model college for boys and Islamabad model school for boys situated in the urban area of Islamabad only. Mathematics experienced teachers have had 10-15 years of teaching experience in the teaching of Mathematics were selected as sample.

1.11 Operational Definitions

Teacher- related factors contributing students' Mathematics performance at secondary school level. The researcher elaborates the operational definitions for some of the main terms used in this study.

1.11.1 Mathematics

Mathematics is science of logical study of numbers, quantity, measure shapes, arrangements, sequences, and many like concepts. It is also defined as mother of sciences that investigates abstract structure that it created itself for their patterns and properties.

1.11.2 Factor

A factor is defined as a situation, reality, or influence which may effect on outcomes.

1.11.3 Performance

According to Cambridge dictionary of English concept of academic performance is defined as how well an educational institution, school, college, and university can perform the given learning activities. It is capacity to achieve when someone is tested on what one has been taught.

1.11.4 Subject Knowledge

Subject knowledge is the actual knowledge of the teachers and expected to teach in teaching learning process.

1.11.5 Assessment Practice

Assessment is the process of gathering and discussing information from multiple and diverse sources to develop a deep understanding of what students know, understand, and can do with their knowledge because of their educational experiences.

1.11.6 Teaching Methodology

A teaching methodology is a teaching method comprises the principles and methods used by teachers to enable students learning. These strategies are determined partly on subject matter to be taught and partly by the nature of the learner.

1.11.7 Professional Attitude

Attitudes towards teaching profession is the attitude of teacher about teaching values, incentives for the profession, attributes of teaching profession, and satisfaction with teaching profession.

1.11.8 Professional Development

Professional development in the teaching profession is mainly based on the professional growth of a teacher, which he or she achieves because of gaining increased experience and examining his or her teaching systematically. Professional development and staff development have the same meaning in this research and are used simultaneously.

CHAPTER 2

REVIEW OF THE RELATED LITERATURE

This chapter illustrates the related literature about the given topic in detailed and consecutive manners. It explains under investigation problem with an overview of research. It provides the framework of this study which enables to establishing the importance of this study. The main aim of this chapter is to highlight the work related to the topic of the study 'investigation of teacher-related factors contributing to students' performance in Mathematics at secondary school level'. This chapter provides arguments, outcomes and evidence of different research revealed the significance of the current study. It is consisting of the concept, nature, importance of learning Mathematics includes the quality and performance of the teacher in the teaching learning process. Furthermore, discussed in detail several reviews about students' academic performance and provides a review of the research studies on teachers-related factors contributing to students' performance. Mathematics is important for all the fields of life. Its expertise is necessary not only for the professionals, economists, bankers, politicians, accountants, but also for teachers and common gentlemen. Education outcomes are measured in term of examination which is considered as important source of education system. To evaluate students' ability, performance and capability as mean of selection for educational advancement and employment examinations have always been used.

2.1 Nature and Concept of Mathematics

Luitel (2019) stated in 21st century Mathematics has considered as an important subject to study and many discussions have been found on its significance. Many mathematicians, researchers, academician, scholars, stake holders and its experts associated with field of mathematical education have been talked about the nature of Mathematics. Thoughts about its nature is connected to their beliefs, that how they recognized it and how the people use it in their real-life environment. In several researchers' different views about nature of Mathematics have been illustrated and presented in several ways to elaborate it according to need of the time when requires. In the studies of Pant and Luitel (2016) they described that Mathematics is not just a subject to be taught, eventually its critical logical thinking as well as problem solving ability focuses on algorithm process. Likewise, Luitel (2012) argued on the nature of Mathematics and consider it as impure knowledge works as a raw material like soil metaphor. It is very much connected and having mutual relationship between people, culture, and land. Moreover, he stated that Mathematics is an impure system of knowledge, which is helpful to empower the complete nature of Mathematics. While in broadly overall nature of Mathematics is pure, and fallible nature of Mathematics is impure. Similarly, in broad way nature of Mathematics is pure whereas imperfect nature of Mathematics is impure. According to views of D'Amboise (2001) that ethnos Mathematics is commonly used to define the correlation between culture and Mathematics. His thoughts about cultural nature of Mathematics were appreciated, highly focused and very popular in Nepal. According to Pant & Luitel (2016) one hundred and more unlike ethic groups have vast Mathematics practices in their daily life like an exercise they do. Such types of routine activities and skills are helpful in the promotion and cultural nature of Mathematics. D'Ambrosio (1990) has described

in his research paper ethnos are recognized by its cultural traditions, customs, codes, and myths particularly way of inferring. Therefore, mathematical nature has been discussed in detail keeping in view of all the society aspects in the mind, it is very much familiar and help the human beings to connect them.

The ministry of education, New Zealand (2006) has recognized the school curriculum, the nature of Mathematics by exploring and using the different methods of space, time in their school curriculum. Moreover, the nature of Mathematics while exploration and uses of different patterns and relations in the way of thinking, space, quantities, and problem solving those equipped learners with effective means for searching, explaining as well as making the sense of the world which they liked.

These viewpoints about nature of Mathematics are helpful and provided direction to the students enables to improve their ability to think logically, critically and plan the creative ideas strategically. According to Loveridge et al., (2005) in their research paper the title perspectives of students in Mathematics. They defined different point of views regarding Mathematics and its nature with respect to students as presented by them. For the mathematicians and its experts, it was very astonished and interested to know that unlike students through about the nature of Mathematics in different ways. It is completely depending upon the basis of students personal learning, their experiences, relationship and interaction with the parents, teachers, friends, class fellows and other stake holders those who are in teaching learning process of Mathematics. Such types of research are very helpful and enables the teachers to think about their behavior and attitude with their students. Even it enables the teachers to think about their teaching style, lesson planning and how to behave the students in classroom and to teach Mathematics in the more and more effectively way. Mathematics subject considered just not a number that can be make fun with it

especially in the study of geometrical as well as symmetrical shapes. With the help of geometry, we are enabled to draw shapes of different angles, triangles, circles, and straight lines. Moreover, we can draw shapes and draw characters when and then we needed and required (Year 5-6). We often use its pattern of calculations, like plus, minus, multiplication, and division to solve day to day problems and its pattern also work like addition is minus and addition is time whereas time is division. Similarly, division means not only division but also fraction and decimal which frequently used in Mathematics. Decimals are percentages and it goes on and on year 2-4. It is like something we use it when we must count something, add, or subtract something, have to measure liquid, sold, gas elsewhere year7-8 (Loveridge et al., 2005). Mentioned above are the arguments about the nature of Mathematics comprehensively and briefly to elaborate. In the present age of technological world, there is dire need to define and analyses all the viewpoints of the nature of Mathematics to understand it logically.

According to Mahayukti et al., (2017) Mathematics is defined as branch of science, source of another science subject and there are so many branches of sciences of discovery and progress depends on Mathematics. Fundamentally, Mathematics is called structured science, in which concepts of Mathematics are structured logically and in a systematic way. This means that in Mathematics, pre-requisite concept serves in a hierarchical way based on understanding to the next concept. Thus, a concept is structured based on earlier and existence concepts, it becomes a foundation concept, so that as a result misconceptions factor may also exist in it (Suherman, 2003). Therefore, idea of understanding of concept must be controlled by students during the learning of Mathematics.

Dahar (2011) viewed that understanding the concept of Mathematics must be learned by learners to solve the problems and find the solution of difficulties in

systematic way even students must know the relevant rules based on concept. The concepts in Mathematics are well planned systematically in hierarchically way from easy to complex (Suherman, 2003). Therefore, teaching learning process of Mathematics should be meaningful, interesting, and motivational for student to enhance academic performance of the student. With the facilitation of good mastery mathematical concepts learn to students, the students learning outcomes will also be good. It can be achieved if the teaching learning process is presented objectively, and the assessment used in accordance with the applicable curriculum.

According to Simon (2017) a Mathematics concept is defined as knowledge of the mathematical necessities in specific mathematical approach. This shows our previous knowledge about Mathematics that how much we have learned and know about Mathematics. To relate the earlier knowledge a relationship must exists. For example, students who understand the formula of rectangle to find its area, they must be kept in mind its length and width. Similarly, a concept of multiplication and division also be appearing in their minds to find the area of rectangle. They must recall their pervious and relate to the current knowledge to find the solution of the problem.

2.1.1 Significance of Mathematics in Education

Before the 19th century effectiveness of teaching of Mathematics at elementary level has been studied. Generally, Mathematics is one of the dull subjects in the school curriculum. Like other factors it also depends on the teacher, if he successfully locating and enhancing interest of the child depending upon the mental level, he may have to help the child to a greater level in gaining more and more Mathematics knowledge effectively (Abelev et al., 2006).

No doubt Mathematics is multi-dimensional subject having lot of interest to solve its problems. If an individual intends to lead a reasonable happy and successful life, he/she must have to understand its basics and logics to understand the routine life matters, he faced on daily basis, therefore, we should take keen interest to understand it. Thus, it is duty of the teachers to make it easy to teach their students and teacher should provide training and proper education to deliver its knowledge with proper understating. It has also been observed that increasing and maintaining interest of the students is a difficult task for a Mathematics teacher. Mostly students are fearful about this subject.

It is the duty of teachers to motivate their students to study and take keen interest in Mathematics. For the time being performance of a teacher has a big interrogation because of new teachers have lack of latest knowledge, basic skills, and techniques of Mathematics to teach. Therefore, evaluation of teacher more important instead of student's evaluation (Phelps, 2020). In all the subjects' Mathematics provides the base since there is no doubt to say that without Mathematics all other subject of sciences and Information Technology are nothing without it. Nations who intend to put itself in the race of developed countries, they proper focus on this subject, especially its curriculum. It is also helpful to boost the learning level of another subject. In whole education process nobody can deny the importance of Mathematics at all. According to Houston (2007) stated that if a student is good in Mathematics, number of chances are increased that he/she may be good in other subject because its numerical practice is helpful to enhance the brain and thinking level. Math works like a tool which is very useful in all aspects of life and without usage of it, no fruitful results can be achieved in daily life. Even then we need it, in the market, in the school. The measurement of distance and time are possible with the help of Mathematics in our daily life. Without using of

numbers and calculations we are just like a blind person. To handle with this situation, teachers arise a few solutions from the students to reach at decisions. In such way teacher tries to improve their concepts involuntarily.

2.1.2 The Importance of Mathematics Subject

Altintas (2018) stated in her study that in every field of life and area no one can be disagreed to accept the importance of Mathematics. In the permanent and pragmatic learning approach high level of Mathematics teaching practices are required to facilitate the students. Furthermore, there is need of the people who intend to learn and love with it to be advances in Mathematics. It is also true there are some negative beliefs about Mathematics generated at the early age and grow exponentially. Thus, it is responsibility of the teachers to overcome such kind of situation. There is dire need for more advance teaching methods and learning techniques that enables the students to reach only important information instead of terminated and rejected information. He argued that there is a need of such kind of teaching material that may be useful to make learning meaningful, conceptual, and interested. Such way students take interest in their learning and responsible to show good performance in it.

Kusmaryono (2014) viewed that in the present era it would be very difficult and even then, not possible for a person to live in this universe without the slightest utilization of Mathematics. Its importance is recognized universally. Mali & Rizwi (2018) stated that the present era is considered a technological world and importance of Mathematics is very crucial, it is considered that it is an essential subject to learn and no nation in this world can make progress without use of Mathematics. The mathematical knowledge proved to be like a vehicle to travel to train the mind of the learners to solve day to day problems and to make them think logically and reasonably.

Jameel and Ali (2016) narrated that Mathematics works like an instrument or as tool to understand many other subjects. In broad way, it is a base of many other sciences which is helpful to understand engineering, Physics, and astronomy. It is taught to motivate the masses in which through open the new doors of development and advancement. Things ranging from compact disc to nuclear bombs, car to airplane would not have to possible to build without knowledge of Mathematics. Being a learner of Mathematics, it is a common knowledge to play an important role and work like a bridge to enter in professional knowledge of engineering, technical and social sciences. Advancement in science and technology is not possible without using Mathematics numbers, digits, shapes, and formulae. Universally, Mathematics is considered as a part and parcel of human thoughts and logical thinking. Mathematics powers affect the way individual process and learning outcomes to gain skills, knowledge and attitude that will be reflected in the day-today behavior serve to motivate, appreciate, and stimulate complexity of the success of the students.

2.1.3 The Importance of Mathematics Subject at Secondary Level

After completion of basic knowledge from primary education, secondary education is indeed its extension and considered to be an elementary stage for higher education and terminal step for most of the youngster students which provided intellect for higher education. In the whole system of education, secondary education plays a significant role and considered to be as an important segment of education. At the one end it provides middle level of workforce that is much important for the economy of the country whereas on the other end it plays significant role to delivers feeder for higher education. It is fact that the quality of higher education is very much linked with the quality of secondary education even then in the language of Mathematics quality of higher studies is directly proportional to the quality of secondary education. For

provision of higher quality professionals, lawyers, doctors, economist, and politicians' higher education is expected to provide for necessity and to obtain higher growth of economy. There are needs to be organize secondary education systematically and it may have enabled to prepare the young student for the pursuit of higher-level education and to prepare all of them for a productive practical life (Government of Pakistan, 2000).

Fawad (2015) elaborated that federal education ministry and professional training, Islamabad working under the Government of Pakistan has developed a Mathematics curriculum in 2006 from primary level to higher secondary school level from Grade-1 to Grade 12. In Pakistan, all its provinces include KPK, Punjab, Sindh and Baluchistan have their autonomous Textbooks Boards. All these Textbooks Boards published their own textbooks to follow the directions of National Curriculum. Mathematics being a compulsory subject from Grade-1 to Grade 10, the National Curriculum for Mathematics has been distributed into small components wherein benchmarks are obviously mentioned.

According to National Mathematics Curriculum (2006) that students of mathematical as well as its operation and process provides clear context and instruments to students at secondary level for reasoning, conclusion, and the exchange of their ideas. Being students of Mathematics, they develop capabilities, skills, and patterns that how to induction of Mathematics to further enhance and apply their knowledge, skills in the other additional fields of life. Studies of Mathematical after primary level gradually developed logical thinking of students and enables them to categorize affiliation between concepts of Mathematics and everyday circumstances. It is reality that Mathematics provides us support in daily life. Our day starts and end with the logically thinking and reasoning of Mathematics. In daily practical life, everything

calculated or must be calculate, our food, cloth, income, expenditure, and time. Such types of problems demand proper knowledge of arithmetic. Similarly, if we go one step ahead and talk about some professions concerned to our daily life for example cobbler, carpenter, mason, fruit seller, and shop keeper all these professions are correlated with the mathematics. According to Rahman (2018) every individual Mathematics knowledge is positively correlated the activities and professions discussed. According to Roger Bacon "Mathematics is the gate way and key of all sciences even Mathematics and Physics have positive correlation. The formulae, laws, rules, principles, equations, geometrical diagrams, and figures are coming in to being because of Mathematics. In Physics all laws of motion can only be explain with the help of Mathematics. Similarly bonding and covalent bonding, compound, mixture, and chemical equations in the subject of Chemistry are very much associated to Mathematics. For explanation of friction, Boils' law and Charles laws, enhancement of solid, liquid and gases and metal needs help from Mathematics (Gronmo, 2017) The field of agriculture directly connected to Mathematics even from bowing seeds to ripe crops. Ratio of fertilizer in crops, to count the watering time is only possible with Mathematics. Correlation of Mathematics has high positive values. Mathematics is science of facts and truth. According to Pythagoras where there is money there is a number. A well-known mathematician Leibnitz said that music is the latest secreted exercise in arithmetic of a mind insensible dealing with numbers. However, we can say that there is a positive correlation among Mathematics and fine arts and drawing. It is important for teachers to have a capability to understand the developed trends in teaching towards with upcoming challenges of education. It may be possible only after amendment in curriculum, design of organization structure and methods of teaching like in other professions, Doctors, Engineers, Accountants, Architects, and lawyers. Knowing their

aims are not enough but skill and mastery in their profession is mandatory. Though, there is a big breach between a teaching profession and others. Because in teaching, a teacher learns from his experiences to share it with students of different mental level, age, and culture. Alfred supposed that mostly professional solve the problems of their clients, but they have no ability to tell their clients how to figure out their problems, but a teacher has a specialty to guide his students to solve their problems and to motivate the students' learning towards Mathematics (Stone, 2018).

2.1.4 Teaching Strategies for Learning of Mathematics

Mathematics teacher plays an essential role in teaching learning process by openly or secretly inducing learner attitude of Mathematics. According to Dent and Harden (2001) the role of the teacher is very much important constructing and supportive in educational effectively environment. Jacobs and Harvey (2010, p.205) viewed that perceptions, attitude, and expectation of the teacher do contribute significantly to students output and performance. In different studies it has been shown that Mathematics teacher holds some values, and these values may have pronounced through the presentation in the classroom. This form of research pointed out that teachers hold both the values, implicit as well as explicit and beliefs which are evident in the communications to send to the learners. Such types of communication led to learners their liking or disliking of Mathematics. Hannula (2002) emphasizes that teachers send out challenging messages to learners which may help the learners to convince them that they are not good in Mathematics, resultantly children choosing out of Mathematics.

Bansilal (2002) in her research stressed and considered that a basic element of any educational process is well trained teachers. She illuminated that mostly

Mathematics teachers in South Africa teaching at the high school level were unqualified. Even though there were many teachers who had not attained any formal teachers' training qualification. There are strong statements within the area of Mathematics education that differences in learners, the attitudes and abilities towards Mathematics are reflection of teacher beliefs in Mathematics, teacher content knowledge, teacher teaching strategies and pedagogies (Ross et al., 2008).

According to Wikins (2008) teacher subject knowledge matter has positive impact on the teachers' classroom practices. Stein et al (2007) stated that many researchers have blind faith that knowledge of Mathematics teacher has importance to his or her success and plays key role in the classroom. Wong and Lai (2006) described that it is very clear and true that teacher knowledge in Mathematics is a basic requirement for successful learners and positive attitude towards the subject. Nardi and Steward (2003) stated that teachers reducing list of Mathematics rules, as result learners deprived of to clarify and understanding the concepts. Thus, at the same time learners are not academically encouraged.

Flores and Day (2006) claimed that many school students and learners of Mathematics do not ask the question during the learning process because they totally trust and depend on their mathematical knowledge as well as competency of their teachers. Thus, misconception regarding understating remain un-challenge. Flores and Day (2006) further emphasis that Mathematics learners should be stimulated to share their mathematical concepts with teachers and class fellows but unfortunately many teachers of Mathematics don't do such kind of practice. Brown and Walter (2005) narrated that a classroom in which teacher was simply fed the information with no space for critical commitment. The researchers found that unsatisfactory results of concepts understandings and logical thinking in Mathematics. According to Ensign

(2003) and Martin (2007) the instructions of Mathematics must be related to learners' prior knowledge and to the contexts accordingly. Matthews (2003) described that teacher should be allowed to their students to make meaning of their own individual thought and conceptions by linking prior knowledge to the new knowledge.

Haylock (2003) proclaims that teachers controlling teaching style during Mathematics learning classes may have a negative effect on the students and as a result they feel unease in Mathematics. It is commonly observed that most of the students are afraid of being questioned by someone or a teacher in authority. In educational environment teacher hold power through remuneration and authorization. Teacher are authorized to implement a specific curriculum distribution style regardless of whether it provided curriculum assess to Mathematics learners (Berends et al., 2002). These studies imply that achievement difference is wide between students from different community groups and numerous types of systematic practices and process are applying in school reinforcement variances in achievement in Mathematics (Geist, 2009). Bol and Berry (2005) argued that teachers have dissimilar expectations of learners in the classroom in term of race, gender and social class and these separate opportunities are recognized in unlike ways. Researcher further argued that influence of teacher expectation can be important in the classroom of Mathematics and can accumulate from pre-school to high school.

Lubienski (2001) claims that in the present educational competition, socio economic variances are the main factors linked with the gaps between white and black students in a school. Moore (2003) added another dimension and explains that many African American schools which are underperforming in public education sector. Moreover, and unluckily teachers as well as school counsellors in these educational institutions frequently discourage to learners choosing Mathematics as subject (Brown

and Wightman, 2002). Moore (2006) emphasis that positive, effective, and quality learning experiences may have shifted to learners, choice towards subjects such as Mathematics. Given the above empirical studies, teachers expectations and teaching practices may affect learners of Mathematics. The African American students and learners in the United States tend to accept negative understanding of Mathematics subject when they are accurately encouraged (Martin, 2006). Though the positively support and encouragement of students' academic performance as well as motivation of their teachers in the best interest of students may enhanced the educational desires of students (Martin, 2006). According to study of Ford and Moore (2004) they encouraged that in USA, the practitioners have to use advanced pedagogical strategies to persuade learners, particularly an African- American learner to go along with profession counseling related to Mathematics.

A study carried out by Keck-Staley (2010) in which he highlighted that student could prefer Mathematics to achieve a balanced hold of the individual circumstances of their life cycles. Learners of Mathematics subject may improve their proficiency in it by studying their own social realism connected to Mathematics principles. The reason is that Mathematics' teacher classroom instructions do not utilize on student experiences. Gutstein (2006) considered that teacher can endorse this objective by fetching Mathematics learners to give them mathematical investigations and problem-solving activities which are linked to their natural world to become it more expressive and important. According to Keck-Staley (2010) that personal recognition of learners must affect their advancement of Mathematics and personal identities of student linked to what occurs for the period of the teaching learning process in classroom. Cobb and Hodge (2002) clarified that teacher communications in the classroom of Mathematics be likely to affect in such way that students consider themselves as Mathematics

learners. Reed and Oppong (2005) claimed that problem of equity Mathematics class is necessary to continually monitored and for its best interest it would be ensured that all Mathematics learners can assess the curriculum and buildup positive attitude toward Mathematics subject. It is responsibility of the teachers try to bring betterment in the logical and analytical skills of the student in the classroom arrangements. Creativity and stories facilitate development developing the imagination is the most important strength of students. They also inspire students' ability of imagination and sense making (Balakrishnan, 2008).

It is fact that problem build up to give the assignments to teachers and students in the classroom is normally not accidental. This is most important to establish possible relation between observed qualities of teacher and unseen characteristics of students in term of teachers' point of view. Similarly, in the other field of life there is inherent in selection problems to evaluate the effect of educational trainings, conferences, seminars to enhance the teachers' capability and productivity. Unseen teacher uniqueness, like "innate" ability, thinking capability can affect such types of education in the country and training they choose to get, range and methodological tactics which have successive teacher's performance in classroom. Thirdly, it is very tough to get the data which subsequently provided a lot of details about the diverse kind of teacher's trainings receive and even other complicated to initiate and fringe to link teacher's training to the attainment of students by they teach and communicate their knowledge (Milan, 2009).

2.1.5 Teachers Motivation in Learning of Mathematics

Sahat et al., (2018) pointed out that many factors contribute the students' academic performance a quality of teacher is one of the important factors. Michaelowa

(2002) stated that the quality of teacher is related to teachers' motivation towards teaching. It is observed that motivated teachers may be associated with an increase in student outcomes.

2.1.6 Responsibility of Mathematics Teacher

At primary level, teacher especially adopts activity based and interesting methods in making the concepts of his students. He manipulates different procedures and strategies to make the learning of his students effective. In this way students actively participate in learning, and this make their learning easy and interesting (Geiger, Forgasz, Tan, Calder, & Hill, 2012). But it is a long debate that whether Secondary school teachers only have proficiency in subject knowledge or also command on how to teach? Or they know the best way, is to integrate both.

Most of the time by the reaction of his student, a teacher understands that at what level of understanding a student is? Responses of students are very important for a teacher; these responses help a teacher to improve his methodology. It is not the era of cramming, one must explain what he has learnt (Watson & Geest, 2005). In social and physical environment, a child where he lives almost reacts in some different ways. From his birth, he reacts in harmful and in faithful way. Teaching helps a child in adjustment. This can be done in two ways to modify the environment or to strengthen the child. Teaching always helps a child to become a useful and an efficient member of the society. If we strengthen the child this will really help the society in forwarding with rapid progress (Ainley, Pratt, & Hansen, 2006).

Math's teacher has an ability to maximize positive interest and minimize the weak points of their students influenced by their home and community in which they are brought up. A teacher can be evaluated through the goal and standards which he

sets for his students. If a teacher succeeds in developing the emotional and liberty aspect of the student by providing them liberty, affection, and freedom (Carroll, Forlin, & Jobling, 2003). Personal relationship among teacher and students affects positively on growth of children. It is the liability of teacher to prepare his learners, to meet the challenges of future. Teaching helps an immature child to develop physically and emotionally in his life. Teacher affects students' personality in both ways i.e., formal, and in-formal and due to these, students have proper involvement in their studies and listen their teachers attentively. Although teacher is an agent of formal teaching, but teacher also act as an agent of informal teaching as his parents, sisters, brothers, and his friends. It is strongly believed that a good math's teacher knows about latest methods, techniques, and strategies. He is also familiar with their students' likes and dislikes and he is expected to understand the objectives which he must achieve. At a time, his/her teaching acts as a science and art. It treats with logically and dramatically (Folkestad, 2006).

Researchers have strong point of view that teacher's competency about their subject is not enough for effective teaching, but the attitude and experiences of the teachers shared by them in their classrooms are more important (Thames & Ball, 2010). Important talent of the school Mathematics teachers is good mathematical concepts, procedural fluency, and skills to handle the situation. National council of teachers of Mathematics stressed that in any educational program, teacher is the most important part. For implementation of all educational process, teacher' behavior towards their subject is most important. Teacher is mostly responsible at all stages**.** (NCTE,1998).

Desire of teachers is to enhance their teaching capacity to become an effective educator in the field of education, so they should be trained and educated in encouraging and constructive atmosphere. For students at early-stage teacher's

behavior matters a lot, Teachers' hope that they will educate and prepare young students in a very good way, so it is the duty of administration to introduce such type of trainings to develop their social consciousness and modify their frame of mind. Marry (2010) said that teachers should be trained confidently to understand the new pedagogical skills, attractive behavior according to students' specific requirements. They should know the learning cycle and stages, fretful and socially engaged knowledge of their students. In this way they can help in improving of teaching process and social change (Cochran-Smith, 2005)

If teachers have proper knowledge of their subject, they also improve skill. This will make a teacher more confident and competent in his field of teaching, for good teaching these steps are important and necessary (Cochran-Smith & Lytle, 2006). In circulating knowledge, they link their knowledge with latest methods and information. Loughran (2006) states for a good teacher understanding of teaching is very important. Teacher should be fully aware that what, how and why they articulate their experiences in teaching and learning process (Loughran, 2006).

A teacher educator should be able to fulfill the needs of all approaches. Nowadays, we have skillful teachers with latest recourses and technology. Technology should not be considered as a split tool; it should act as a part of teaching and integral part in effective teaching. Teacher educator institutions prepare their students in such a way that they will be able to meet the challenges of future. They should be given opportunities to teach in latest technology equipped classrooms. This is way to get practical experience of teaching and responsibility of quality teaching. (Hiebert, 1997).

2.1.7 Availability of Teaching Resources

The availability, providing using teaching learning resources go a long way to bring improvement in the quality of teaching which increases the academic performance of the individual as well as overall the educational institutions. Adedji and Owoeye (2002) indicated that there is a significant connection between the use of proposed textbooks and the academic performance of students. Douglass and Kristin (2000) viewed that a complete analysis of activity-oriented learning in kindergarten education system at grade-eight level, it is decided that by using the manipulative material produces greater attainment instead of not using them. Moreover, it is also observed that long-term use of performance instructional material by the teachers enhanced the achievement of the student and their attitude. Opare (1999) proclaimed that by the requirement of human and material resources include a suitable academic atmosphere goes a long way affected to boost academic performance of students.

Ankomah (1998) remarked that effective teaching learning process depend upon the competences of its human and material resources which were essentially required to seek the knowledge. The term of effective has been used in many aspects in the literature of the past eras. It must be needed to make clear how it is used in this review. Stanford (2001) described that teacher effectiveness is the grade in which teacher attains wanted goal-oriented effects upon students. Likewise, it is defined as teacher effectiveness is how much and how well students attain commitment in the face of problem. In commonly, the terms of Mathematics strategy, instructions, practices, and typical thoughts as a teaching generated strategy the desire results enhance their logical thinking and deep understanding toward learning of Mathematics. Speaking all these problems in a single study at hand significant data and inference challenges for the requesting the teaching methodologies (Stone & Eberts, 1984). In this paper we

displayed new proof on the effects of teacher school-based service, formal education as well as in service professional development training to enhance teacher efficiency by using a single statewide administrative record from Pakistan and specifically from Islamabad. This data allows us to draw performance of the student to individuality of their classroom teacher as well as in revolve link teachers to them in service training and different methods which may outcome, their college course outlines, and their college entrance scores of exams. This particularly rich data provides an opportunity to address the appointment problems in the schools located in the territory of Islamabad associated with teacher achievement of training and assignment of students to teachers (Suleman & Hussain, 2014). Our inquiry progresses in two phases originally, we approximate achievement of student models that include a rich set of co-variants that assess the time changing uniqueness of students, their classmates and their school principal who may need to be explored. Moreover, we consist of multiple levels of fixed effects that control for un-measured time-invariant student, teacher, and school inimitability in future. It may be further allocated and needed to be explored in any case of data (Ziegler & Loss, 2017). This first stage model further detailed data on the amount and structures of education and training teachers receives more conditions and modifications after they have inserted the institution, containing both graduation and workshops funded by schools and school districts level students how they explored called “in-service” or professional development training (Betts & Rice, 2003).

2.1.8 Instructional Strategies for Teaching of Mathematics

Khan et al., (2016) stated that instructional strategies conclude the tactic that a teacher practice to attain the objectives of learning. The students learn what, not only depends on what they are taught but also how to be taught, their interests and

experiences. In the last ten years' different research has showed the new perspective that how learners can build their personal understanding. A teacher needs to involve in advance levels of Mathematics to improve their knowledge of contents and their teaching strategies. The active contribution of students in Mathematics is helpful for the teachers. This enables the teachers to judge levels of competence development of all the learners in the classroom by walking to watch reaction of the students. Such types of strategies are very important and beneficial when these became a part of a daily mental Mathematics lesson. Teacher can practically implement instructions in many ways. Many of the mathematical skills are used in Mathematics and students are threaded in content. To determine that which kind of strategy is fruitful for Mathematics learners, teacher should view the content material before teaching. Student may succeed by the adoption of learning strategies like outlining, notes preparation through questioning techniques.

2.2 Students' Academic Performance

Performance of the students is very much associated with Mathematics learning program. Different anthropologist is strongly agreed that the student who really shows their interest and they have keen learning aptitude towards their study than the intention towards their study raised up significantly (Mikka, 2015). In one recent study, multiple data have gone by the researchers from at least ten states of United States of America representing and applying different testing of more than seven million youngsters' students (Ralf, 2015). When the collected data analyzed through probability the same sample of gender similarities was found for all ethnic groups studied. Therefore, girls have reached equality with boys in Mathematics performance in the United States of America, even in high school where a gap existed in earlier decades (Fair et al, 2016). On the other hand, coding of the test items on these assessments for cognitive states

pointed out that none of all of them tapped complicated problem in the high level of calculations solving for most of the states at most rating level. Therefore, it was impossible with these no child left behind data sets to find out whether a gender gap existed in compounded problem solving. Accordingly, to tests a random sampling of United States students in each year, the researchers also evaluated facts from the National Assessment of Educational Progress, a federally arranged program. At presently in the United States, girls have reached at the equal level of boys even for measures requiring problem solving. Some another anthropologist has discussed and argued in the absence of difference in gender in Mathematics performance to the advancement of STEM fields in public is not relevant to the to some extent, investigator must be focused on the talented mathematically presentations. The progress in STEM fields is enhanced not only by the brilliant persons but also enhanced in the millions of laboratory technicians, accountants, bachelor, and master level scientist whose skills of Mathematics capacity below the 75 percentiles but their contributions are very essential or proactive to promote and develop it (Mikka, 2015).

There are several diverts factors may have influenced the performance of the pupils at the level of secondary school. The under-acknowledgment requirements and interest of pupils with their previous knowledge as well as skills in the directions of mathematical judgements are the main formative factors to achieve lower score in Mathematics. Taking interest and positive feelings in Mathematics increased the pass ratio in Mathematics. Poor economic condition of the parents another relevant cause of their low position. Moreover, negative approaches regarding teaching of Mathematics created the nervousness and anxiety in Mathematics students. Due to lack of parent's interest as well as knowledge in its overall capability of student affecting badly (Acharya, 2017). Earlier research on the training of the teacher have given way in the

teaching mythologies a highly conflicting result and have fueled a wide range of policy recommendation (Cameron, 2008). In some research and related studies find that formal education and teaching methods are important, and these have been inferred as a supporting and firming the present teacher training programs in universities as well as enlarged high expenditures and the results are not up to the mark as they were talking about on post-college trainings (Nilsen et al., 2016).

2.2.1 Students' Motivation towards Learning Mathematics

According to Refandi (2013) motivation is explanations of individual have for behaving in each condition and manners. According to another more complicated definition of motivation is, the motivation is said to be a potential to direct behavior on an individual that is constructed into the system. Many experts and psychologist have reasoned their opinion and studies about motivation. Middleton and Spanias (1999) stated that Mathematics success is a powerful impact on the motivation to achieve the set goals.

2.2.2 Students' Attitude towards Learning of Mathematics

As per National Research Council (2000) as cited by Akey (2006) beliefs of students about their competency for success in the school level learning of Mathematics directly interconnected to levels of engagement and emotional states which play a vital role to promote their academic abilities successfully. Therefore, students' attitude determines their efforts those are to be expected to set in their Mathematics subject learning. Therefore, it is obligatory for Mathematics teachers to work hard and stress productive attitude during learning process at school and upper level to order to attain better performance results.

2.2.3 Students' Attitude Development towards Mathematics

Mostly learners considered Mathematics is a problematic and hard subject to study (Brown et al, 2008). By nature, it is a logical subject, and its several concepts cannot be explained in easy way. The physical presentation of Mathematics does not relate to everyday life. It is possible that Mathematics is competent to promote overall progress of every student by offering knowledge which may encouraged them to expand publicly and being enabled to make sense of society more effectively. Though, Mathematics revealed as being abstract and un-related subject to life (Ali & Reid, 2012). Most of the students in most of the countries considered Mathematics as a difficult subject and hard subject to study, they do not enjoy school Mathematics during learning, often they avoid developing their understanding level. Attitudes incline to decline with age in simple way because work becomes more challenging and as the students make older, they may have begun to think that they have no requirement to study Mathematics in upcoming. Perhaps, negative attitudes on account of learning of Mathematics is challenge for learners (Duffin & Simpson, 2000).

Al-Ahmadi and Oraif (2009) studied the idea of academic self-belief found that it is completely connected to past success. This has many concerns towards learning of Mathematics. If the students appreciate achievement as an elusively then it is impossible that attitude may stay positive. Similarly, the confidence level of students related to success in examination only depend on other factors, then examination is tumble-down to consign some waste basket of failure and likewise confidence of the students may be hurt. Moreover, the demand to challenge the tasks does not essentially produce a perception of trouble when a task is perceived as to challenge and difficult than the efforts are not supported by the incentive. As a result, attitude seems to be weakened (Reid & Yang, 2002).

Matthews and Pepper (2005) explained those dominant explanations are not more ongoing with Mathematics for both high and low attaining student, these included the lack of enjoyment and belief about Mathematics subject that is boring. Moreover, they observed the apparent unimportance to the real world as a factor. Certainly, fun plays an important role for students at the age of 11-14 years old effective Mathematics learning (Nardi & Steward, 2003). In England, a prime reason for taking Mathematics is to become mathematician or choose as a profession which is conditional on it. Higher secondary school level in Scotland the reason for taking Mathematics is considered as an integral part of whole education. At all educational levels, Mathematics is a popular subject in Scotland, whereas position in England is quite opposite (Ali & Reid, 2012).

2.3 Factors Affecting the Academic Performance of the Students

Some of the diverse factors influences the performance of the student introduced by an Indian researcher Kapur which are concerned to secondary school Mathematics students are parental and school administration related (2018). Moreover, all the above factors, some other factors can also be affected the performance of the students in Mathematics at secondary level, but the specific objective of the study is to discuss teacher related individual factors contributing Mathematics performance of the students.

2.3.1 Students-Related Factors

Acharya (2017) described in his study some of the factors influence the academic performance of the students**.** In the high failure rates of students in Mathematics, teacher related factors are most important elements in the study of Mathematics. Without taking students interest in it there is not possible to achieve the

knowledge of Mathematics. Students' achievement is directly proportion to their interest, willingness, and practice in the learning of Mathematics**.**

2.3.1.1 Prior Knowledge of students

Student prior knowledge is another characteristic of student concerned factor which may influence the performance. After successfully completion of middle examination, student is promoted in next grade-9 class but immediate they feel burden of study on their shoulders because of they have no prior knowledge about it.

2.3.1.2 Lack of students Labor

Lack of student labor is also an aspect linked to student related factor. Student do not take interest in classroom, having greater strength in class it is very difficult for teacher to control to all of them. Most of the time they silently play with each other in the classroom without taking any interest in their studies. Similarly, when they reached at home, they feel tired and place their bag one side. Most of the time they waste to participate other activities other than study.

2.3.1.3 Parents support

In the process of education, parent support to their children can play an important role at all the stages and all levels of education. Parent who concentrates on their children properly and asks about their academic activities on daily basis, their children showed better results. On the other hand, some parents are illiterate, and they have no idea about their child's academic activities so their children cannot show the fruitful results.

2.3.2 Environmental Factors

Environmental factors also effect on the academic performance of the students. These factors are referred to teaching learning environment and home environment. Teaching learning environment specified that educational inside environment like the environment of an educational institutions or specifically it may also be classroom environment. Home environments mean family environment. These diverse factors determine the student's achievement in learning.

2.3.2.1 Learning environment

Learning environment refers to show where the students gain knowledge and how they bring changes in their behavior. Overall, in teaching learning process, it is responsibility of the teachers to create the suitable atmosphere in the classroom for educational activities. Teacher should have motivated to the students, to take interest in their study with full of confidence and devotion. It is responsibility of the school administration to manage the friendly environment in the school to promote the educational activities.

2.3.2.2 Home Environment

It is universal truth that home is to be considered the first school of child and his mother is his first teacher to educate him. The basic education of the children is very much depending on their home environment. Having good home environment has positive impact on student's achievement. Uneducated home environment is not relaxing for students. They feel uncomfortable, and unable to discuss academic issues with their parents.

2.3.2.3 Economic status of parents

Much research showed that the economic condition of the parents is directly affect the children's learning. Those parent who have better economic condition, responses of their children in education are comparatively better because they used all kinds of available economic resources to bring the betterment of their child's education. They provided all kinds of resources to their children to achieve good score in studies. Even then they arrange tutors to teach their children all difficult subjects. The better economic condition of the parents provided their children a better environment.

2.3.3 Socio Economic Status of the Students

According to Jeynes (2002) the social economic status comprising on parents' educational background, economic position of students and occupational condition. In most of the studies, the researchers' stress on the academic performance of students, it is not incredible that social economic status of the students is one of the major factors which may influence the academic performance of students. Graetz (1995) described that educational success of the students strongly dependent on the social economic status of the parents of the students. According to Considine & Zappala (2002) that availabilities of economic resources, strong families and parents having strong financial background are very provided advantages educationally, economically, and socially to the students and influence the positive effect of the learning of the students and may foster their achievements.

2.4 Teacher Education

Teacher education is expected to improve their beliefs and performance in pedagogy. Teacher education is smoothly moving from quantitatively to quality education (Slavin, 2008). At every level teacher education is being discussed, but still

there are little research which show impact of teacher' trainings on the betterment of students (Borg, 2011). If we are serious to enhance the quality of students, it must be given emphasis on teacher education quality. That's why there is a need of good trainings aligning with the curriculum and quality books. The methods of teaching of each subject demands different techniques and strategies (Mewborn, 2003). Teacher education is directly associated with students' behavior i.e., for students, there are so many topics that they cannot search for themselves, sometimes without teachers they are helpless, and they need guidance so, communicating is the important part of it. In mostly countries where many focuses on teacher education and is being studied this subject i.e., communication skills are taught as a compulsory subject (Baumert et al., 2010). It is the important feature of teacher education. Knowledge must be delivered in a systematic manner, in this way teaching becomes interesting. Some people believed that knowledge can be transferred from one person to another. Actual teaching is based in persuading the student. Teacher act as an instrument in helping a student and this is a way for students to understand what a teacher wants to teach.

Teacher Education provides a base for teachers to learn more and more about children psychology. For this purpose, different topics have been included in the agenda of trainings related to child psychology. Students get encouragement and stimulation from their teachers. From trainings teachers understand the value of right things in right manner at right time. They are especially told that time, resources, and energy should not be wasted (Harris & Sass, 2011). In poor and underdeveloped countries, they learn how to make low-cost material as Audio. Video aids for instruction. This makes learning easy, interesting, and effective for them. Unfortunately, during the training of teachers, it is the most neglected part. Along with effective teaching, there should be a system of support both in their motivational and

emotional aspects. This will improve the level of success of students and their self-efficacy but unfortunately their emotional training is not up to the mark (Baylor, Shen, Warren, & Park, 2004). At some extent, these days' teachers' education system is facing problems of incompatibility and unrelated syllabus in their curriculum. There is a prominent gap between the lives how students live, and they learn in schools and colleges. Students and teachers are living in the age of technology and no doubt they are surrounded by this technology in their lives. Although schools and college have tried to keep their speed as the rate of change of in students' lives but still there is a lot of gaps because especially students' lives in multitasking all-around technology motivated and energetic world. But this concept of driven technology is still missing at some extent in schools, colleges and in teachers' education. If administration of teachers' education is serious in quality and quantity, they should assure that prospective and in-service teachers have equally assess to latest technology regardless of their economical background (Cochran-Smith & Fries, 2001). Then it might be possible to bridge out these mentioned gaps between modern methodology and existing traditional teaching methods.

If a teacher is our center of focus, then automatically student will be. Last few decades are busier than ever to find out new teaching trends, techniques, and cultural adaptability in teacher education. There is a need to seek out and conceptualize a proper model. That model will suit which is a combination of latest technology and tradition but based on the geographical regional requirement by providing good professionals. So, one can say that it is not necessary that a model which is successful in developed countries just like UK, USA and Australia and it may also be successful in underdeveloped countries because they have their own problems and priorities (Fuchs et al., 2009). Now we can negate the saying that teachers are born, not made because

of latest techniques of teaching training. Now in developed countries, it is believed that if we want to improve the quality of teaching ultimately, we should work on to improve the quality of teacher and try to focus his capacity building (Darling-Hammond, 2000).

2.4.1 Teachers Professional Courses in Pakistan

The main purpose of professional education is to improve overall performance of the teacher. According to academic qualification of teacher, a variety of teachers professional courses are available in different educational institutes of Pakistan. A degree or teaching certificate is a permission letter to apply teaching job. According to need and requirement, several teaching programs have been introduced. This is basic duty of the state to provide good trainings to their teacher. For this purpose, different workshops are being arranged for teachers. Such kind of teachers training programs are highly beneficial for teachers and students. The main purpose of training is to share newly teachers training methods. Nobody can ignore the importance of these trainings. In Pakistan, the following degrees and certificate courses have been introduced to provide profession education to qualified individual to become successful teacher.

2.4.2 PTC (Primary Teaching Certificate)

This course is provided through the government colleges of elementary education and through distance learning, an Open University located its headquarters in Islamabad offered this teaching program. PTC courses consist of two semesters of six months and each having short term teaching practice in the first semester while long term teaching practice in final semester. During the semester an eternal system of evaluation of theoretical exams undertaken. The final evaluation practical examination of teaching practice made jointly by the internal and externa examiners. The similar

process also adopted by the Allama Iqbal Open University, Islamabad. This program covered the students of primary level.

2.4.3 CT (Certificate in Teaching)

This is also provided through the Government Colleges of Elementary Education and through distance learning education program also introduced by the Open University, Islamabad. For certificate in teaching program the basic required qualification is B.A/BSc degree. It is also consisting of two semester study; each has short term teaching practice while long term teaching practice at the end of last semester. An internal evaluation system undertaken to get theory papers.

While final evaluation is made jointly, the external and internal evaluation on teaching practice. After successfully completion of course work and final teaching practice evaluation, a certificate is awarded to candidate which allow him to apply for suitable teaching job as per his/her qualification. The same process is also adopted by the Open University, Islamabad. This program covered the teaching method from grade 6-8 level students.

2.4.4 B.Ed., M.Ed., and Other Related Programs

These teacher education programs are degree level programs offered by Public Sectors universities as well as private sectors universities in Pakistan included Distance learning universities. This degree trained and allowed to teach at secondary school level students from grade 9-10. The Allama Iqbal Open University, Islamabad also offered several types of B. ED programs and required qualification is intermediate, Bachelor of Arts degree and a master's degree is required to get admission in B. ED. In Master of Arts Education program, the required qualification is B. A/B.Sc. and this program is of two years comprising on 04 semesters.

2.5 Teaching of Mathematics in the Scenario of Pakistan

Baig (2015) stated that educational situation in Pakistan is not very admirable as compared to other countries. Lack of financial resources is the biggest hurdle in educational reforms. Generally, two types of secondary schools are running in Pakistan, in public as well as in private sectors. As compared to public schools, situation in private schools is much better but they highly have fee structure which is not payable to every individual due to poor economic condition. Mostly students get admission in public schools which are not in an appropriate condition. There is big shortage of qualified teachers especially subject specialist. In every classroom strength of the students is very high and it is not possible for a teacher to pay attention to each student properly. The commonly uses teaching of Mathematics and including its applications are of lecture, inductive & deductive methods. Likewise, discovery, analytic, problem solving, synthetic, laboratory and project methods are also important methods which are used in learning process in the teaching of Mathematics. Similarly, mostly teachers adapted instructional methodology according to available resources and strength of the students and depends on situation. Ministry of Education, Government of Pakistan developed and updated Mathematics curriculum for secondary school students and onward for higher secondary level. As per National Curriculum of Mathematics (2006) for grade 9 and 10 has been distributed in different small groups and benchmarks are clearly declared. The given tables explain weight ages of topics for grade IXX level in accordance with curriculum in the field of Mathematics. Bar charts shows and overall view of the topics in term of percentages. National Curriculum for Mathematics (2006) comprises on five standards of Mathematics. The teacher competency is deliberately kept broad and allow to flexibility to teacher as per need and agreeing to their student.

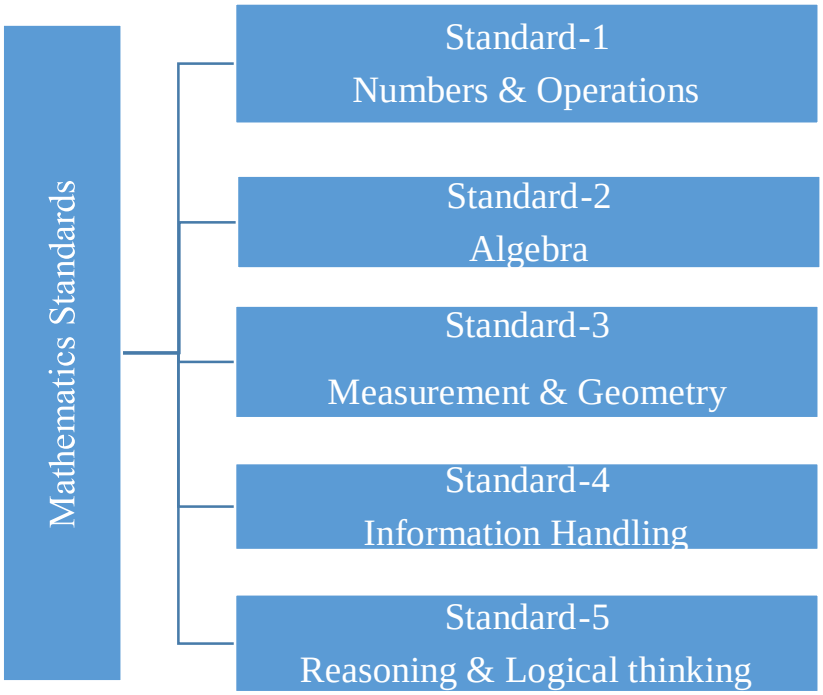

Figure 3. Mathematics Standards

According to Baig (2015) in Pakistan Mathematics teacher must be familiar with all the methods of teaching being used commonly to obtain better outcomes by applying appropriate methods to find out the solution of the problem according to nature of the problem. Pakistan is a developing country and Mathematics educational condition is not very much encouraging. Lack of financial resources, funds, government grants for education are the main barriers and obstacles in educational developments at every stage of education especially at secondary school level. The National Curriculum for Mathematics (Ministry of Education, 2002) has been distributed all the book syllabus of secondary school level into various small units and benchmarks are also clearly mentioned. To understand both the textbooks of grade 9 &

10 Mathematics is divided into small units and counted weightage wise as shown in the given table.

Table 2.1

Grade 9 & 10 division in small units

S. No	**Unit Title**	**Weightage**
1.	Matrices and Determinants	10 %
2.	Real and Complex Numbers	6 %
3.	Logarithms	5 %
4.	Algebraic Expression & Formula	8 %
5.	Factorization	8 %
6.	Algebraic Manipulation	5 %
7.	Linear Equations and Inequalities	5 %
8.	Quadratic equations	7 %
9.	Theory of Quadratic equations	7 %
10.	Variations	6 %
11.	Partial Fractions	5 %
12.	Sets and Functions	12 %
13.	Basic Statistics	10 %
		Total 100%

Table 2.2

Grade 9 & 10 division in small units

S. No	Unit Title	Weightage
14.	Linear Graphs & their applications	5 %
15.	Introduction to Coordinate Geometry	4 %
16.	Introduction to Trigonometry	11 %
17.	Congruent Triangles	6 %
18.	Parallelograms &Triangles	6 %
19.	Line Bisectors & Angle Bisectors	6 %
20.	Sides & Angles of Triangle	5 %
21.	Ratio & Proportion	6 %
22.	Pythagoras Theorem	8 %
23.	Theorems related to Area	5 %
24.	Projection of a Side of Triangle	6 %
25.	Chords of a Circle	5 %
26.	Tangent to a Circle	6 %
27.	Chords and Arcs	5 %
28.	Chords and Arcs	5 %
29.	Angle in a Segment of a Circle	6 %
30.	Practical Geometry–Triangles	3 %
31.	Practical Geometry–Circles	7 %
	Total	100 %

2.5.1 Teachers' Quality and Performance

Teacher plays a significant part in recognition of the high levels and these levels are progressively highlighted in school systems globally. Regardless of broad

agreement regarding significance of highly quality performance, researcher, stake holders, policy developer and scholars have been incapable to extent a compromise about what explicit abilities as well as individualities creates a good teacher. By the passage of time and generation of new knowledge world widely, the demands placed upon teachers are increasing day to day, but the profession of teaching is becoming more and more complicated. Hanushek (1997) assessed in his study that difference between having a good teacher characteristic and an average teacher go over and above one grade level that is equivalent to an annual attainment growth. To enhance the quality professional development of the teacher and to face the new challenges of the present era, the government must be arranged teachers training programs. These programs must be essential to arrange before service as well as in service teachers. To conduct short time refresher courses within school are also important.

Generally, it is knower from the help of different scholars that supporting teacher value is considered a key element at primary as well as secondary school teaching level in the United States. Similarly, one and only most important goal of no child left behind law present in the states, purpose to provide “highly qualified teacher” in every educational institutional environment. Although periods of several research it has been seen that there is no compromise on what factors enhance the quality of teacher in the teaching environment. We focus of our study is to check the relationship between productivity of the teacher and his training. Likewise focus on including formal before service education, in service performance improvement and in formal trainings. Equally common, moreover, it is pointed out that formal education is not relevant or incorporated technology which presented the way others to claim for the elimination of education colleges (Fair et al., 2016). One reason for the ambiguity or lack of accepting the effects of training of the teacher. In this connection previous

studies have been incapable to overcome these methodological questions in estimating effects of teacher's quality trainings. At initial stage, it is difficult to separate and recreate the efficiency, especially in learning process where own ability of students affected of a peer of students and other characteristics of finding and thinking out of the box which we measured as schools also affect measured outcomes (Mikka, 2015).

2.5.2 Teachers' Competency

Boyatzis & Kolb (1995) explained that competency is mixture of knowledge, experience and capability which allows the individual to perform a task efficiently. Boyatzis (1982) argued that competency is an ability of a person to determine a functionally related system in achieving the specific goals. Rylatt and Lohan (1995) used a separate term for competency that may be a general, key, basic skills and skills linked to the personal references to the knowledge and attitude are based on job responsibilities assigned to individual across all areas. The word skill repeatedly denoted to as competency which is collection of knowledge concerned to attitudes and skills that effect individual work performance measured in accordance with set standards. Mestry and Grobler (2005) suggested a model "Iceberg" in which they defined that knowledge and skills can be developed easily with a little bit effort and may also be identified. Although, personality is most important element in creating excellent worker who has the essential knowledge and basic skills. Based on above discussion and keeping in view of the model Iceberg competency, it may be determined that competency of teachers in teaching learning process is the combination of domain of knowledge, attitude, and skills. According to Selvi (2010) the teacher competency should be reviewed continuously and constantly in parallel with the changes and reforms in the studies. The main role of the teacher is to bring positive changes into educational system in effectively way. Hence teacher need new competencies to cope

with all these changes and it is very essential for a teacher to redefine all these competencies.

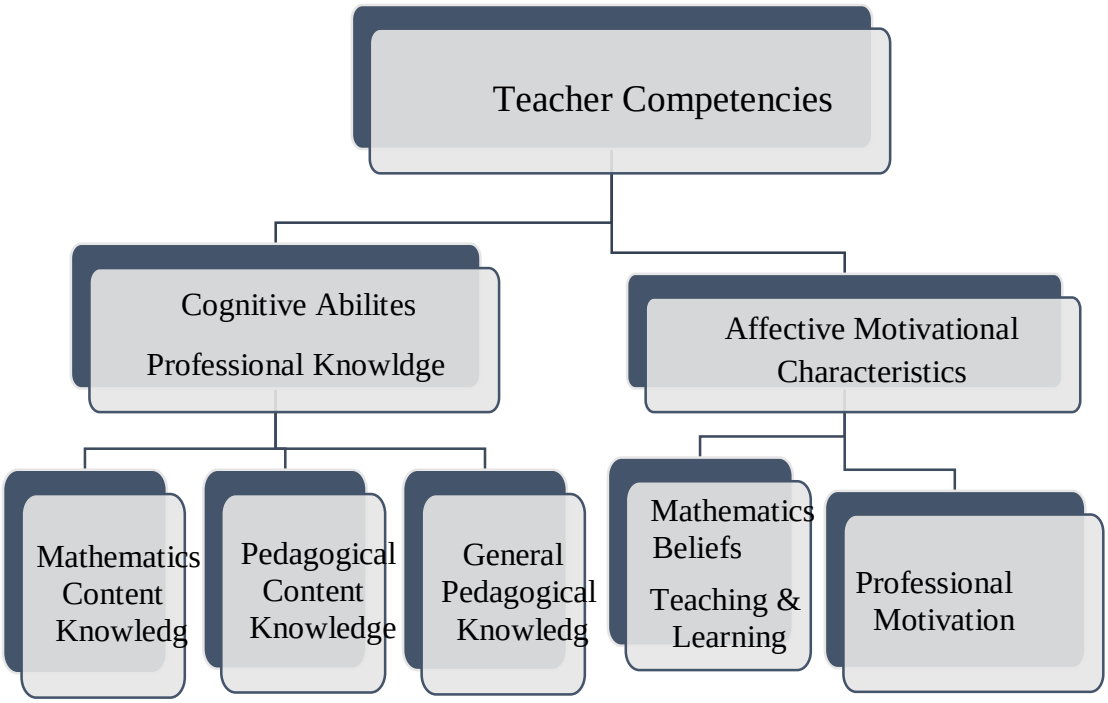

Fig 4. Teacher Competency Factors (Richardson Thompson et al, 1992)

2.5.3 The Effect of Competency of Mathematics Teacher to Creative Teaching

In the field of education Mathematics is considered a complicated subject, it is difficult to understand as compared to other social sciences. It has some rules, formulae, numerical and full of procedures and rules gives true or wrong answers to mathematical problems. Such type of inappropriate response causes space to appliance creative teaching learning process in Mathematics seems to be fastened rather than other subjects like languages and arts. Resultantly there are three domains of competency referred to this concept paper as mathematical teacher's competency that affect the teaching practice of the teacher: -

i) Knowledge of Teacher

ii) Skills of Teacher

iii) Attitude and personality of teacher

2.5.4 Knowledge of Teacher

Borko and Putnam (1996) stated that knowledge of teacher is the domain of competency of Mathematics teacher which provided a solid encouragement on preparation the creative teaching. To become creative and effective mathematical teacher he must be needed to master the knowledge of mathematical contents. Murray and Male (2005) described that there are a smaller number of mathematical teachers tried to be creative teaching of Mathematics. This spread over to new teachers who need time to master the contents as well as curriculum. Teachers who are proficient in mathematical content may improve the achievements of their students. Hill et al., (2005) in their study establish that there is a significant relationship between the proficiency mathematical content and achievement of Mathematics students. Competency of Teacher should not be in the form of mathematical knowledge, but it should also be into the pedagogy. Shulman (1986) narrated in his research that content and pedagogical knowledge are helpful to improve the conceptual understanding of the teacher. The effect of content and pedagogical knowledge should be given consideration as teacher should not only be the master in the contents of the subject to be taught but also to learn how to teach and explain the subject. Kim et. al., (2011) stated that teachers having pedagogical knowledge of Mathematics content may easily choose effective strategies and teaching method in creative teaching. Some other factors like students learning ability, teaching resources, aims of teaching may also influenced the practice of creative teaching. Teacher of Mathematics who is aware of

his students' ability, the cognitive style and attitude about learning of Mathematics will be able to determine students learning requirements and will be able to teach style in suitable manner to their cognitive level. As per statement of Lin & Li (2009) a noble and creative teaching should have the objectives to be achieved. Rich and achievable objectives are very helpful for the learners and teachers to certify that their teaching learning process doesn't escape scheduled foundation.

2.5.5 Skills of Teacher

Alkhrusi et al., (2012) argued that Mathematics teachers' skills influence on the creative teaching. Before implementation the teaching and learning process in the class, teacher must be well planned and prepared the lecture to achieve required outcome. Akyuz et al., (2013) described that creative mathematical teacher must be wise and tactful in organizing planning as well as portfolio in all their activities This indicates that teachers' teaching is creative, effective, well planned, prepared and teacher is confident to deliver lecture before entering the classroom. The classroom management skill of the teacher also influences the practice of creative teaching. Well organized classroom and an efficient teacher enable to teacher to teach creatively and perfectively (Wang, 2006). According to Cochran-Smith, (2005) it is mandatory for a teacher that he must be practice the creative teaching even mathematical knowledge and skills must be communicated to their pupils during the teaching learning process. Thus, such skills of teacher generate and develop the interest in Mathematics students. As per Hong et.al (2005) Mathematics teacher who uses various teaching style and teaching method to make it interest the subject will be accepted by the pupil easily. Pupils' participation and taking keen interest in the classroom also influence the creative practices of teaching. Therefore, teacher must be skilled in determining the teaching strategy.

Tarmizi et. al., (2010) in their study assessed that creative teaching and learning activities such as problem-based learning may also cause to enhance the interest of students in teaching and learning process. Good communication association, good relationship and good understanding with due respect also influence the atmosphere of creative teaching. Similarly, the poor communication, misconception between student and teacher during teaching process make the students' creativity unobstructed. On the other hand, a good affiliation with the teacher will minimize the student concern for the subject of Mathematics. This proved by the study of McGlyn Stewart (2010) which found having good communication between himself as a teacher as well as mathematician capable to increase confidence of the teacher. Similarly, the performance evaluation or assessment of the students can be formative or summative. Alkharusi et al., (2012) stated that an ability to assess the student's learning assessment is considering as an essential skill which improve the performance of the student as the quality of teachers' teaching. Kennedy (2005) suggested that to improve the deficiencies of Mathematics teachers, they must need skill reflect by themselves and are willing to bring betterment in self-professionalism constantly. In this technological world, the use of technology also plays important role for teachers and their creative teaching. Proficient and competent Mathematics teacher must be capable to integrate learning technology into their classrooms and teaching practices (Zhu et al., 2013; Gouws & Dicker, 2011)

2.5.6 Attitude and Personality of Teacher

Elements of personality and attitude of Mathematics teachers also effect on creative teaching. A Mathematics teacher needs to have a good attitude, personality, motivational, intelligently controlling stress, confidence, and positive thinking for

creative teaching (Cropley & Cropley, 2011). Professionally accredited teachers are enables to encouraged and motivate to attract the student (Klausen, 2010).

Table 2.3

Domain Competency and Its Elements

S. No	Domain Competence	Competency Elements
1.	Knowledge of Teacher	Content Knowledge of Math
		Content Pedagogy Knowledge of Math
		Student ability Knowledge
		Teaching Resource Knowledge
		Teaching Objective based Knowledge
2.	Skills of Teacher	Skills of Planning & preparation
		Management Skills for Classroom
		Diversity Teaching Strategy Skills
		Pupil's Involvement Skills
		Assessment of Pupils and Learning Skills
		Teaching Reflection Skills
		Level of Professionalism Improvement Skills
3.	Attitude and Personality	Flexibility Motivational
		Strong Believer
		Ready for Uncertainty Situation
		Curiosity

2.5.7 Teachers Beliefs about Mathematics

According to Skot (2015) beliefs are a person's personal ideology as well as person's conception. These are mentally understanding of thoughts, personal understanding and individual prepositions that assumed to be corrected. Teachers' beliefs effect in teaching learning process happens because beliefs can assess and guide teachers thinking, and instructional modernizations applied in the classroom. Minarni (2018) argued that beliefs of the teachers are part of competencies of the teacher and may be one of the factors that may influence student's performance. Thus, such beliefs of teachers are very important and further it is required to be searched. An elementary understanding, conception, initial thoughts, or proposition about things considered correct whichever consciously or unconsciously by a teacher. Torner (2002) gave concepts about Mathematics beliefs on teacher based which can be divided into three categories which are (i) global beliefs (ii) subject matter related beliefs (iii) domain specific beliefs. Similarly, Ernest (1989) elaborated in his study the key components of teacher beliefs regarding Mathematics which are (i) conception of Mathematics or viewpoint of teacher (ii) the teacher model or conception of the nature of Mathematics (iii) conception of learning process. Belief of Mathematics teacher may have developed within teaching learning process by the teacher through his experience and knowledge which he has attained over a long time. Conley (2017) concluded in his research that shifting of teachers' beliefs are most important because we are working to shift teachers understanding influence decisions that teacher make and serve as indication of their decisions. He suggested in his research that lesson planning is vehicle that may be shifted the beliefs and developed Mathematics knowledge of teachers to improve outcomes for students. In educational sector, systematic change is challenge, such as

schools, teachers training programs, these are dire needs to be conducted to improve outcomes for students in learning and teaching of Mathematics as a subject at secondary school level.

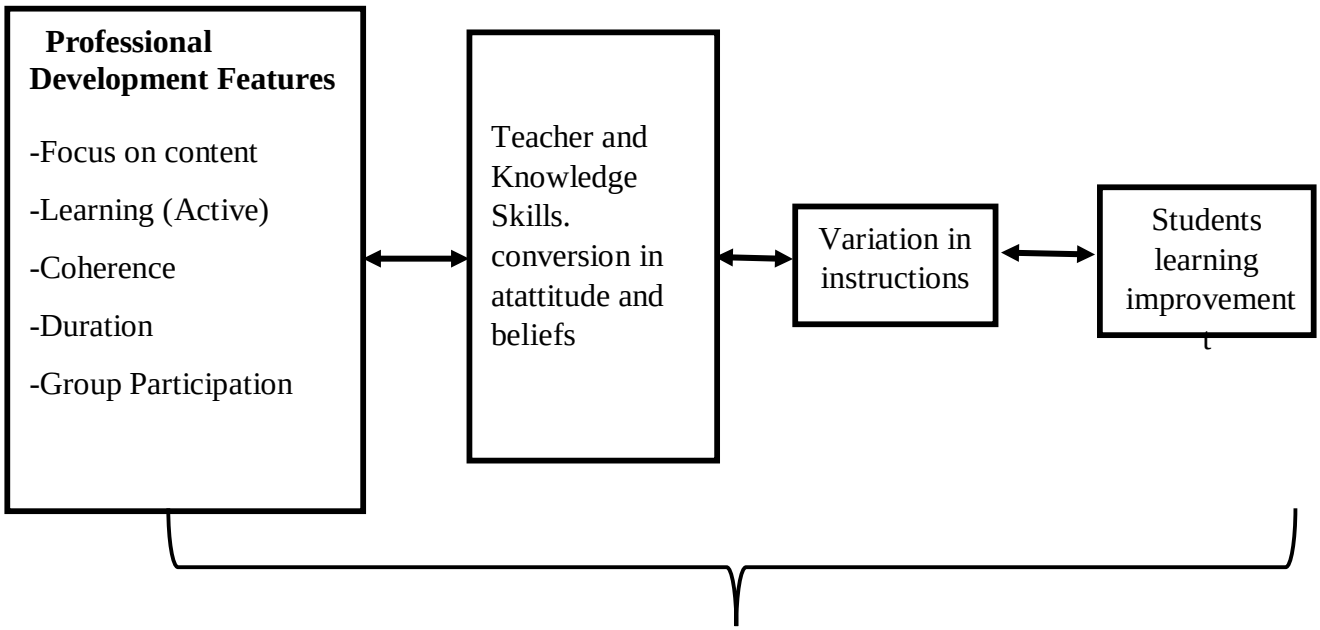

Figure 5. Teacher & Student Characteristics, Curriculum, Leadership, Policy Environment

In above figure it shows that teachers' beliefs indirectly influence the achievement of the students. Similarly, achievement of students may also be affected by teaching standard and learning practice whereas the quality of teaching practices affected by the knowledge of the teacher. Indirectly, beliefs of the teacher can contribute the performance of the students.

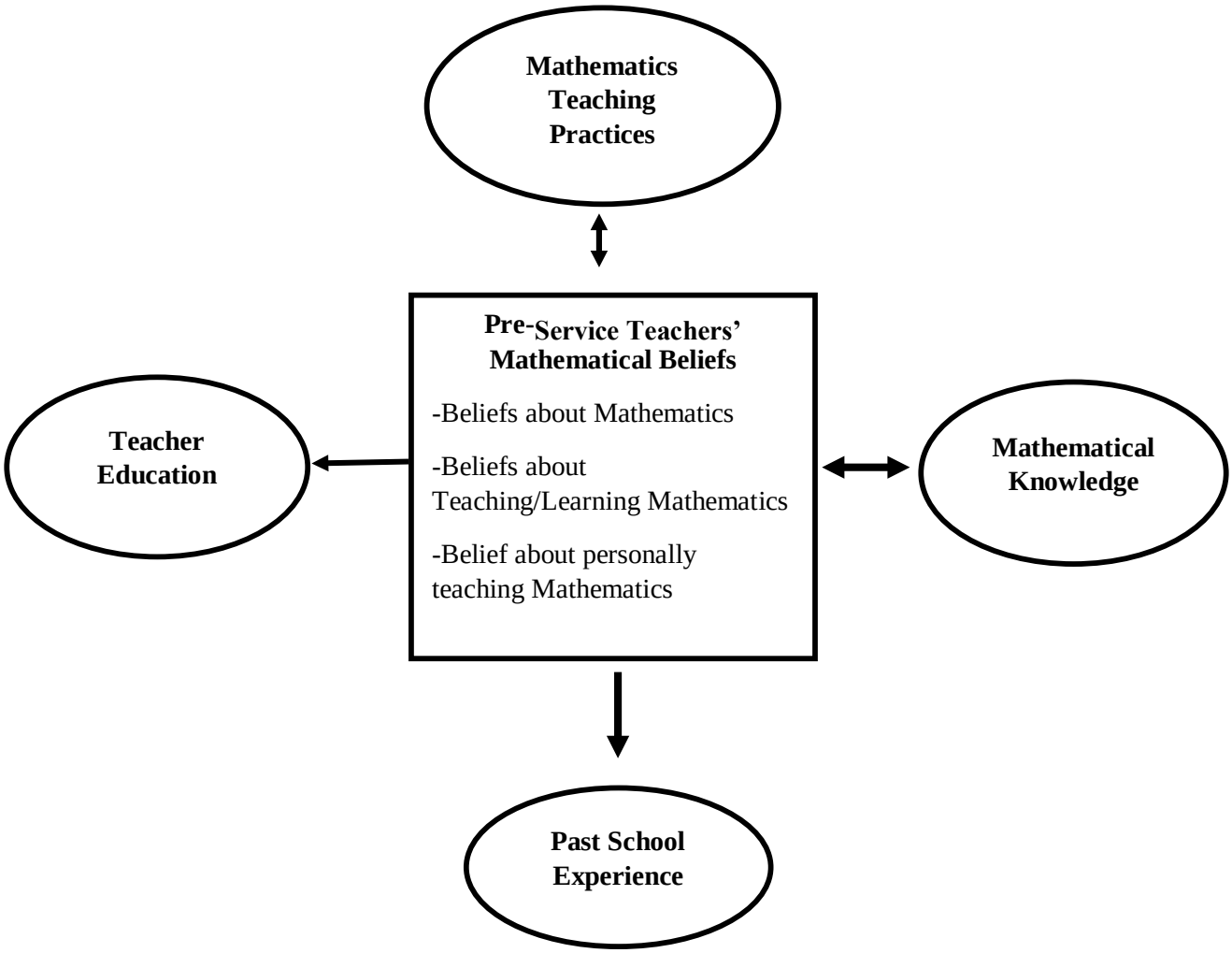

Figure 6. A model of factors contributing to mathematical beliefs of pre services teachers adapted from Anderson et al. (2005) and Raymond (1997)

2.5.8 Role of Teacher in Teaching of Mathematics

Teachers needs to be supposed a new role in teaching of Mathematics if the students are to build their own mathematical understanding. A teacher must have to generate an inspiring environment that encourage and enhance learning of Mathematics through internal activity. Teaching of Mathematics in classroom, there is needs to be listening by the learners, understanding the level of students' thinking, approach and setting task to understand how the learners of Mathematics construct its meanings. Role

of the teacher moves from dispensing information to forecasting, organizing, leading, and controlling a cooperative learning environment (National Curriculum for Mathematics, 2006). Teacher plays an important role in classroom, works like a gardener in a garden, who see each plant, check the soil, examine leaves and flowers to save them from disease, also ensure that each plant take its nutrition. Similarly, a teacher should take care of his students, their needs, understanding level, psychology, and their abilities to make it effective teaching process in the classrooms.

A teacher educator should be able to fulfill the needs of all approaches. Nowadays, we have skillful teachers with latest recourses and technology. Technology should not be considered as a split tool; it should act as a part of teaching and integral part in effective teaching. Teacher educator institutions prepare their students in such a way that they will be able to meet the challenges of future. They should be given opportunities to teach in latest technology equipped classrooms. This is way to get practical experience of teaching and responsibility of quality teaching. (Hiebert, 1997)

2.5.9 Conventional Teaching Methods for Mathematics

Lessani (2017) argued that to achieve learning outcomes in teaching Mathematics, teacher must be knowing different teaching methods. Based on teaching mathematical education, the teacher can employ this knowledge. Mathematical teaching learning process is continuing process through which students must be developed their thinking level, solid understanding of suitable Mathematics ideas in each academic level. In this arranged method, teacher assesses preceding technique and then controls low level trouble solving as followed the seat work reproducing teachers' presentation. This kind of pedagogical approach of placing primary attention on the teacher as a transporter of knowledge that is, teaching by telling as an agents of

behaviorist theory. By giving lecture in the dominant position that is considering the common method of teaching using the traditional method.

2.6 Teacher Related-Factors Contributing to Students' Performance

According to Afshar and Dosti (2015) in education process teacher plays an integral role upon whom the success or failure of educational activities depend. The main goal of the education system to fulfilled by the teacher who put the curriculum into preparation. To conclude the influence of teacher concerned factors on the academic performance of students in Mathematics several studies have been done. Rotumoi and Too (2012) stated that teachers' professional status is concerned to teaching behaviors and connection they have with children. Asikhia (2010) argued that qualification and experience of teachers' significantly influenced students' academic performance. Musau and Migosi (2015) stated that there was no significance difference in means between qualification of the teacher and students' Mathematics performance. Teacher is an individual who provides education to his pupils and motivate teaching activities. In the process of teaching learning the education of children mostly depending upon the role of the teacher (Acharya, 2017).

2.6.1 Teachers' Academic Qualification

An academic qualification of the teacher is elementary element of teaching. Without academic qualification teaching learning process may not be accommodated. In educational institutions there may be many types of teachers, teaches languages, science, arts, technological subjects but they all have some basic qualification. Suppose a teacher intend to teach English subjects to their student at secondary school level, his academic qualification must be graduation except profession qualification

2.6.2 Teachers' Professional Knowledge

Professional knowledge is very helpful in the improvement of teaching methodologies of all those subjects to be taught in classroom. It is also very helpful to understand the psychological condition of the students. Teachers get knowledge about the contents they teach to students. The basic knowledge and academic qualification enhance the value of teacher's knowledge in connection of their field of interest.

2.6.3 Teachers' Teaching Experience

With the passage of time, teaching experience of Mathematics teacher grows gradually. Though the teachers are competent and have knowledge of subject matter, skills, and different ways to deliver their mathematical views to their students, likewise teacher gain experience more and more. This experience of the teacher is very helpful for him to deal with the student socio psychologically. A teacher having experience is capable to handle and deals with naughty and stubborn students in the classroom. It is the matter of discipline which may organized only with the procession of time. So, we can say that there is no knowledge without experience.

2.6.4 Teachers' Motivation

Utomo (2018) stated that in teaching learning process, teacher as one of the elements play multiple roles. Teacher not only transferring knowledge but also guide to his students at every step. They encourage the potential of the students to improve alternative in learning. This shows that the teacher faces complex task and responsible in respect of to achieve educational goals. Teachers are required to enhance the performance of the students to carry out the task. This complex task and responsibilities of achieving educational goals, teacher motivation play an important role. Teacher becomes educator because of motivation. Johnson (2017) described in his study

motivation increases learning of students. In this learning, role of teacher is very crucial to increase students' learning through motivated. Students are motivated to learn naturally because of they have their own interest and enjoyment in the subject they are studying in the classroom. After study many research papers, it is fact that teacher motivation enhances the ability, capability and will power of students which make them to achieve objectives of their studies.

2.6.5 Teachers' Subject Knowledge

To make the lesson effective as well as approachable, the teacher must be attaining the basics of the subjects included other relevant information which can be helpful to enhance the worth of the lesson. Although no objective method adopts to check the mental temperament of Mathematics teacher then struggles may be made to reach out teachers who have considerable sphere of information about the area of expertise. In generally it has been observed that competency of the subject matter is very much associated to the achievement of the student. According to Ekstam et al., (2017) For the subject knowledge teacher must be aware of the social condition and principles which are concerned to the subject being taught. In everyday life situation its value must be checked. According to Walsha et al., (2020) teacher must be aware the knowledge of all the subjects being taught in the same grade class. Such way teacher can use better teaching strategy and may be in better position to use different teaching aids.

2.6.6 Teachers' Professional Attitude

According to Iqbal et al., (2013) attitude may be defined as a relational mental condition that directs the behavior of an individual. Different persons have different mental disposition like experience, desires, beliefs, like and dislikes intension. These

mental dynamics are essential parts of attitude. In present time, one of the main concern of students and parents is the quality of education. In this process of education teacher is main factor and play a key role. Teacher positive attitude towards their professions define the limitations of teaching and learning process. Thus, the personal feelings and interest of the teacher affect the teachers' performance.

2.6.7 Teachers' Teaching Methodology

Yamatone and Ahmedova (2020) described that teaching methodology is series of such kind of activities in which teachers may enhanced their professional qualification, improve their professional competency, develop the level of understanding, skills, educational principles, and techniques. Teaching method can be divided into four categories. These are well known methods and each of them has its own importance and significance as discussed below separately.

2.6.7.1 Teacher Directed Method

In teacher directed method teacher does plan, organize, and presents the subject matter to students. In this method teacher is consider a controlling authority. There can be very shade in these methods, but these can be further extended the following methods which are commonly practices: -

Lecture Method

It is a historical method, **a**nd its history goes back to the period whenever there was no publishing material in the shape of prints and other way of communication. Teacher transmits their knowledge to students in oral way. Teachers depend upon his memory to convey the knowledge. With the passage of time this lecture method has

been considering the responsible transmitting the way of knowledge from generation to generation. It has three basic forms.

i) Former Lecture

ii) Informal Lecture

iii) Lecture commentaries

i) Demonstration Method

The demonstration method is like a lecture method, it directly uses interaction of information and share the views from teacher to students. But minutely it is different to lecture method as in this method a visual approach is used. It is very useful in science subject, physical education, music, and type writing.

ii) Drill Method

One of the most direct form of supporting learning can take place through drill method. All the compulsory parts of the topic are repeated in drill method. This method too much depends upon on memorization and practices.

iii) Questioning Method

This method mostly used by the teachers. In this method teachers asks questions to their students without apprehending that how much time of the class taken by relevant teacher. It is one of the main effective ways to encourage students to develop higher order thinking skills.

2.6.7.2 Student Directed Method

This method is quietly different from teacher directed method. In this method the responsibility of learning of students in on only on students weather they take interest or otherwise.

2.6.7.3 Interactive Method

In interactive method students and teachers play their role together. Not only teacher control the classroom but also students is responsible. Either joint session take place amongst the teacher and the students or both.

2.6.7.4 Problem Solving Method

The problem-solving method is totally different from above discussed methods, in this method problem presented and try to search solution of the problem. In this method question are asked and make suitable suggestions.

2.6.8 Assessment Practice of the Teacher

Assessment is considering a process that collecting information from multiple as well as diverse source to develop an understanding in depth of what student knows and understand. They can do with their knowledge because of their educational experience. Hussain et al., (2019) stated that assessment practice of the teacher enhances student critical thinking. In classroom assessment practice of the teacher play an important role and cause of development of student thinking level. Alkharusi (2010) viewed that teacher uses of different form of methods of assessment environment, performance assessment portfolio and performance have been thought to be more authentic way to students learning process.

2.6.9 Teachers' Professional Training

The professional training of teacher is any type of continuing education effort for educators. Learning can take place formal or informal setting included seminars, conferences, coursed and workshops**.** The professional development of a teacher namely education and training to enhance teacher's knowledge and skills has considered on top priority. Teachers' profession training is crucial to improve students' outcomes because professional training involves a multidimensional structure and changes across teachers' professional life. According to Betlem (2019) to improve teacher's preparation and teacher's quality to improve student's achievement, government world widely has invested in teaching standards and performance benchmark.

2.7 Summary of Review of Related Literature

In this chapter review of the literature was made according to the objectives of the study. Firstly, nature and concept of Mathematics was discussed in detail. The significance and importance of Mathematics study as subject was also defined. Teacher's teaching strategies, teacher's competency, components of teacher competency were also discussed. The National Curriculum Standards for Mathematics discussed along with its model. Table of specification provided a road map of Mathematics teaching in shape of a book at secondary school level also shown in form of table. Factors contributing students' performance were discussed. After discussion in detail on teacher related factors contributing to student's performance a conceptual framework was formulated in this study.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides comprehensively explanation of research methodology. The plan of action that researcher is going to implement during this research is thoroughly explained in this chapter. The present chapter describes the research methodology that was applied to investigate teacher-related factors contributing to students' performance in Mathematics at secondary school level. This chapter highlights research method, population, sampling procedure, research tool and procedure of data collection.

3.2 Research Design & Approach

In this study the researcher used descriptive research design and qualitative research approach. Focus group discussion method was used for data collection. An open ended self-developed instrument, focus group discussion guide was used for discussion. Qualitative research involves collection and analyzing of non-numerical data. It is very helpful in getting in-depth insight of a problem. Focus group discussion method is one of the commonly used qualitative research technique to use in date collection. It is usually including a limited number of respondents (8-12). According to Rabiee (2004) in focus group discussions (FGDs) individuals are selected and gathered by researcher for discussion on the topic of research. Focus group discussion (FGDs) is like a round table conference in which participants express their views about the topic

of research. Interaction among participants of focus group discussion (FGDs) makes this strategy more effective. According to Sim & Waterfield (2019) the purpose of focus group discussion is to provide a comfortable atmosphere in which participants can share their ideas and experiences about topic of the research. In this method of data collection, researcher plays a role of moderator, observer, listener, and eventually inductive analysts. In this strategy mostly open-ended question are asked without following a formalized list of questions. Open-ended questions are very helpful in extracting valuable data from interviewee. For focus group discussion (FGD) researcher first developed a research guide.

3.3 Population

In this research the population of study comprises of male teachers of Mathematics. In the urban area of Islamabad city there were 28 secondary schools in total working under the umbrella of Federal Directorate of Education, Islamabad. Strength of Islamabad Model Schools for boys is 12 whereas Islamabad model colleges are 16 in numbers. All these secondary schools were situated in main city and main sectors of Islamabad. List of all these secondary schools enclosed herewith at (**Annexure-B)**.

Table 3.1

Total numbers of Boys Secondary Schools

District Schools	Secondary Schools Names	Boys Secondary
Islamabad	Islamabad Model School for Boys (IMSB)	12
	Islamabad Model College for Boys (IMCB)	16
	Total Secondary Schools	28

In secondary schools of Islamabad, the Islamabad Model Schools for Boys, and Islamabad Model College for Boys there were 84 Mathematics teachers were teaching Mathematics. All these Mathematics teachers were the population of the research.

Table 3.2

Total Number of Mathematics Teachers at Federal Government Secondary Schools

ICT (Urban) Table of Population

District	Total number of Schools	Math Teachers at Secondary Schools
ICT (Urban)	28	84

Source: Federal Directorate of Education, Islamabad

3.4 Sampling Technique and Sample of the Study

According to Taherdoost (2016) sampling is the method of collection of accurate interpretation from a population of interest that is called sampling. A population consists of many individuals; it is difficult for a researcher to collect data from every single person of population. To save time, resources and to overcome this

problem a sampling technique was used by the researcher. According to Sharma (2017) the following are three very common and useful techniques of sampling in qualitative research:

i) Conventional sampling technique

ii) Purposive sampling technique

iii) Theoretical sampling technique

In this research purposeful sampling technique was used. According to this technique of sampling information–rich cases are selected as sample for research.

Table 3.3 Description of Selected Participants for Focus Group Discussion

Sample of the Study	**Qualification & Professional Qualification**	**Experience**
09 Mathematics Teachers	BSc (Double Math & Statistics) B.S.Ed. B. A, B.Ed.	10-15 years

From 28 Federal Schools in urban area, nine teachers of Mathematics were selected had have 10-15 years of Mathematics teaching experience and keeping in view of their academic and professional qualification. Mostly teachers were BSc (Double Mathematics & Statistics) degree holder even then general graduate teachers have also studied Mathematics subject up to the intermediate level. They were purposefully selected.

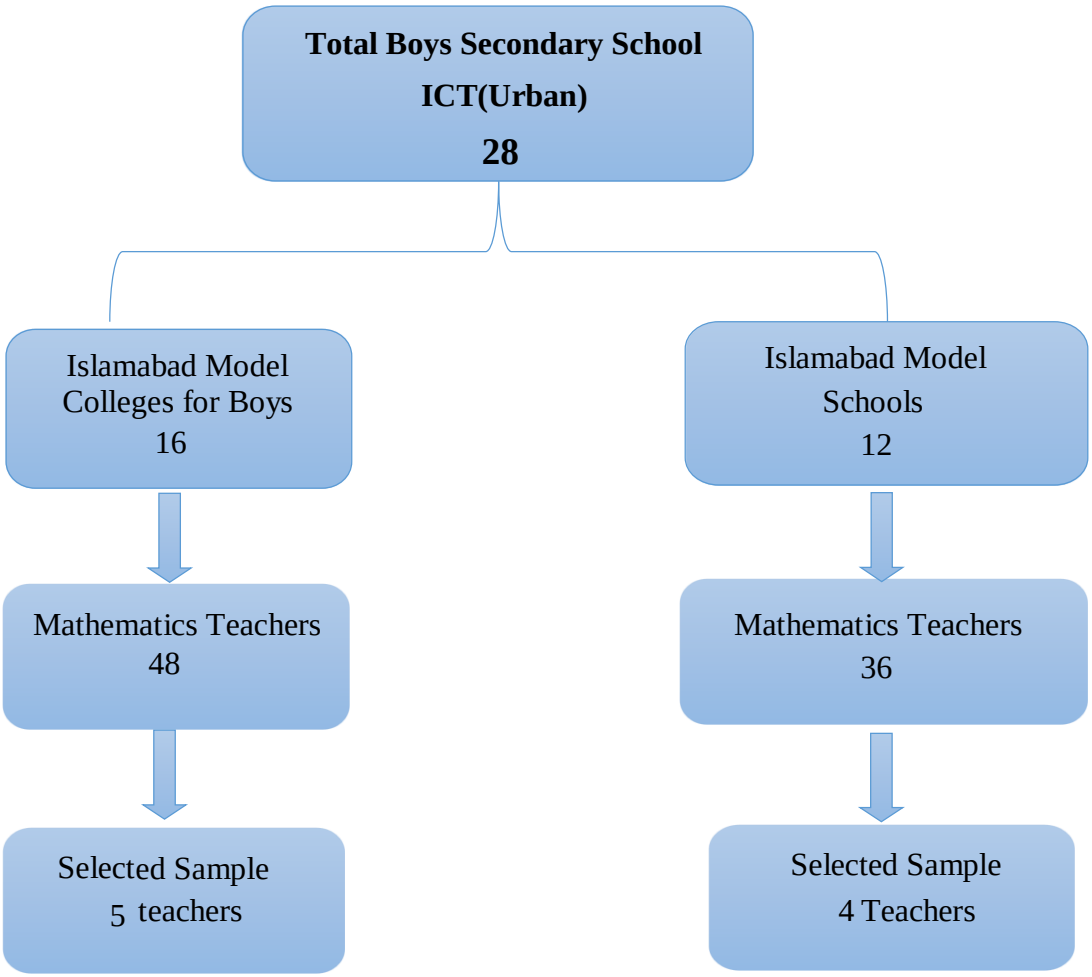

Fig 7. Overview of Sample of the study

3.5 Research Instrument

Research instruments process begins with identifying the main objectives of the study. A list of questions and schedule is prepared by the researcher as a guidance for each representative of focus group discussion. This is followed by pursuing ethics clearance. According to Krueger and Casey (2000) people and self-disclosure be likely to be comfortable. Eagerness to fully connect in a group discussion is instrumental in creating valuable data and can be attained more readily within a homogenous group.

Before conduction of focus group discussion (FGDs) researcher have developed an interview guide by keeping in view of the following steps: -

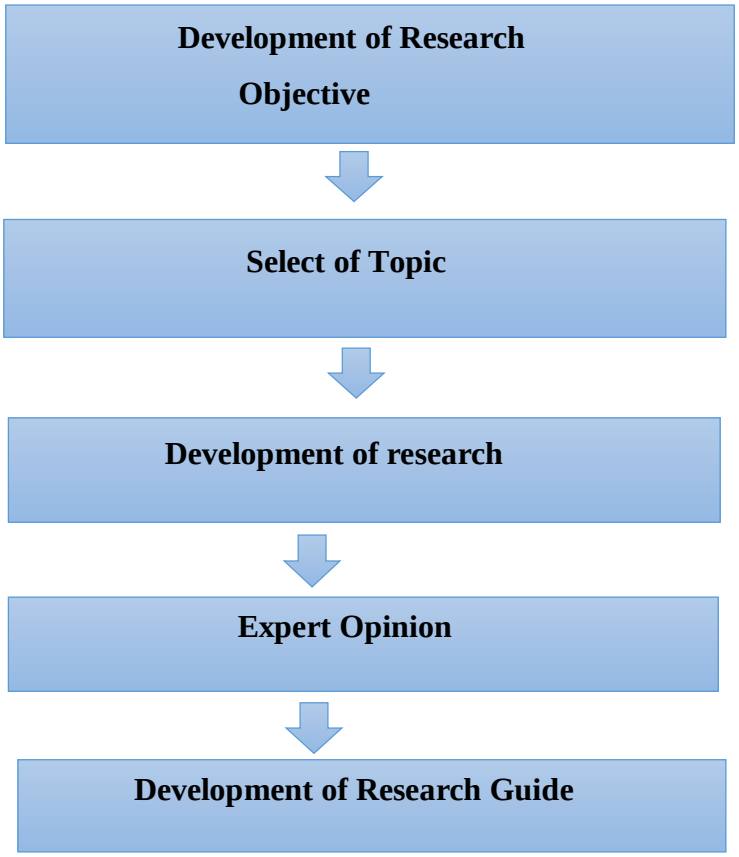

Figure 8. Steps in formulation of Focus Group Discussion Guide

This guide contains on important areas and questions about research topic that may explore during the interviews (**Annexure-C).** After review of the related literature, keeping in view of objectives of the study and conceptual framework the researcher design item wises the instrument as follow: -

Table 3.3 Research Instrument Design

S. No	Description	Items as per Conceptual Framework
1.	Subject Knowledge	Items 1&2
2.	Teaching Methodology	Items 3&4
3.	Teachers Knowledge & Assessment Practice	Items 5&6
4.	Teachers Professional Attitude	Items 7&8
5.	Teachers Professional Training	Items 9&10

3.6 Verification of Tool

In verification of tool, validity of research tool, pilot testing and reliability of research tool is involved.

3.6.1 Validity of Research Tool

Validity of an instrument means the degree to which it measures what it expected to measure, and reliability indicates to the degree that instrument produces the same results over multiple trials. It is an important characteristic of a research tool. To check the validity of research, guide the researcher approached to six experts of the educational field. Researcher personally visited three well known universities of Islamabad/Rawalpindi to meet the experts' scholars. Researcher thoroughly explained the main objectives of research and each statement of research guide. All experts thoroughly analyzed the research guide and checked various aspects of validity. Changes were made in research guide in the light of their piece of advice and

suggestions. Validity Certificate of experts' scholars are enclosed at (**Appendices E to G).**

3.6.2 Pilot testing

For pilot testing of focus group discussion six (6) teachers of Mathematics were selected from Islamabad Model College for Boys and Islamabad Model Schools for boys by simple random sampling technique from population outside the circle of sample. Based on the pilot testing the focus group discussion guide again revised accordingly. The second revised version was again discussed with the experts of Mathematics and supervisor. They recommended minor changes which were incorporated and subsequently the instrument was finalized.

3.6.3 Reliability

The term Reliability is a concept used for testing quantitative research, the idea is most often used in all kinds of research. This relates to the concept of a good quality research when reliability is a concept to evaluate quality in quantitative study with a "purpose of explaining" while quality concept in qualitative study has the purpose of "generating understanding" (Stenbacka, 2001, p. 551). The difference in purposes of evaluating the quality of studies in quantitative and quantitative research is one of the reasons that the concept of reliability is irrelevant in qualitative research. According to Stenbacka, (2001) "the concept of reliability is even misleading in qualitative research. If a qualitative study is discussed with reliability as a criterion, the consequence is rather that the study is no good" (p. 552). Based on above statement reliability is not essential in this study.

3.7 Data Collection

In this research researcher used tool for collection of data is focus group discussion (FGDs) and for this purpose focus groups discussion guide was used to collect the required data. Krueger & Casey (2014) explained that focus groups consist of a discussion that is carefully designed to obtain perceptions of participants on a given topic. After establishing validity and pilot testing of the research tool the researcher several visited offices of the Principals in both Islamabad Model College for Boys as well as Islamabad Model Schools located in the urban area of Islamabad to discuss and get permission to conduct a session of focus group discussion for the purpose of data collection. Due to Covid-19, all the Federal schools were closed for academic activities since last 2020 to date. Only some administration staff and Principals were available on their duties in schools by rotation. On the request and after several visits the schools, Principals of Islamabad Model Colleges and Islamabad Model Schools provided a list and contacts numbers of Mathematics expert teachers with their recommendations. The researcher communicated with Mathematics experts and met with them several occasions to discuss the matter and to finalize the schedule of focus group discussion. On the request of the researcher principals already permitted them verbally to attend the educational discussion. Soon after, researcher was remained in contact with them till completion the session. Although there is no specific guidance on the number of focus groups, most studies organized at least two groups (Stewart & Shamdasani, 2015). The number of focus groups depends on the topic, the questions, and the amount of information. Krueger & Casey (2014) suggested that these groups should be consisted of 4-12 participants.

For focus group discussion nine (9) Mathematics teachers had have 10-15 years' Mathematics teaching experience were selected and they were communicated properly, the venue, date, and time of focus group discussion. The venue of focus group discussion was Researchers' Library, Dawah Academy, Faisal Masjid, International Islamic University, Islamabad. On the request of the researcher, the Senior Librarian, Research Library allowed to conduct Focus Group Discussion with full of cooperation and support. On the given date and time, Mathematics teachers reached in the Research Library. Researcher and Senior Librarian warmly welcomed to them. After their sitting, discussion stared with the name of Allah. One of the teachers recited some verses from the Holy Quran. Then the research addressed shortly to welcome them. Later, discussion started. To keep in mind, the objectives of the study, researcher asked questions one by one, and all their views were recorded accordingly. (Stewart & Shamdasani, 2015) suggested that the session should last from 90-150 minutes. Researcher Discussion was lasts for one and half hour (90 minutes) in afternoon on April 28, 2021. The researcher played a role of interviewer/mediator whereas all the participants were interviewee. Whole session of focus group discussion was recorded visually and audio-ally. Later, whole recorded data was converted by the researcher in computer typing form. Session was adjourned with prayer.

3.8 Data Analysis

In this research data was collected through Focus group discussion by using focus group discussion guide. Since the data was obtained in qualitative form. Thematic analysis was used to analyze the data. This technique was used to identify, analyze, and interpret pattern of within the qualitative data (Braun & Clark, 2019) This is most common analysis in qualitative research. The technique assisted in terms of providing

accessible and organized procedures for generating codes and themes for qualitative data. In the present study, researcher organized comments and responses according to the questions asked in the focus group discussion session. The technique made it possible to identify and organize the emerging themes and sub themes according to challenges and solutions. The following steps suggested by Braun and Clark (2006) were followed to perform thematic analyses:

3.8.1 Familiarization with the Data

Familiarization with the data is very common to all forms of qualitative analysis. Researchers engage themselves in, and become intimately familiar with, their data; reading and re-reading the data and noting any initial analytic observations.

3.8.2 Coding

Coding is also a common element of many approaches to qualitative analysis (Braun & Clarke, 2012) this involves generating brief labels for important features of the data of relevance to the research question guiding the analysis. Coding is not simply a method of data reduction, it is also an analytic process, so codes capture both a semantic and conceptual reading of the data.

3.8.3 Searching for Themes

A theme is a logical and meaningful pattern in the data relevant to the research question. If codes are the bricks and tiles in a brick and tile house, then themes are the walls and roof panels. Searching for themes is a bit like coding to identify similarity in the data. This ‘searching’ is an active process; themes are not hidden in the data waiting to be discovered by the in researcher, rather the researcher constructs themes.

3.8.4 Reviewing Themes

Reviewing of themes involves checking that the themes work in relation to both the coded extracts and the full data set. The researcher reflects on whether the themes tell a convincing and compelling story about the data and begin to define the nature of each individual theme, and the relationship between the themes

3.8.5 Defining and naming themes

Requires the researcher to conduct and write a detailed analysis of each theme, identifying the 'essence' of each theme and constructing a concise, effective, and informative name for each theme.

3.8.6 Writing up the Themes

Writing is an integral element of the analytic process in TA (and most qualitative research). Writing-up involves weaving together the analytic narrative and (vivid) data extracts to tell the reader a coherent and persuasive story about the data, and contextualizing it in relation to existing literature

3.9 Ethical Consideration of Research

Research ethics are compulsory for research because human beings are involved in it. It is statutory right of participants to get protection of their privacy. The researcher was very careful in this connection to follow the research ethics. Firstly, an authority letter was obtained from the International Islamic University, Islamabad to conduct focus group discussion at Research Library and to note views and suggestions of the expert Mathematics teachers. All participants were informed about the objectives of the research. Participants of this study were assured not to use their given information for any other purpose.

3.10 Delimitation of Study

This research study was delimited only for subject of Mathematics. The study was limited to Islamabad Model College for boys and Islamabad Model schools situated in the urban area of Islamabad. Date was collected only from Mathematics teachers. Only teachers related factors contributing to students' Mathematics subject performance were investigated.

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

The purpose of the study was to investigate teacher-related factors contributing to student performance in Mathematics. In this chapter data analysis and interpretation are described. A qualitative research approach was used by the researcher to collect the required data. In this study, framework dimensions some of teacher related factors influence the performance of the students in Mathematics are evaluated. For this purpose, focus group discussions (FGDs) method was used for data collection. Since the role of science teacher is very crucial in the development of Mathematics subject so the researcher decided to collect the required data from Mathematics teachers by conducting a focus group discussion session. Focus group discussion method is preferred than other methods of data collection because it is valuable for obtaining data in depth understanding of the various interpretations of a particular problem of the research participants.

In the present study focus group discussion (FGD) method was used for data collection. For this purpose, nine teachers of Mathematics were selected from Islamabad Model College for Boys (IMCB) and Islamabad Model School for Boys (IMSB). Mathematics teachers were selected based on their qualification, teaching experience and practical examiner experience. Teacher having such characteristics and qualities were the most appropriate for this research. In this study researcher was interviewer whereas the mathematics teachers were interviewee, and they described their views and suggestions. By applied coding repetitions to create key protection and

bio-diversity ideas covered in such type of study as illustrated by Chrmaz (2006). For easy referring all participants were allotted a code. The researcher assigned a unique code on the views of the teachers' participants for the protection of their identity. These codes were consisting of numeric numbers and alphabetic. The allotted alphabets codes were as A.B.C-P-Q. Where A.B.C stands for their institute name, where (P) stands for participant individual code and (Q) stands for question number.

Question1. What are your views about subject knowledge of Mathematics teachers?

Views of teacher H.B.C-A-1

In all the teaching learning process, the teacher is the pivot who plays a key role in education process. It has been observed that in most of the cases teachers have insufficient knowledge of Mathematics subject. Behind this there are so many reasons are hidden. Foremost reason is the shortage of teachers due to which shortage; Mathematics classes are assigned to teachers of other subjects. These teachers have insufficient knowledge about Mathematics subject. As a result, the performance of the students affected badly and cause to lack of interest in this subject. Secondly if we talk about regular teachers who teaches Mathematics subject at secondary school level, amongst all only one or two have prior subject knowledge and rest of the teachers have no subject knowledge. They do not try to grow up and develop their subject knowledge. Based on insufficient subject knowledge, they teach to students without confidence and lack of interest due to which overall subject performance affects.

Views of teacher H.G.C-B-1

The role of teacher is very essential in the teaching learning process as they have framed the mental structure of the growing students. He is supposed to do

coaching the minds of youngsters and make them some valuable assets of country. Mostly teachers have unsatisfactory subject knowledge. They are conceptually not very strong. They have no prior subject knowledge and planning to teach their students. To overcome the situation of their subject knowledge deficiencies they use subject guides and key books for self-understanding and after do some practice they are unable to teach Mathematics in proper way. This is because of after getting job especially in government sector teachers become lazy, and they do not make many efforts to enhance their capabilities and subject knowledge. They think that if they do work hard to improve their subject knowledge, no extra benefits or incentives will be given to them. In this way with the passage of time their subject knowledge become weak. This unsatisfactory performance of teacher is directly affected overall subject performance of the students as well.

Views of teacher S.B.C-C-1

In advance countries the most talented potential of the society is encouraged to adopt the profession of teaching. However, in Pakistan almost every educated person intends to choose other professions rather than teaching. A well-qualified personalities have their priority to choose central superior services and some of them gain profession qualification like doctor, engineer, pilot, armed forces officer but unfortunately teaching profession is not their priority to choose. Mostly teachers have inadequate subject knowledge. They taught only selective syllabus in the class and appreciate the students for memorization of questions or memorize the steps of solution of problems in Mathematics without any understanding. Due to this practice of the teacher the performance of the students affecting. I think the reason for this unsatisfactory subject knowledge is that at secondary level a teacher teaches multiple subjects at a time. Due

to this fact, they cannot concentrate on a particular subject and even then, they do not have sufficient subject knowledge.

Views of teacher S.G.C-D-1

Being a Mathematics teacher, I am absolutely agreeing with the fact that mostly Mathematics teachers have insufficient subject knowledge. In their mind teaching learning process is a job just like other jobs the people do. They do not consider it pious profession. They do not try to enhance their subjective ability. They have no command on subject knowledge. These kind of practices on the behalf of the teachers are the main causes to produce lack of interest, laziness in Mathematics amongst the students. As a result, the performance of the students suffers badly. Only a few students can obtain good score in examination.

Views of teacher M.B.C-E-1

It has been observed that memorization of important questions and Mathematics numerical are common in our education system at secondary school level. After completion of Mathematics exercise our teacher marked some important questions to memorize and do practice for final examination. Their effort is to communicate a short cut way to study and do selective study only. The main aim of the teachers is to pass the subject and promote to next grade. They do not try to learn them conceptual study. Eventually, our teachers are conceptually not very strong. They have got their degrees by rote way and believe on it. Then they choose the field of teaching so that's why they have lack of subject knowledge. Such kind of practices of the teachers affect the performance of students academically.

Views of teacher G.S.B-F-1

In teacher education, two important factors are input factors and process factors in the perception of senior teachers, input factors are resources, teachers, and community. The process factors are associated with proper collaboration among the students and teacher's activities, but it is regretted to say that in our classroom's teachers have not enough subject knowledge and they use conventional way of teaching and provide to student helping material in the shape of notes. I have often observed that teachers teaching Mathematics have insufficient knowledge. Before going into class, they memorize questions and note some hints on a paper to deliver the same to the students.

Views of teacher G.S.G-G-1

Teachers don't put efforts to improve their knowledge. They taught selective syllabus in classes. They restrict themselves on limited syllabus to study. By the usage of this practice constantly throughout the year their subject knowledge become weak instead of improved.

Views of teacher P.C.B-H-1.

I believe that teachers of Mathematics need improvement in their subject knowledge. How a teacher without understanding of Mathematics can develop understanding of Mathematics amongst the students.? Without sufficient subject knowledge a Mathematics teacher cannot be perform effectively.

Views of Teacher P.C.B.I.1

The Subject knowledge is always considering key to effective teaching. Teacher's training includes three fields in which the training of subject knowledge keeps on priority basis by the educationist. Our teachers teaching Mathematics subject

have insufficient knowledge about Mathematics that how to teach it. Due to lack of knowledge sometimes teacher take official job try to complete during in Mathematics period. They loudly inform to students that he is doing an urgent piece of work. They depute a class monitor to ask some question to students, give them numerical work to solve form home. This practice of the teacher is only due to the lack of interest and subject knowledge.

Question 2. What are your suggestions about subject knowledge of teachers?

Teacher's Suggestions H.B.C-A-2

I suggest that availability of sufficient teachers must be ensured. Government should fill the vacant vacancies of teachers without any delay. So that teachers of one subject must not be deployed for teaching of another subject.

Teacher's Suggestions H.G.C-B-2

I suggest that there should be a proper monitoring system to check whether a teacher is teaching properly or not. It is also responsibility of the head of school to keep check and balance on the academic activities of the teacher whether is he able to teach? or otherwise.

Teacher's Suggestions S.B.C-C-2

A teacher should teach only that subject in which he has sufficient knowledge and expertise otherwise he may lose his level of confidence. He should avoid teaching irrelevant subject in which teacher has not how now.

Teacher's Suggestions S.G.C-D-2

Teacher should be given subject knowledge through special designed courses. This practice should be continued in the whole academic year. In this way improvement of subject knowledge may be enhanced amongst the teachers.

Teacher's Suggestions M.B.C-E-2

New teacher training programs must be introduced to enhance the capabilities and subject knowledge of Mathematics teachers. In this technology world it is the need of the time because now the world has become the global village. Due to availability of internet all kinds of information are available.

Teacher's Suggestions G.S.B-F-2

Competent teachers always apply deep and integrated sets of knowledge. I suggest that a teacher should teach only those subjects in which he has sufficient knowledge. The teacher should select such course to teach in classroom which he has been teaching from many years.

Teacher's Suggestions G.S.G-G-2

Teacher should have taught only those subject in which he has sufficient knowledge. Teacher should select those subjects in which he has full command and confidence, having proper teaching plan. In those subjects he has enrich, deep understanding and update his knowledge on regular basis, having these characteristics of teacher may have enhanced the performance of the students.

Teacher's Suggestions P.C.B-H-2

I suggest that refresher courses must be introduced, and a teacher may be given a chance to attend the trainings. Moreover, he should prepare two-dimension chart, the

first side of chart should refer the names of the course which he has to be taught and other side of the chart should have various topics of the course.

Teacher's Suggestions P.C.B.I.2

I suggest that teacher should take interest to improve his subject knowledge. He must try to read books, research papers, articles to improve subject knowledge.

Objective 3. To describe influence of teachers' subject knowledge and assessment practice on performance of Mathematics' students at secondary school level

4.1 Table of Emergent Theme 1

Research Question	Respondent' views & Suggestions	Emerging Themes
1.How does teachers' subject knowledge influence the performance of Mathematics secondary school level?	HBCA-1, HGCB-1 SBCC-1, SGCD-1 MBCE-1, GSBF-1 GSGG-1, PCBH-1 PCBI-1	Insufficient Knowledge Conceptually not strong at Focus on selective study
	HBCA-2, HGCB-2 SBCC2, SGCD-2 MBCE-2, GSBF-2 GSGG-2, PCBH-2 PCBI-2	needs to improve subject knowledge

Conclusion

Teacher's subject knowledge affects the performance of Mathematics students. Mathematical concepts of the teachers are not very clear. They do not have Mathematical skills. As a result, they cannot teach Mathematics subject at secondary level very efficiently and effectively

Question3. What are you views about teaching methodologies used by Mathematics teachers in the class?

Views of teacher H.B.C-A-3

I am not satisfied with the teaching methodologies used by teachers in the classes. Mostly teachers used conventional lecture method. The teachers fill the board and students' just take notes from it. Students are not appreciated for asking questions.

Views of teacher H.G.C-B-3

Teachers mostly used lecture method is the classroom. They totally depend on it. They have no diversity in their teaching methodology. Students are encouraged for memorization and discouraged for questioning. In my view it is not suitable to always use lecture method. There should be adopted a proper teaching methodology which covers all aspects of the teaching learning process.

Views of teacher S.B.C-C-3

I am not satisfied with teaching practices carried out by Mathematics teachers in the classes. Mathematics is subject of understanding. Proper and effective teaching methodology matters a lot. Unfortunately, teachers do not use suitable method which is according to demands and need of the time. Mostly black board teaching is carried out in the classes. In many cases teachers take written hints to them in the class.

Views of teacher S.G.C-D-3

A teacher should use multiple teaching strategies and methods in the class depending upon need and demand of topic and students. Unfortunately, in our classes' situation is quite different. A teacher memorized some questions then just solves them on board and directed to students to note and memorize them.

Views of teacher M.B.C-E-3

Teachers use inappropriate methodologies. Mathematics is taught orally. They appreciated to students for memorization and. They do not support to students for questioning or discussion about it.

Views of teacher G.S.B-F-3

Teaching methodologies are very important part of learning process. Without appropriate and effective teaching methodology learning outcomes cannot be achieved. In our country teachers use only that method in which fewer efforts are required and that make their work easy. I suggest that teachers should prefer that teaching method which develops better understanding among the students.

Views of teacher G.S.G-G-3

Effective teaching of Mathematics is not possible without appropriate teaching method. Mathematics teachers need to be provided training. Such way their skill may be improve they will be able to show outstanding performance. Presently they are so many shortcomings in their method of teaching.

Views of teacher P.C.B-H-3

Mathematics is not name of just memorization of some formulae. It is based on understanding of many concepts**.** For proper understanding of Mathematics appropriate teaching method is very important. I am also agreeing with the fact that our Mathematics teachers are methodologically not very strong.

Views of Teacher P.C.B.I.3

To meet the academic challenges of secondary school students, it is mandatory for teachers to prepare themselves in well manners by using their own abilities to

understand and face the new challenges. A teacher understands that what a level of understanding of his student is in the classroom. In the classroom feedback or responses of student are very important for a teacher, these responses are helpful to improve the teaching methodology of a teacher.

Question4. What are your suggestions about teaching methodologies used by Mathematics teachers?

Teacher's Suggestions H.B.C-A-4

I suggest that teachers should be properly trained. They must be aware with modern teaching methodologies. There should be opportunities for teachers that in service training the gets the whole range of activities on which they can extend their professional education, competence, and principles.

Teacher's Suggestions H.G.C-B-4

I suggest that teachers must be introduced with new teaching methodologies. This can be achieved by introducing new teacher training courses. Mainly there are four categories into which teaching methods can be divided namely teacher directed methods, students directed methods, interactive method as well as problem solving methods. Teacher should be aware to teach by apply all these teaching methods.

Teacher's Suggestions S.B.C-C-4

I suggest our Mathematics teachers should be well equipped with Information Technology and multimedia. Our Mathematics teachers are still having a stick and a black board. We cannot achieve the goals whenever a proper Mathematics teaching cannot be possible with modern technologies.

Teacher's Suggestions S.G.C-D-4

I suggest quality of teacher training is not very well. There is no encouragement for teachers. It is just passing of the time. New and advanced teacher training courses must be designed according to new challenges.

Teacher's Suggestions M.B.C-E-4

I believe that quality of our teaching training is not very rich, it is needs to be improved gradually. Low quality of education badly affects the performance of the individuals and impact on overall performance of the students.

Teacher's Suggestions G.S.B-F-4

I am also agreed with the fact that the quality of our teaching training is not good. Teacher is considering an important agent of bringing appropriate change in the behavior of students. Mathematics teacher should be well qualified and trained and knows that how to deliver his knowledge to next generation with devotion and full of enthusiasm. Teacher should be ensured that he has capabilities.

Teacher's Suggestions G.S.G-G-4

Role of a teacher in the classroom is like a gardener in a garden who attends each plant, watered each plant, and examine all the plant leaves and flowers. Similarly, teachers should be guided and trained accordingly.

Teacher's Suggestions P.C.B-H-4

I suggest that Ministry of Education and Professional Development, Government of Pakistan may concentrate on personal and professional development of teacher.

Teacher's Suggestions P.C.B.I.4

I suggest that teacher should be adopt teaching methodology according to psychology of the students and accordance with their level of understandings.

Objective 2. To examine the influence of teaching methodology on the performance of Mathematics students at secondary school level.

4.2 Table of Emergent Theme 2

Research Question	Respondent views & Suggestion	Emerging Themes
Q2. What is the impact of teaching methodology on the performance of Mathematics students at secondary school level?	HBCA-3, HGCB-3 SBCC-3, SGCD-3 MBCE-3, GSBF-3 GSGG-3, PCBH33 PCBI-3.	traditional methodology in appropriate method pedagogically not strong
	HBCA-4, HGCB4 SBCC-4, SGCD-4 MBCE-4, GSBF4 GSGG-4, PCBH4 PCBI-4.	Required multi strategies Refresher course are required for teachers

Conclusion

Mathematics teachers are pedagogically not very strong. In this technological world they are using traditional methods of teaching. Mostly use lecture method to teach their students and they do not allow to students for questioning in the classroom.

Question 5. What are your views about assessment practices for Mathematics?

Views of teacher H.B.C-A-5

I am not satisfied with assessment practices carried out by Mathematics teachers at secondary level. Teachers assess only memory of students. Mostly assessment is carried out by paper and pencil test.

Views of teacher H.G.C-B-5

Assessment of Mathematics students at secondary level is unsatisfactory. Such unsatisfactorily assessed performance of the students at secondary level do not perform well. Questions are frequently repeated in examination especially in board examinations. Students prepared only selective syllabus in examinations and got passing marks.

Views of teacher S.B.C-C-5

Only lower order learning is assessed. No focus is given for higher order thinking skills. Analysis of board papers have revealed that only lower order thinking of students is assessed.

Views of teacher S.G.C-D-5

Assessment is very important part of learning process but unfortunately it is facing many issues and challenges in our country**.** Teachers should be trained for better and effective assessment.

Views of teacher M.B.C-E-5

Assessment plays very important role in learning process. Assessment help teachers to select appropriate method for teaching and make his/her teaching more affective. Unfortunately, in our country teachers do not use appropriate assessment techniques**.** The assessments made by our teachers are not authentic.

Views of teacher G.S.B-F-5

I am not satisfied with assessment practices carried by our Mathematics teachers at secondary level. It is often observed that teachers cancelled a question and award no marks if it is solved by some other method rather than the recommended method by them.

Views of teacher G.S.G-G-5

Without proper assessment system a quality teaching of Mathematics is not possible to improve and bring betterment in it. There are many issues with assessment practices carried out by Mathematics teachers at secondary level in Pakistan**.**

Views of teacher P.C.B-H-5

Assessment of Mathematics teachers at secondary level is very unsatisfactory. it is based on memorization.

Views of Teacher P.C.B.I.5

Assessment is the process of collecting information by using the various sources to build up an understanding of what students realize, know and what they can perform on the behalf of their educational experiences. In our school system due to many of reasons assessment system exists but not properly follow to achieve the fruitful results.

Question6. What are your suggestions about assessment practices used by Mathematics teachers?

Teacher's Suggestions H.B.C-A-6.

I believe that our teachers are not properly trained. From last 4 years Federal Board is conducting a training program for examiners to enhance their assessment capabilities. But these efforts are not enough.

Teacher's Suggestions H.G.C-B-6

No efforts have been made to handle this issue. I suggest that reform should be made in curriculum to address this issue properly.

Teacher's Suggestions S.B.C-C-6

I suggest that our teachers should be properly trained. A schedule assessment process may create interest of learning amongst the students. Fear of assessment is helpful for students to motivate them for subject preparation. Teacher should try to conduct assessment tests, quizzes, white board numerical practice of students and topic discussion.

Teacher's Suggestions S.G.C-D-6

I suggest that the problem is with our teacher training. New advance and affective teaching courses must be introduced, and teachers must be trained properly and affectively.

Teacher's Suggestions M.B.C-E-6

Assessment is an essential part of teaching learning method. Quality education cannot be delivered to students without proper assessment. Our teachers do not properly assess students. I suggest that they should be properly trained.

Teacher's Suggestions G.S.B-F-6

I suggest that the quality of our teachers training is not good. Quality of teacher's training must be improved.

Teacher's Suggestions G.S.G-G-6

I suggest that student-teacher ratio must be focus, our classes are very populated. It is not possible for teachers to assess huge number of students in limited time. Teachers should be equipped with modern technologies.

Teacher's Suggestions P.C.B-H-6

Teachers should be trained and equipped with technology in the present technological era.

Teacher's Suggestions P.C.B.I.6

With the passage of time, it has been proved that assessment is mandatory to observe the capability and educational level of students. I suggest that assessment should be on regular basis. As per need, teacher should observe the assessment process and prepare a schedule of assessment practices.

Objective 3. To describe influence of teachers' subject knowledge and assessment practice on performance of Mathematics' students at secondary school level

4.3 Table of Emergent Themes 3

Research Question	**Respondent views & Suggestion**	**Emerging Themes**
Q3. Do the teachers assessment Practice effects the performance Of Mathematics students at secondary school level?	HBCA-5, HGCB-5 SBCC-5, SGCD-5 MBCE-5, GSBF-5 GSGG-5,PCBH-5 PCBI-5.	Not properly assessment Focus on lower order thinking skills Assess only students memory
	HBCA-6, HGCB-6 SBCC-6, SGCD-6 SGCD6, MBCE-6 GSBF-6, GSGG-6 PCBH-6, PCBH-6 PCB1-6	for proper assessment teachers' training is mandatory

Conclusion

Teachers do not assess performance of students in Mathematics at secondary level effectively. Main emphasis of assessment is only on memorization. Even in board examination memorization of students is tested. Focus of assessment is lower order thinking skills, and no concentration is given to higher order thinking skills.

Question7. What are your views about professional attitude of Mathematics teachers at secondary level?

Views of teacher H.B.C-A-7

Attitude is the tendency of an individual to respond it positively or negatively. The teacher's professional attitude towards teaching of Mathematics is related to success in classroom. Our teachers are not putting their full efforts in classes. They just fulfill the formalities.

Views of teacher H.G.C-B-7

I am not satisfied with attitude of Mathematics teachers at secondary level. Instead of any lesson planning, teachers ask to their students which exercise we must solve today? Teachers take books from students. If teacher have no chalk or board marker, he will teach orally without any hesitation.

Views of teacher S.B.C-C-7

I believe there is no issue with attitude of Mathematics teachers at secondary level.

Views of teacher S.G.C-D-7

In many cases teachers do not take inter in teaching by warmly. They are less motivated to students.

Views of teacher M.B.C-E-7

In many cases I have observed very casual attitude of teachers. They go in classes without any preparation and do not put their full efforts for teaching.

Views of teacher G.S.B-F-7

I feel them unmotivated. They teach without any energy and enthusiasm. Teachers don't appreciate students for questioning. They force students to keep silence in class and fallow recipe of teacher.

Views of teacher G.S.G-G-7

Teachers don't show very positive attitude in the class. They teach only few brilliant students. They don't focus on weak and back benchers. They believe that maintenance of silence in the classroom is their main responsibility.

Views of teacher P.C.B-H-8

Teachers just solve some memorized questions on the board. They don't allow students to talk about their queries. Mostly go to class without any preparedness, without any lesson planning, they take book and marker from students, waste most of the time in telling stories to the students or talking about administrations of the institute.

Views of Teacher P.C.B.I.7

Th professional attitude of the teachers on the way to teaching is an essential variable. I think the basic characteristic of a good teacher is capacity to create a pleasant environment in the classroom. The positive attitude of the teacher can bring positive

change in the classroom. But unfortunately, it has been observed that the professional attitude of the teachers to students is not very admirable.

Question 8. What are your suggestions about professional attitude of Mathematics teachers at secondary level?

Teacher's Suggestions H.B.C-A-8

Our teacher's professional attitude is not very appreciating. I suggest they should be amended. Teachers should be given increment because of their good performance.

Teacher's Suggestions H.G.C-B-8

I suggest that there must be a proper penalty and reward system. Having continuously unsatisfactory performance of teachers must be reminded to improve and those having good performance must be rewarded. This practice will be helpful to motivate the teachers.

Teacher's Suggestions S.B.C-C-8

I suggest that there should be a proper monitoring system this will have a positive effect on teacher's attitude.

Teacher's Suggestions S.G.C-D-8

The believe that lack of proper training, large class size, extra workload and attitude of principle are the different causes for such kind of attitude of the teachers. I suggest that these issues should be addressed to bring positive changed in attitude of teachers.

Teacher's Suggestions M.B.C-E-8

I suggest teachers should be given incentives for their hard work.

Teacher's Suggestions H.B.C.F-8

There must be a proper check and balance system.

Teacher's Suggestions G.S.G-G-8

Teachers must be appreciated for their good performance. They must be given extra increments and promotions on their good performance. This will be motivated for them and then they will try to perform well and put more efforts.

Teacher's Suggestions P.C.B-H-8

School headmaster should appreciate teachers for their efforts.

Teacher's Suggestions P.C.B..I-8

Professional attitude plays a significance role in teaching learning process. It is suggested that if teacher shows negative attitude and beliefs to his pupils in the classroom, it directly effects on students learning. Such way academic performance of students will be affected badly. They will show unsatisfactory result as an individually as well as collectively. So, there is dire need to develop professional attitude of the teachers. In this regard it is suggested that school administration with the approval of department may arrange lectures of motivational speaker according to their need. These lectures of motivational speakers may bring change in the professional attitude of the teachers.

Objective 4. To identify the effect of teachers' professional attitude on the performance of Mathematics' students at secondary school level

4.4 Table of Emergent Themes 4

Research Questions	Respondent views & Suggestions	Emerging Themes
Q3. Does professional attitude of the teacher influence the performance of Mathematics students at secondary school level?	HBCA-7, HGCB-7 SBCC-7, SGCD-7 MBCE-7, GSBF-7 GSGG-7, PCBH-7 PCBI-7	Profession Attitude does matter Students are not allowed to ask question freely
	HBCA-8, HGCB-8 SBCC-8, SGCD-8 MBCE-8, HBCF-8 GSGG-8, PCBH-8 PCBI8,	Attitude needs to be amended

Conclusion

Mathematics teachers are not motivated. They do not put their full efforts and attentions for teaching of Mathematics due to deficiency of their profession attitude. They teach very casually. It is often observing that teacher go in the class without preparation and ask to student what he must teach today.

Q.9 what are your views about professional training of Mathematics teachers at secondary level?

Views of teacher H.B.C-A-9

The quality of teachers training is very not as per requirement. It needs to be improved. Our Mathematics teachers are not familiar with multimedia, Wi-Fi, and

projectors. They use conventional black board methods which does not fulfill the demands of Mathematics teaching.

Views of teacher H.G.C-B-9

I am not satisfied with teacher training. They are not according to the needs of the time.

Views of teacher S.B.C-C-9

Our teacher training courses are not according to the need of time. There are very few teachers' training institutes. I suggest that new teacher's training courses must be introduced.

Views of teacher S.G.C-D-9

I totally agree with the fact that our teacher training courses are not fruitful and needs to be improved.

Views of teacher M.B.C-E-9

I believe that our teacher training is not very effective. They are not according to the needs of time.

Views of teacher G.S.B-F-9

Teachers training courses are outdated. Number of teaching training institutes are insufficient.

Views of teacher G.S.G-G-9

Teachers training courses are needs to be modified. These courses are not full fill the requirement of the present era.

Views of teacher P.C.B-H-9.

I am not satisfied with teachers' training. We need improvement in teacher training and teacher training programs.

Views of Teacher P.C.B.I.9

The process of teachers training may help to fill the gaps between modern methodology and traditional way of teaching. Hence, I think that in service teachers training are very essential to improve their skills.

Question10. What are your suggestions about professional training of Mathematics teachers at secondary level?

Teacher's Suggestions H.B.C-A-10

I suggest that we need to conduct advance teacher training courses which are on technology based and covered information technology.

Teacher's Suggestions H.G.C-B-10

I suggest that more teacher training institutes should be established.

Teacher's Suggestions S.B.C-C-10

I suggest that new teacher training courses should be designed.

Teacher's Suggestions S.G.C-D-10

I am also agreed with the fact that new teacher training courses should be introduced. Present teacher training courses have no link with modern technology which is a great drawback.

Teacher's Suggestions M.B.C-E-10

Teacher training courses are needs to improve. Present courses module for teachers training programs are outdated and not technology based.

Teacher's Suggestions G.S.B-F-10

I have observed that teachers' training for teaching of Mathematics is not very effective. It needs upgrading. Curriculum for teacher's training courses must be upgraded.

Teacher's Suggestions G.S.G-G-10

New teacher training courses must be introduced. New teacher training courses must include training of computer and internet. Present courses are not according to the demands and needs of the time.

Teacher's Suggestions P.C.B-H-.10

I suggest that we should train our teacher to use science and technology for teaching of Mathematics.

Teacher's Suggestions P.C.B.I.10

A trained teacher is familiar with students learning phase and concerned with new knowledge which may contribute to improving teaching learning process. A very famous saying that teachers are born not made has been reversed on the behalf of the latest technology and in service teaching trainings.

Objective 5. To determine the effect of teachers professional training on the performance of Mathematics' students at secondary school level.

4.5 Table of Emergent Themes 5

Research Questions	Respondent views & Suggestion	Emerging Themes
Q3. Do the teachers professional training effect the performance of Mathematics students at secondary school level?	HBCA-9, HGCB-9 SBCC-9, SGCD-9 MBCE-9, GSBF-9 GSGG-9, PCBH-9 PCBI-9.	Teacher's trainings are not very advance
	HBCA-10, HGCB-10 SBCC10, SGCD-10 MBCE-10, GSBF-10 GSGG-10, PCBH-10 PCBI-10.	Required advance level training programs

Conclusion

At the government sector there is very less chances for teachers to avail the facility of teachers training program especially those teachers who are living in rural areas. Selection of teachers for training is also a complicated procedure.

CHAPTER 5

SUMMARY, FINDINGS, DISCUSSIONS CONCLUSION AND RECOMMENDATIONS

5.1 Summary of the Study

Mathematics is one of the most important subjects in our life and it is called the mother of all sciences. It is equally important in all subjects. It is involved in Physics, Chemistry, Biology and Computer Sciences. It plays a role of nucleus in science and technology. Mathematics is considered as a foundation of science in education. Now days its importance is globally accepted. All the developed countries have a quality teaching of Mathematics. Pakistan is a developing country, and it is essential for it to maintain and focus on quality teaching of Mathematics. There is a perception that teaching of Mathematics in Pakistan is facing many problems and challenges. The present study was designed to investigate teacher-related factors influencing students Mathematics performance. The study was based on these following objectives: -

1) To explore teacher-related factors contributing to students' performance in Mathematics at secondary school level.

2) To examine the influence of teaching methodology on the performance of Mathematics students at secondary school level.

3) To describe influence of teachers' subject knowledge and assessment practice on performance of Mathematics' students at secondary school level.

4) To identify the effect of teachers' professional attitude' on the performance of Mathematics students at secondary school level.

5) To determine the effect of teachers' professional Training on the performance of Mathematics students at secondary school level.

The population of this research were Mathematics' teachers from Islamabad Model College for Boys and Islamabad Model schools for boys. There were 28 secondary schools situated in the urban area of Islamabad. These 28 secondary schools are in the main sectors of the capital city. In all these schools 84 Mathematics teachers were teaching Mathematics on regular basis. From these 28 boy's secondary schools' data was collected through purposive sampling technique by using focus group discussion method. For this purpose, 09 Mathematics teachers were selected as a sample of this study. As Mathematics teachers were leading on driving seat by teaching of Mathematics subject in the learning process so it was decided to collect the data from them through focus group discussion method. From the previous research, students' papers, research articles, documents and educational policies were studied thoroughly in depth to investigate about the topic. In the light of several studies, keeping in viewpoint of objectives of this research, a focus group discussion guide was developed. In this study, validity of group discussion guide was developed with the help of experts. For its reliability, pilot testing was made. Some minor changes were made in this focus group discussion guide based on results of the pilot testing. The Focus Group Discussion was held at Research Library, Dawah Academy, Faisal Mosque, International Islamic University, Islamabad (old campus). An approval granted letter to conduct focus group discussion is attached at (**Annexure-H).** Obtained data was examined by using the thematic analysis procedure. According to findings of the data, teacher's subject knowledge, teaching methodology,

assessment practices, professional attitude and professional trainings affects the performance of Mathematics students at secondary school level.

5.2 Findings

1. According to the conclusions of the data, teacher's subject knowledge affects the performance of Mathematics students at secondary school level. Majority of in-service teachers are not very rich in subject knowledge and teaching skills. They are not teaching Mathematics subject at secondary level very efficiently and effectively ways because of this, students shown an unsatisfactory performance in Mathematics at secondary school level. Shortage of Mathematics teachers, schools and lack of monitoring policy and un-motivational attitude of the teachers are the major causes of this unsatisfactory subject knowledge of the teachers.

2. In service Mathematics teachers are not very strong academically. In this technological world they use simple lecture method to teach their students and they do not allow to students for questioning in the classroom. Even then any kind of discussion about solution of the problems in Mathematics is not allowed in the classroom. As a result, students do not take participation in learning of Mathematics, just they wait to over the period. Teachers have no resources to equipped with modern technologies, they used traditional methods in teaching learning process. Only tool of teaching they have is board marker in the classroom. Mostly teachers appreciated their students for memorization. Only selective syllabus is being taught in the classes as per directions of the board. Similarly, questions are frequently repeated in the annual board of intermediate and secondary educations examination. As a result, all over the year teachers concentrate and give directions to their students only to do preparation for selective study for final examination for the sake of obtain good score in

examination. No creative activity initiated by the teacher in the classroom. Due to unavailability of required resources teachers do not have any facility of Wi-Fi, internet and multimedia or any other device in the classroom to be used during learning process. Rottenly teachers use keys and guidebooks for their understanding to enable them to solve the numerical problems on the white board. Even though, they also recommended the same key books for their students to solve the left-over algebraic expressions, trigonometric, geometric problems and other numerical. Students follow the directions and use key book not only in classroom but also at home, even then they copy their homework from it. Mostly teachers take textbook and solve the question on white board, likewise they talk with blackboard and do not have an eye contact to their students in the classroom. Such kind of teachers practices in classroom create boring environment among all the student and make them lazy and dull. Teachers do not care for diversity. Students' personal needs, academic concentration and requirements are not important for them.

3. In service Mathematics teachers do not assess the performance of the students in Mathematics at secondary level effectively. Main emphasis of assessment is only on memorization. Even in board examination memorization of students is tested. Focus of assessment is lower order thinking skills, and no concentration is given to higher order thinking skills. Mostly teachers taught selective syllabus of Mathematics and do not follow the standards of curriculum. Such way students are no need to hard work, feel comfortable, so they appreciated this kind of act from teacher side. Understanding have no place in assessment. During the evaluation answer sheet or monthly test, class teacher crosses the solution of the problem and give less marks or zero marks if it is not according to the method used by them as proposed by the teachers.

4. In service Mathematics teachers are not much motivated. They do not put their full efforts and attentions for teaching of Mathematics. They teach very casually. It is often observed that teachers go in the classroom without preparation and ask to students what he has to teach today? Even he takes book and marker from the students to deliver a lecture without any lesson planning and preparedness. Teachers teaches without energetically and lack of confidence. They just solve the question on the board and ask student to solve them. Even then they solve (2 to 3) questions from an exercise, left over and handed over to students to solve from the home. They are not allowed to ask questions regarding this. Even they depreciated to students for questioning and asking about steps of the expressions. Teachers waste most of their time to tell the stories to their students, even discuss political and current issues in the classroom. In many cases teachers engage students in different activities to pass the time.

5. At Government level there is less chances for in service teachers to avail the facility of teachers training programs especially those teachers who are living in rural areas. Selection of teachers for training is also a complicated procedure. The standard of teacher training for Mathematics teacher is not very good. Teacher training courses are outdated. They have no link with science and technology. These courses are unable to train our teachers effectively. Curriculum of teachers training courses does not full fill the demands of present era. These teachers training courses are not very effective. Even though master trainers are not well trained to train the teachers with full of devotion and enthusiasm. Teacher trainings institutes are very fewer in numbers. These are unable to accommodate all the teachers for trainings and due to shortage of mathematics teachers. Moreover, schools are not in the capacity to spare their teachers for refresher courses or any other trainings. Even then, to get approval from the

competent authority to forward the name of teacher for trainings is a complicated procedure.

5.3 Discussion

The findings of the present study indicated that subject knowledge is an important component in education system. In service teachers without subject knowledge cannot teach properly and in well manners. Lack of subject knowledge means lack of understanding. According to Smothers & Robinson (2005) a teacher with less subject knowledge put his students at risk. According to Ball & Mewborn (2001) importance of subject knowledge is beyond questioning. Hibert & Levere (2006) argued that Mathematics should be taught with full of confidence and understanding. Subject knowledge is not only base for understanding but it also gives confidence to teachers. A teacher having subject knowledge, he appreciates his students for questioning. Subject knowledge of teacher is very helpful in developing a conducive environment in the class. Teachers lacking in subject knowledge do not interact so much in the class and mostly deal with white board. There should be an immediate monitoring policy to monitor the teachers whether they are teaching Mathematics in right way or otherwise. The school principal and vice Principal are responsible to monitor but unfortunately, both the administrative posts qualification does not match with Mathematics teachers.

Another finding indicated that teaching methods are basically set of strategies that in service teacher uses in the classroom for smooth transfer of knowledge to students. Teaching methods play a very vital role in achieving learning goals of teaching of Mathematics. Pedagogically weak teachers are like a person who is sitting on driving seat, but he is no perfect in driving. A good teacher is one who uses

appropriate teaching methods in the class. Selection of teaching method is depending upon nature of lesson and nature of learners. The study of Adunola (2011) also supported the findings that it is very important for a teacher that he must be familiar with different teaching strategies. Ayeni (2011) mentioned in his research that during teaching a teacher uses different suitable strategies to bring suitable changes in the behavior of students. According to Hightower et al (2011) effective teaching method is very important in teaching learning process.

Assessment findings of Gulikers et al (2007) defined as an authentic assessment gives a teacher very valuable information. By feedback of assessments a teacher knows where his students are standing. Assessment must be considered an integral part of education. It is not something separated from teaching learning process. Unluckily in Pakistan, standards of assessment are not very worthy (Hilali, 2002). In Pakistan, assessments practices system is weak and limited. Even in board examinations higher order thinking skills are not assessed. These weak standards are affecting the performance of students in Mathematics very badly.

Professional attitude is basically mental state that directs the attitude of a person toward a job or activity. Likes, dislikes, hopes, beliefs and experiences are components of attitude. According to Khalil Ur Rehman (2013) teaching is greatly affect by professional attitude of a teacher. In service teachers with positive professional attitude can teach with more enthusiasm and energy. Teachers with non-professional attitude just pass their time in class and waste the time of students as well. Teachers professional attitude also affect abilities of teachers and it also impact on the students' performance.

In service Teacher's professional development is very important in whole education process at every level. Professional education makes teachers professionally strong. According to Rehmani (2006) teacher's professional education is very important for quality education. Unfortunately, standard of professional education for teachers in Pakistan is not very rich. According to National Education Policy 1998-2010 teacher's education suffers badly, needs to bring improvement in quality and standards. Khan (2011) also criticized that professional development programs introduce for teachers are not capable. He further stated that these programs are nor knowledge based and neither application based.

5.4 Conclusion

In service Mathematics teachers at secondary school level have in-sufficient Mathematics knowledge to teach as per desirability. Without sufficient knowledge of a subject, a teacher cannot improve understanding level of the students.

Mathematics is a subject of logical thinking and understanding. Teachers are needed to teach by applying multi teaching methodologies but unfortunately in service teachers used conventional lecture methods with consist of one-way flow of knowledge. In conventional lecture methods teacher is on driving seat. Students have no opportunities to ask questions. They just blindly follow to his class teacher and copy the material from white board without any understanding. Teachers try to fit all students in same pair of shoes without taking care of their individual needs and requirements.

Assessment is an important element of teaching learning process in any educational system. It helps a teacher to choose an appropriate method of teaching. It also helps the teacher to find where his student is standing. Assessment is very

helpful to find out the gap between target sets and target achieved. Mathematics teachers used in- appropriate assessment practices for assessment of students at secondary school level. They do not assess the learning outcomes. Mostly assessment is done to evaluate the memorization of students even in annual board examinations. Assessment is restricted to lower order thinking; no focus is given for assessment of higher order thinking skills.

In service Mathematics teachers at secondary level are not equipped with modern technologies like internet, Wi-Fi, and multimedia. These modern technologies are very helpful in teaching of science, their role in development of understanding is beyond doubt. Unluckily, in 21st century our Mathematics teachers are stuck with white board, marker, and traditional lecture method to solve the question and directed to students copy it. Conceptual understanding has no place in our Mathematics classroom.

5.5 Recommendations

1. Government may be constituted monitoring committees. These committees may have comprised of experts' Mathematics teachers which may be visited to secondary schools and to investigate that how the teacher is teaching of Mathematics in the classroom. These committees must be implemented proper depreciation and reward system for teachers. If teacher is teaching with devotion and accordingly, he must be awarded with special increments, incentives, or bonus and if he is not doing well, just passing time, he may be reminded in the shape of official letter and way to stop his annual increments and other benefits until improve his performance.

2. New Teachers Training programs may be introduced for in service Mathematics teachers to develop that are compatible with teacher trainings program of modern

developed countries. In service teachers may be trained according to these programs. These programs may have potential to make our teachers pedagogically strong.

3. In service teachers may be made aware of teaching competencies and equipped with modern technologies like multimedia, Wi-Fi, and internet facilities. Teacher may also be trained to use these technologies not for himself but also need of the time to deliver this knowledge to his students as well. School administration may encourage the teachers to use this modern technology and provide them resources in this connection.

4. Government may be appointed Mathematics teachers having the relevant academic qualification and experience. At the other end teachers, who have not relevant qualification and experience avoid engaging their services for the purpose of Mathematics teaching. With the passage of time, to enhance literacy rate in Pakistan, Government may also be arranged to establish new secondary schools. Such way it may be helpful to reduce the burden on existing schools.

5. Time to time Government may be introduced and make arrangement to conduct training courses for in service teachers to improve their professional skills. While on training of new teaching and assessment methodologies they may be trained on regular basis.

6. In service teachers may be oriented with the techniques of measurement and evaluation

5.6 Suggestions

Since the scope of study was limited to Islamabad model college and Islamabad model schools for boys situated in main sectors (urban) area of capital city. It is suggested that similar studies may also be took place to cover greater and large areas.

Hence sample of future research may lead to broad based, and results may be generalized and might be provided the basis for some future planning and to make new policies.

The current study focused only teacher related factors contributing to student's Mathematics performance, but it is suggested that it may be further extended for other subjects of science education like Physics, Chemistry, Biology, and Computer Sciences.

It is suggested that it may be carried out in depth study about other factors rather than teacher related like socio economic factors of students, parents related factors and educational institute related factors as well.

The present study the researcher applied qualitative research approach and used focus group discussion method to collect the data, it is suggested that other researchers may be applied quantitative approach to conduct the study.

5.7 Limitations

Researcher was intended to collect data from school principals, Mathematics students and mathematicians but restrictions of time and resources and as well as pandemic Covid-19 situation in the country could not do so. The population of this study was limited to Islamabad Model College for boys and Islamabad Model School for Boys situated in the main sectors.

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Appendix-A

NATIONAL UNIVERSITY OF MODERN LANGUAGES
FACULTY OF SOCIAL SCIENCES
DEPARTMENT OF EDUCATION

ML.1-4/2020/Edu

Dated: 20-01-2020

To: **Zahid Mehmood Rana,**
1488-MPhil/Edu/S18

Subject: **APPROVAL OF MPHIL THESIS TOPIC AND SUPERVISOR**

1. Reference to Minute Sheet No. ML.1-2/2020-Edu dated 02-1 -2020, the Higher Authority has approved your topic and supervisor/s on the recommendation of Faculty Board of Studies vide its meeting held on 15th Oct 2019.

a. **Supervisor's Name & Designation**
Dr. Khush Bakht Hina,
Assistant Professor, Department of Education
NUML, Islamabad.

b. **Co-Supervisor's Name & Designation**
Ms. Sundus Kashmiri
Lecturer, Department of Education
NUML, Islamabad.

c. **Topic of Thesis**

Investigation of Teacher-Related Factors Contributing to Students' Performance in Mathematics at Secondary School Level

2. You may carry out research on the given topic under the guidance of your Supervisor/s and submit the thesis for further evaluation within the stipulated time. It is to inform you that your thesis should be submitted within the prescribed period by **31st Jan 2021** positively for further necessary action please.

3. As per policy of NUML, all MPhil/PhD theses are to be run through Turnitin by QEC of NUML before being sent for evaluation. The university shall not take any responsibility for high similarity resulting due to thesis prior run by any other individual.

4. Thesis is to be prepared strictly on NUML's format that can be taken from the MPhil & PhD Coordinator, Department of Education.

Telephone No: 051-9265100-110 Ext: 2090
E-mail: mdin@numl.edu.pk

Dr. Hukam Dad Malik
Head,
Department of Education

Cc to:
Dr. Khush Bakht Hina
Ms. Sundus Kashmiri

Appendix-B

List of Islamabad Model Schools for Boys (Urban)

Sr.#	**Institute Name**	**Mobile #**	**Level**
1	Islamabad Model School for Boys(VI-X), G-8/4, Islamabad	0333-5150831	SSC
2	Islamabad Model School for Boys, G-8/1, Islamabad	0301-5191549	SSC
3	Islamabad Model School for Boys (VI-X), I-8/4, Islamabad		SSC
4	Islamabad Model School for Boys (VI-X) No. 2, I-9/4, Islamabad	051-9258122	SSC
5	Islamabad Model School for Boys (VI-X) No. 1, I-9/4, Islamabad.	0333-5121192	SSC
6	Islamabad Model School for Boys (VI-X), F-6/2, Islamabad	923005225351	SSC
7	Islamabad Model School for Boys (VI-X), G-6/4, Islamabad	3335145497	SSC
8	Islamabad Model School for Boys(I-X), I-14, Islamabad	0346-5274693	SSC

9	Islamabad Model School for Boys (VI-X), G-11/2, Islamabad	0302-8182062	SSC
10	Islamabad Model School for Boys (VI-X), F-8/3, Islamabad	0333-5580582	SSC
11	Islamabad Model School for Boys (VI-X), I-10/2, Islamabad	3455233410	SSC
12	Islamabad Model School for Boys(VI-X), G-10/3, Islamabad		SSC

List of Islamabad Model College for Boys (Urban)

Sr.#	Institute Name	Mobile Nos	Level
1	Islamabad Model College for Boys, F-10/3, Islamabad	0300-5109218	BOTH
2	Islamabad Model College for Boys, I-10/1, Islamabad		BOTH
3	Islamabad Model College for Boys, I-8/3, Islamabad	0333-5253021	BOTH
4	Islamabad Model College for Boys, F-11/1, Islamabad		BOTH
5	Islamabad Model College for Boys, F-11/3, Islamabad	0333-5196988	BOTH
6	Islamabad Model College for Boys, G-11/1, Islamabad		BOTH
7	Islamabad Model College for Boys, F-8/4, Islamabad	0333-5622902	BOTH
8	Islamabad Model College for Boys, F-7/3, Islamabad	0344-5510652	BOTH
9	Islamabad Model College for Boys, G-10/4, Islamabad	0333-5134307	BOTH

10	Islamabad Model College for Boys, Street No. 17, I-10/1, Islamabad	0333-5187847	BOTH
11	Islamabad Model College for Boys, G-7/2, Islamabad	0346-5002713	BOTH
12	Islamabad Model College for Boys, G-6/2, Islamabad		BOTH
13	Islamabad Model College for Boys, G-9/4, Islamabad	3345180732	BOTH
14	Islamabad Model College for Boys, H-9, Islamabad		HSSC
15	Islamabad Model College for Boys, F-10/4, Islamabad		HSSC
16	Tanveer Hussain Shaheed Model College for Boys (VI-XII), G-7/4, Islamabad	333514787	SSC

Appendix-C

Following questions were formulated for focus group discussion (FGD)

Subject knowledge	1	What are your views about subject knowledge of mathematics teachers?
	2	What are your suggestions about subject knowledge of teachers?
Teaching methodology	3	What are you views about teaching methodologies use by mathematics teachers in class
	4	What are your suggestions about teaching methodologies used by mathematics teachers?
Assessment practices	5	What are your views about assessment practices for Mathematics?
	6	What are your suggestions about assessment practices used by mathematics teachers?
Professional attitude	7	What are your views about professional attitude of Mathematics teachers at secondary level?
	8	What are your suggestions about professional attitude of mathematics teachers at secondary level?
Professional training	9	What are your views about professional training of Mathematics teachers at secondary level?
	10	What are your suggestions about professional training of mathematics teachers at secondary level?

Appendix-D

Covering Letter of Validity Certificate

INVESTIGATION OF TEACHER-RELATED FACTORS CONTRIBUTING TO STUDENTS' PERFORMANCE IN MATHEMATICS AT SECONDARY LEVEL

Subject: **Request for Validity Certificate**

Respected Sir/Madam,

I have attached my focus group discussion guide developed for the purpose of research titled as "Investigation of Teacher-Related Factors Contributing to Students Performance in Mathematics at Secondary School Level"

Kindly check my focus group discussion guide its content and construction, provide your valuable suggestions for its improvement and certify its validity by filling the certificate attached at the end of the document.

Objectives of the Study

To attain the purpose of the study, the following objectives were developed: -

1) To explore teacher-related factors contributing to students' performance in mathematics at secondary school level.
2) To examine the influence of teaching methodology on the performance of mathematics students at secondary school level.
3) To describe influence of teachers' subject knowledge and assessment practices on the performance of mathematics' students at secondary school level.
4) To identify the effect of teacher's professional attitude' on the performance of the mathematics students at secondary school level.

5) To determine the effect of teachers' professional Training on the performance of the mathematics students at secondary school level.

Research Questions

Keeping in view of review the literature and objectives of the study the following research questions were formulated for this research:

1) How does teachers' subject knowledge influence on the performance of mathematics students at secondary school level?

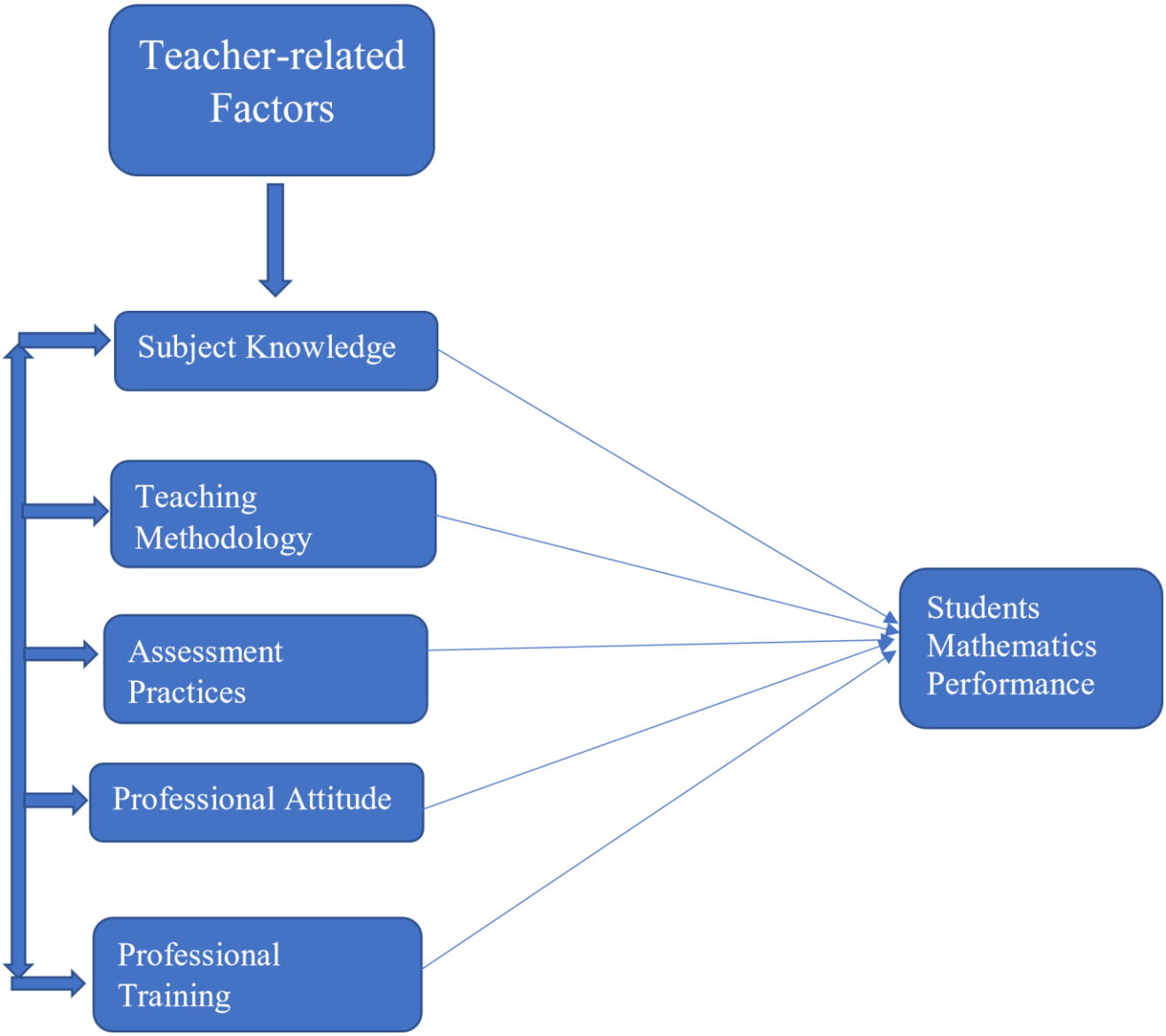
2) What is the impact of teaching methodology on the performance of mathematics students at secondary school level?

3) Do the teachers' assessment practices effect the performance of mathematics students at secondary school level?

4) Does the professional attitude of the teacher influence the performance of mathematics students at secondary school level?

5) Does the teacher professional training effect the performance of mathematics students at secondary school level?

Conceptual Framework



Appendix-E

Certificate for Tool Validation

Investigation of Teacher-related Factors Contributing to Student's Performance in Mathematics at Secondary School Level

Presented by: Zahid Mahmood, M Phil Scholar
Education Department,
National University of Modern Languages, Islamabad

This is to certify that the Focus Group Discussion Guide developed by the scholar towards his thesis has been assessed by me and I find it to have been designed sufficiently to investigate teacher-related factors contributing to students performance in mathematics at secondary school level students .It is considered that the research instruments developed for the research above-titled, is according to the objectives and research questions of the research, assure adequate construct and content validity according to the purpose of the research, and can be used for data collection by the researcher with fair amount of confidence.

Name Ms. Sumaira Kayani

Designation Lecturer

Institutional Name Arid Agriculture University, RWP

Dated 25-03-2021

Appendix-F

Certificate for Tool Validation

Investigation of Teacher-related Factors Contributing to Student's Performance in Mathematics at Secondary School Level

Presented by: Zahid Mahmood, M Phil Scholar
Education Department,
National University of Modern Languages, Islamabad

This is to certify that the Focus Group Discussion Guide developed by the scholar towards his thesis has been assessed by me and I find it to have been designed sufficiently to investigate teacher-related factors contributing to students performance in mathematics at secondary school level students .It is considered that the research instruments developed for the research above-titled, is according to the objectives and research questions of the research, assure adequate construct and content validity according to the purpose of the research, and can be used for data collection by the researcher with fair amount of confidence.

Sumaira

Name Ms Sumaira Batool

Designation Lecturer, MPhil Scholar

Institutional Name International Islamic University, Islamabad.

Dated March 29 2021

Appendix-G

Certificate for Tool Validation

Investigation of Teacher-related Factors Contributing to Student's Performance in Mathematics at Secondary School Level

Presented by: Zahid Mahmood, M Phil Scholar
Education Department,
National University of Modern Languages, Islamabad

This is to certify that the Focus Group Discussion Guide developed by the scholar towards his thesis has been assessed by me and I find it to have been designed sufficiently to investigate teacher-related factors contributing to students performance in mathematics at secondary school level students .It is considered that the research instruments developed for the research above-titled, is according to the objectives and research questions of the research, assure adequate construct and content validity according to the purpose of the research, and can be used for data collection by the researcher with fair amount of confidence.

Name Mr. Salman Khalil

Designation Lecturer, Edu. Department

Institutional Name Allama Iqbal Open University IBD

Dated 07-04-2021

Appendix-H

أكاديمية الدعوة
الجامعة الإسلامية العالمية بإسلام آباد باكستان
Da'wah Academy
International Islamic University
Islamabad, Pakistan

No. DA (IIU) F-37/Lib/2021/
Date: March 18, 2021

TO WHOM IT MAY CONCERN

Mr. Zahid Mahmood S/O Muhammad Ramzan, Mphil Scholar (Education) National University of Modern Languages, Islamabad is allowed on his request to conduct focus group discussion (meeting) of Federal School Teachers at Dawah Research Library, Dawah Academy, Faisal Masjid, Islamabad *in the month* of April, 2021

(Dr.Ata-Ur-Rehman)
Senior Librarian

DR. ATA-UR-REHMAN
Senior Librarian
Dawa Research Library
Faisal Masjid Campus
International Islamic University
Islamabad, 0334-5006717