Effects of Interactive Learning Environment on Students' Motivation in Mathematics at Secondary School Level

By

Saima Afzal

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Saima Afzal

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Submitted By: <u>Saima Afzal</u>   **Registration #:** 701-PhD/Edu/F17
                        Name of Student

<u>DOCTOR OF PHILOSOPHY</u>
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<u>Dr. Quratul Ain Hina</u>   _____
 Name of Supervisor   Signature of Research Supervisor

<u>Prof. Dr. Khalid Sultan</u>   _____
Name of Dean (FSS)   Signature of Dean (FSS)

<u>Maj Gen Shahid Mahmood Kayani HI (M), Retd.</u>   _____
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Registration #   **701-PhD/Edu/F17**

Discipline   **Education**

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Dedicated to

Every challenging work needs self-efforts as well as piece of mind

I dedicate my efforts to;

ALLAH SUBHANAHU WA TA'ALA

And

Last PROPHET MUHAMMAD SALLALLAHU ALAYHI WA SALLAM

Whose blessings enabled me to produce such creative piece of work?

ABSTRACT

Thesis Title: Effects of Interactive Learning Environment on Students' Motivation in Mathematics at Secondary School Level

The major objectives of the study were to explore the practices related to interactive learning environment prevailing at secondary school level, to investigate the level of students' motivation at secondary school level and to measure the effect of Interactive Learning Environment on students' motivation at secondary school level. Interactive learning environment was independent variable while Students' motivation was dependent variable. It has a quantitative research approach and survey method was used to carry out this study. 12810 students of 10th class studying in schools of Federal Directorate of Education Islamabad were the population of the study. Proportionate stratified random sampling technique was used to draw sample. The sample was comprised of 1350 students. Two questionnaires were adapted to collect data i.e. "What is Happening in This Class" and "Motivation Assessment Scale" and were validated by five experts. The overall reliability of the motivation Assessment Scale was .93 and overall reliability of the What Is Happening in the Class was .91. Mean score was used to explore the practices related to interactive learning environment. Students' score was used to investigate the level of students' motivation. Regression was used to measure the effect of Interactive Learning Environment on students' motivation. Due to time and resource constraints study was delimited to only mathematics course of 10th class students studying in public secondary schools working under federal directorate of education. On the basis of findings task orientation was found most prevailing practice while students' involvement was found the least prevailing practice in mathematics classrooms. It was concluded that Interactive Learning Environment had great influence on the students' motivation, therefore it is recommended that schools may provide the learners such classroom learning environment which enhance their level of motivation. As cooperation among students' greatly affected the students' motivation while learning mathematics therefore teachers may make efforts to promote cooperation among students.

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LIST OF ABBREVIATIONS

Abbreviation	Terms
ILE	Interactive Learning Environment
MAS	Motivation Assessment Scale
WIHIC	What Is Happening In This Class
LEI	The learning Environment inventory (LEI)
CES	Classroom environment Scale (CES)
MCI	My Class Inventory (MCI)
ICEQ	Individual Classroom Environment Questionnaire (ICEQ)
CUEI	College and University Classroom Inventory (CUEI)
QTI	Questionnaire on Teacher Interaction (QTI)
SLEI	Science Laboratory Environment Inventory
CLS	Constructivist Learning Survey (CLS)
SDT	Self-Determinant Theory

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CHAPTER 1

INTRODUCTION

1.1. Background of the Study

The society is frequently shifting its tendencies in education and a vibrant adaptation has become a necessity in teaching practice. Compared to traditional approaches of teaching and learning. The Process of learning demands not mere passive reception of information, rather its demands participants to be more involved and active in learning process. The participation and acquiring knowledge are critical in modern classroom context. There is a need of different approaches of teaching to construct information and knowledge acquisition of the students. The process of teaching is more demanding, changing and challenging now a days. With this swift, the role of the teachers is rapidly changing. The relationship between the students and teachers also demands a significant change unlike conventional teaching approaches. The teachers are supposed to be updated with the prevailing practices in pedagogy. With the emergence of new theories and developments in the field of education, a paradigmatic shift replaced the process of teaching by effective learning. Therefore, there is a dire need to investigate the procedures and methods of teaching and the effectiveness of the approaches adopted by the teachers.

The learning is considered as an important indicator of students' progress in our country. Several variables may affect the learning in a particular subject area. Discovering strategies for enhancing learning process remained one of the central points of focus for educationists during last few decades. There are many factors which may enhance the learning of learners. According to Maina, Koushik & Wilson. (2018), these factors include classroom environment, attitude of students, leadership styles, abilities and skills of the teachers, their health and psychological factors, role of their parents, their social circle, their motivation level and encouragement of students. In this way, the environment

is believed to be one of the important factors for investigation in the field of education. For engaging learners in wrestling with materials for effective learning interactive learning environment plays an important role. Interactive learning environment changed the lectures into discussions and the teachers and learners both became partners in the journey of acquisition of knowledge. Learning environment discusses the diverse physical locations, psychological emotions, contexts, relationships among class fellows and cultures in which the learner learns.

The complex area of teaching is knowing the ways to motivate the students towards their ultimate success in academic and routine tasks. Majority of teachers fail at learning that how to motivate in the classroom. However, motivation is considered as a critical aspect of teaching and learning. This is the motivation which enables the learners to learn effectively and efficiently, but not all the learners are well motivated. It is witnessed that motivated students are learning in an effective way. The disruption in the class is mostly happens because of the bad behavior of the students and they are not willing to be active participant in a healthy discussion during the classes or may remain deprived of retention of the given information. All these things are directly connected with the motivation.

As we know that students learn in a wide variety of settings, like inside the schools, outside of school's settings and from the society and home. Setting also covers the cultural and philosophical domination of the context. This also includes the interactions and treatments among the individuals. It also means the characteristics and adaptations of the methods, applications of techniques and making certain arrangements. For the facilitation purpose, teachers may shift for adaptation and establishment of a suitable setting which may include facilitation in decoration of classroom with visual aids i.e. charts, graphs and pictures to ensure visual learning. The change in system, materials and technology in education are the best forms from the part of facilitators in the classroom. A teacher may bring Audio -visual aids to support the teaching practice and facilitation in learning procedure. Similarly, schools infrastructure, policies, service rules and management are the relevant areas of environment in an educational institute. All of the factors are actively involved in learning procedure and have

impact on learning environment. Interactive learning demands a unique sort of environment where the interactions are encouraged. The administration, policies, and environment related issues are considered as most effecting areas of a setting.

According to Kudari (2016) most of the educators view that the learning environment affects the learning procedure and involvement of the learners in overall learning process. It effects the teaching and what might be taught. The motivations, self-actualization, and distinctiveness along with safety are among the major impacts of environment. The environment where there is proper arrangement of the light and resource material was contributing favorably for the learning procedure. However, the classrooms where there is no proper arrangements of the sunlight, decorum and dreary locations are witnessed with unacceptable behaviors from learners' part. However, the bullying and unexpected activities are most likely to be occurred in such conditions. Interactions between adults and teachers are also very important and may be thought as an important factor which also may affect the learning environment and to be said as positive learning environment and reciprocal of it is called 'negative' setting. Interactive learning environment provides a hands-on, real-world approach to education. Interactive learning environment can motivate the learners and enhance their learning. Interactive learning environment is the key factor which provides hands on, minds on real world approach for teaching and learning. Motivation is one of the most important area in learning process. It remained a matter of discussion for the educationists and psychologists as its role is critical in learning.

According to the Guay et al. (2010), motivation mentions the reasons which inspire the behavior which is characterized by personal willingness and volition. Motivation includes an assemblage of closely related interests, views, perceptions, activities, set of beliefs, values and ethics. Motivation level varies due to teaching and learning method, individual differences, subject areas and learning environment. Motivation can be manipulated by changing instructional practices, learning environment, behavior of teacher etc. Covington (2000) made this point forcefully by reporting, "Three things must be remembered: motivation, motivation and motivation. The academic context is

highly investigated on effectiveness of learning. The effective learning remained a goal for many studies in the past. The performance of the students have been observed to be varying according to learning setting and academic environment. The scholastic accomplishments mostly depend on the place and situation. The mix ability and diversity in the classrooms give birth to the difference in learning. The uniqueness of learners is observed in their capabilities. Some learners are with high self-esteem, while some other are not. The conception of their self-image also varies from learner to learner. The aptitude, maturation, personality traits and society are some areas where students vary from others. Hence, as per Bloom's Taxonomy, the three domains (cognitive, affective, and psychomotor) are the major differences in learners. There are family, social, cultural and motivational aspects of learning where learners distinguish. Learners' thinking style, dreams and potentialities are the other unique and distinctive features involved in learning process. Learner's modalities and personality types are the core areas where they fall different categories. There are some inbuilt characteristics and differences like family economic status, intelligences, exposures to the situations (experiences), and the correspondences in learning level of learners and the content to be taught. After viewing all above factors, provision of a suitable environment to the learners to optimize their learning capacity is direly needed. In current study the endeavor is made to comprehend the reasons for dissimilarities in the learning process and recommend the solutions to maximize the learning.

All these factors also affect learning across the subject areas. Mathematics is considered as tough and boring subject and it is difficult to motivate the learners for mathematics learning so that they may achieve good grades. At a broader level, motivation is the major factor involved in mathematics learning. However, the other factors can be motivation, logical reasoning, problem solving attitude and learning environment etc. The physical learning environment would permit diversity of learning setting/environment where students can practice and experience to learn and grow. Similarly, the environment influences the motivation of learners, helps to gain the attention of learners and enhances the knowledge acquisition process. Motivation is an internal process which helps a person

to move towards a goal. Like intelligence motivation can't be determined or directly observed. Instead of all other parameters motivation can only be inferred by noting the behavior of an individual.

Moreover, mathematical knowledge cannot be learned effectively through chalk and talk method. To learn mathematics in effective manner it is essential that children are motivated, have problem solving attitude and engaged exploring cause and effects relationship through hands-on-experience. Learning mathematics at secondary school level may have an influential effects on their performance in college and their future careers as well. Having strong and solid background in the subject of mathematics can help the learners to develop and create sophisticated perspectives and brings more opportunities and career options. The importance of learning mathematics has been repeatedly focused and emphasized by educationists and educators (Wilkins & Ma, 2003). Both teachers and parents are worried about the learner's achievement in mathematics and paying special attention to improve their performance in mathematics. Politicians have also emphasized on improving students' performance and closing the learner's achievement gaps in mathematics learning. It is impossible for the teachers, learners and parents to bridge the gaps and make substantial academic progress until and unless they recognize the factors which influence the achievement and improvement in mathematics learning. According to Salmi et. Al. (2019) in complex environment classroom teaching is a complicated task and teachers have to perform concurrent functions like motivating, instructing, organizing, encouraging and helping the learners to achieve their goals. In this reverence Kim (2000) explained the multidimensional role of teachers. Commonly teaching and imparting knowledge is teachers' main role to perform but learning environments matters a lot and learning environment and its effectiveness for interferences have also been studied and researched from different aspects. Many researchers have tried to differentiate disparate types of teaching activities, like classroom management, learning activities and behavior control mechanisms to get hold on the complications of classroom teaching and procedural activities of the real classroom happening. Other educationists and

researchers have inspected the instructions from various aspects, e.g. interpersonal skills, classroom management, learning activities and recognition of overlaps between all these perspectives.

In addition Wubbels & Brekelmans (2005), inspired by conducting research on learning environment have emphasized on effectiveness, connecting the teaching behavior and characteristics of learning environment and conditions with students' results. According to Schoenfeld (2004), the learners outcomes supposed in educational usefulness are mostly achieved cognitively. Mathematics and language related accomplishments were the center of focus in past studies. However, the association of attitude, environment and learning remained the points of investigations. In the past studies, the effectiveness of the teaching practice was highlighted and few recommendations were made for the best and appropriate learning environment and situations. Ehmke, Drechsel & Carstensen. (2010) suggests 6 situations for learning of learners namely relevance of content or subject matter, quality and style of imparting instructions, teachers interests, social affiliation, competence support and support of autonomy. Research results of Kudari (2016) have favored the significance of these situations in connection with the intrinsic motivation of learners. Teaching has been described by Scheerens (2014) as a comprehensive set of conditions which may smooth the progress of teaching and enhance the learning of learners. It is commonly accepted fact child more time is spent in classrooms of the schools. It is only the Classroom where the students learn different skills which are considered essential and appropriate for them to attain success in the society. Kim, Fisher and Fraser (2012) reported that it in only the classroom where students expand a comprehension regarding their status in society and the placement in the global market and acknowledge their role in the world. The institutions are the locations where happens the development of learning and skills required to achieve their settled goals. According to Opdenakker & Minnaert (2011) the classroom environment can be arranged and organized in such a way that it brings innovation and creativity and does not uphold a negative learning environment. There are various factors which greatly affect the setting of learning. The layout of the classroom and the seating arrangements are the major issues. Decorum,

audio – visual aids and wall posters also make classroom environment interactive. Skinner, Kindermann & Furrer (2009) explained the other components involved in the overall environment of the classroom. These are mostly immaterial i.e. enthusiasm, how students feel energetic, classroom rules and regulations, noise and silence. Friesen (2001) described one of the most important area which make a noticeable influence on students' successes the physical environment of the classroom. It can be association of learners with each other, structure of classroom, arrangement of resources, and color scheme of the classroom. For the conducive learning, the elements are supposed to be very critical in the classroom. However, it is not the case that all of elements are influential factor individually. Individually, each of these elements exerts a significant positive influence on students' abilities and enhances their learning experiences. When combined collectively, these factors contribute to a highly effective learning process, further strengthening students' skills and capabilities. Constructivists support the interactive classroom scenario and provide with certain theories for learning and consider the environment where learning is active as very important, (Darr & Fisher, 2005). It is because the constructivism suggests that world has no definite meaning which may be tried to decipher and decode. In the ever-evolving landscape of education, the integration of interactive learning environments has emerged as a transformative force, reshaping the dynamics of classroom instruction. Nowhere is this transformation more critical than in the realm of mathematics education at the secondary school level. This topic delves into the profound impact of interactive learning environments on students' motivation in the context of mathematics learning. Mathematics, often perceived as a challenging subject, stands to benefit immensely from innovative approaches that not only foster comprehension but also ignite a sense of enthusiasm and determination among students. By examining the intricate relationship between interactive learning environments and motivation, we unveil a powerful synergy that can redefine the way students engage with and excel in mathematics, paving the path for enhanced learning outcomes and mathematical proficiency. In this exploration, we delve into the components of interactive learning environments, the diverse facets of

motivation, and the evidence-based insights that underscore the potential for this educational paradigm shift to revolutionize secondary school mathematics education.

1.2. Rationale of the Study

It is not only the curriculum and outcomes that determine the quality of education but also learning environment and motivation of learners (Gottfried, Fleming & Gottfried, 2001). According to Fraser (2012), "the classroom is the place which permits the management of the learning and the quality of what goes on in the classroom also has profound impact on students' achievement and motivation. According to Rogoff (2003) learning environment can be classified into five different dimensions which are Physical dimension e.g. space, student teacher ratio, physical facilities, learning materials, interpersonal i.e. student teacher interaction, Institutional, which relates to style of school's governance, Socio-psychological i.e. psychological aspects that impinge upon learning, social aspects such as teacher's support, cohesiveness and collaboration among students. Over the past thirty years, there have been a plethora of studies on various characteristics of the setting/environment and the impacts on learners' achievement. A considerable work has been done to develop tools and techniques to gauge classroom environment. Research has exposed the encouraging relationships existing in setting and learners' motivation. Aldridge & Fraser (2000) is of the view that innovative teaching, learning environment of schools effects student achievement and attitude towards learning. Ryan & Deci (2009) are also view noteworthy results on students' learning in mathematics. A review of the existing studies reveals that most of the studies are focused on a specific aspect or dimension of classroom environment. According to Fraser (2012) despite the fact that students have a large stake on what goes on in the classroom and how it affects their learning researchers have heavily relied on curriculum and achievement". In his review of instruments for classroom environment study and their application, Fraser (2012) has reported a number of instruments and studies. Most of the studies are focused on specific dimension of classroom environment e.g. physical, material or interpersonal aspects of learning environment. Classroom environment is an interplay of the physical, material,

interpersonal interaction among students and between student and teacher (Prenzel, Kramer & Drechsel 2001). There are many studies which have explored and considered multidimensional aspects of classroom context. Furthermore, studies have revealed that attributes of classroom are significantly related with students' achievement. Enhancing student engagement, for example, has emerged as a significant variable in school completion. Wubbels, Brekelmans, Denbrok & Tartwijk (2006) suggests that creating a caring and supportive environment, helping and providing opportunities to students for success in their learning, helping to solve personal problems within the school environment. Similarly Maganga (2016) in their study found a relationship between teacher support and fairness and students' academic achievement. Maganga (2016) also found a link in achievements of mathematics and its relationships with impartiality. Schreiber (2002) states that there is a connection in learners' perceptions and the engagements. According to Steve and Richard (1990), when a student first steps into a room they will make a judgment about the type of class they are going to be taking. Rather, the focus is on the teaching and learning activities, and the school space and classrooms in which these activities take place are often not even considered. Only a few educational researchers focus on the relationship between the architecture of the school and classrooms and mathematics learning that takes place within these schools and classrooms (Higgins et. al. 2005; Woolner 2010). They observed the classroom setup, paying attention to desk arrangements and the visual stimuli adorning the walls. These factors played a pivotal role in motivating learners to engage actively in the learning process. This scrutiny served five crucial functions that held immense significance for past educational research and, more importantly, for nurturing students' motivation to excel in mathematics (Weinstein 2007; Weinstein et al. 2011). These functions are: Assessment (Observing the classroom environment allows educators and researchers to assess how various elements, such as desk arrangements and visual stimuli, influence student motivation and engagement in mathematics), Identification (Researchers can identify specific aspects of the classroom setup that are most effective in motivating learners. This includes recognizing what

elements on the walls or the arrangement of desks have a positive impact.), validation (The observed data can validate the significance of these elements in motivating students for mathematics learning. It confirms whether the setup indeed contributes to enhanced motivation.), guidance (The findings serve as valuable guidance for educators and administrators in designing future classroom environments that foster motivation for mathematics education.) and research (The observed functions contribute to the body of educational research, providing insights into the critical role of classroom setups in motivating learners for mathematics. This research informs future studies and practices in the field of education.)

According to Steele, these basic functions must be fulfilled for effective teaching and learning, especially in the mathematics classroom. Bronfenbrenner (2005) seen the social ecological dimension for teaching and learning in schools and classrooms. The benefit of this theory for creating learning arrangements is illustrated by Sacher (2006) in his Didaktik Der Lernökologie. He showed how the social surrounding could be used for designing teaching and learning in classrooms increasing the learners' performance in learning mathematics. García et al. (2016) found that affective motivational variables brought the distinction between high and low performance in mathematics.

Lie et al. (2020) found interactive learning environment as the contributing factors for motivating the learners and improving performance in mathematics. In the study of Prast et al. (2018), perceived competence was the only motivational variable found to influence high achievement in mathematics. Interactive learning environment and supportive relationship between teacher and student may have significant value in motivating learners for learning mathematics (Frymier, 2000), and promoting mathematics learning (Cheeseman, 2009). There is a need to focus on more than one attributes of classroom environment to determine the factors which have positive or negative impact on motivations and learner's accomplishment. Considering the fact that in Pakistan students' performance in mathematics at Secondary school level is very poor (Sa'ad, Adamu & Sadiq, 2014). The importance of classroom environment and dearth of research on socio-psychological attributes of

classroom environment it is imperative to explore the socio-psychological aspects of the classroom processes besides material and physical dimensions. The current investigation has been apprehended to evaluate the results of interactive learning environment on motivation of students in mathematics. The "What Is Happening In This Class" is a widely-used model in classroom environment research (Aldridge & Fraser, 2000; Dorman, 2003). Gherasim, Butnaru & Iacob (2011) used five subscales of "What Is Happening In This Class" and explored its effect on extrinsic and intrinsic motivation. In this research the effects of 5 sub scales of "What Is Happening In This Class" were assessed on motivation (intrinsic, extrinsic and amotivation) in maths classrooms. And this study was not conducted in Pakistani culture. Sultan (2017) used all 7 subscales of "What Is Happening In This Class" and determined the impact of critical thinking on developing positive classroom learning environment. According to the findings of Sultan (2017) all components of "What Is Happening In This Class" were existing in public and private secondary schools. Study of Sultan (2017) inspired the researcher to conduct this study. In this study effects of all 7 subscales of "What Is Happening In This Class" was explored on motivation of students in mathematics class rooms. The existing body of research underscores the critical influence of the learning environment on student motivation for acquiring educational outcomes. Studies have consistently revealed the multidimensional nature of the classroom context, comprising physical, material, interpersonal, and socio-psychological dimensions. While numerous investigations have explored the relationships between all these aspects and students' achievements. All these research studies reflected that there remains a noteworthy gap in the examination of the socio-psychological attributes of classroom environments in the specific context of Pakistan's secondary schools. An alarming state of mathematics performance among secondary school students in Pakistan and understanding the socio-psychological dynamics of the classroom environment becomes imperative. The imperative need to enhance students' motivation in mathematics at the secondary level. Mathematics is often considered a challenging subject, and students' motivation plays a pivotal role in determining their success and engagement in this critical

field of education. Interactive learning environment, characterized by dynamic and engaging teaching methods, hold the promise of fostering intrinsic and extrinsic motivation, promoting deeper conceptual understanding, and ultimately improving academic outcomes in mathematics. By investigating the effects of such environments on student motivation, this research seeks to contribute valuable insights to the educational community, offering evidence-based strategies to enhance mathematics education and inspire a lifelong love for learning in students at the secondary level.

The rationale behind using the theory of motivation, which encompasses intrinsic motivation, extrinsic motivation, and amotivation, lies in its ability to provide a comprehensive framework for understanding and influencing human behavior. Intrinsic motivation is the innate drive that comes from within, where individuals engage in activities because they find them inherently enjoyable or satisfying. It fosters creativity, autonomy, and a sense of personal fulfillment. Extrinsic motivation, on the other hand, involves external factors such as rewards, punishments, or recognition that drive behavior. It's effective in situations where intrinsic motivation may be lacking, as it provides tangible incentives to accomplish tasks. Amotivation represents a lack of motivation, often stemming from a perceived inability to achieve desired outcomes or a disconnection from one's goals. Recognizing amotivation is crucial, as it allows for interventions to reignite motivation. By considering these three components, organizations, educators, and individuals can tailor motivational strategies to suit specific contexts. For instance, understanding when to employ intrinsic rewards (e.g., fostering curiosity) or extrinsic rewards (e.g., performance bonuses) can lead to more effective outcomes. In essence, this theory recognizes that motivation is not one-size-fits-all. It acknowledges the complexity of human motivation and provides a versatile framework to address various motivational needs across different situations, ultimately promoting greater personal and collective achievement.

This theory was also found most appropriate according to the age and cognition level of the learners.

1.3. Statement of the Problem

An important and interesting aspect of the teaching is to understand either the learning environment of mathematics classrooms is capable to motivate students to do mathematics effectively in the classroom. This is a matter of investigation for many researchers and educationists and being discussed at many forums these days. In the present study practices related to interactive learning environment prevailing at mathematics classrooms, in public secondary schools were explored and then motivation level of the learners for learning mathematics was found. Then the effect of interactive learning environment on motivation of the students was determined.

1.4. Objectives of the Study

Following objectives were carried out to accomplish the research work under study.

1   To explore the practices related to interactive learning environment prevailing at public secondary schools.

2   To find the level of students' motivation at secondary level in public schools.

3   To determine the effects of "Interactive Learning Environment" on students' motivation at secondary school level.

    3a.   To determine the effects of Students' involvement on students' motivation at secondary school level in mathematics class.

    3b.   To determine the effects of Students' Cohesiveness on students' motivation at secondary school level in mathematics class.

    3c.   To determine the effects of task orientation on students' motivation at secondary school level in mathematics class.

    3d.   To determine the effects of Investigation on students' motivation at secondary school level in mathematics class.

    3e.   To determine the effects of equity on students' motivation at secondary school level in mathematics class.

3f.   To determine the effects of teachers' support on students' motivation at secondary school level in mathematics class.

3g.   To determine the effects of cooperation among students on students' motivation at secondary school level in mathematics class.

1.5. Assumption of the Study

According to the findings of Sultan (2017) Interactive Learning Environment as per framework of Fraser, Fisher, and McRobbie (1996) is prevalent in mathematics classrooms at public secondary schools so the study would be conducted to determine the effect of Interactive Learning Environment on students' motivation.

1.6. Research Question

To what extent the students of public secondary schools are motivated for learning mathematics.

1.7. Null Hypotheses

Following hypotheses were developed to accomplish the study:

H_01:   There is statistically no significant effects of Interactive Learning Environment on students' motivation at secondary school level.

H_01a: There is statistically no significant effects of cohesiveness on students' motivation at secondary school level.

H_01b: There is statistically no significant effects of teacher support on students' motivation at secondary school level.

H_01c: There is statistically no significant effects of investigation on students' motivation at secondary school level.

H_01d: There is statistically no significant effects of students' involvement on students' motivation at secondary school level.

H_01e: There is statistically no significant effects of task orientation on students' motivation at secondary school level.

H_01f: There is statistically no significant effects of cooperation on students' motivation at secondary school level.

H_01g: There is statistically no significant effects of equity on students' motivation at secondary school level.

1.8. Conceptual Framework

A conceptual framework is a foundational structure that helps researchers and scholars to organize, understand, and explain complex phenomena in a systematic and coherent manner. It serves as a guiding framework for research, providing a theoretical foundation for the development of hypotheses, the collection of data, and the analysis of results. A conceptual framework breaks down the research problem into its constituent concepts and variables. Concepts are abstract ideas or phenomena, while variables are measurable aspects of these concepts. Conceptual frameworks are ubiquitous in academic disciplines such as social sciences, economics, psychology, and others, and they offer a structured foundation for organizing and understanding research (Miles et al., 2013). A conceptual framework is often employed when researchers are exploring a new or less-studied topic. It helps researchers gain an initial understanding of the relationships between concepts and variables (Creswell, 2009). A conceptual framework is a visual or written product, one that explains either graphically or in narrative form the main things to be studied and the key factors, concepts, or variables and the presumed relationships among them." (Trochim, 1989). "A conceptual framework presents a picture of the main elements in a research study. It serves as a guide for identifying what variables will be examined and what statistical relationships might be explored." Donna (2014), pointed out that a conceptual framework is a crucial tool for developing research questions and hypotheses: "A conceptual framework outlines the main issues and concepts that the researcher will study and that exist in the literature or theories that have been developed. It is a map of the proposed

study". Barbara and Brink (2017), described the role of a conceptual framework in shaping research directions. According to them, "A conceptual framework serves as a guide to specify and clarify the direction of the research process. It suggests ways to organize and develop the research and indicates what needs to be explained." Roberto and Alessandro (2018), discussed the role of a conceptual framework in guiding the interpretation of research outcomes. According to him "A conceptual framework provides a basis for interpreting results and provides a clear structure for understanding and classifying findings. It facilitates the transition from data collection to knowledge generation." These citations collectively underscore the idea that a conceptual framework is "conceptual" because it is based on theoretical concepts and ideas that help structure the research process, guide inquiry, shape research questions, and facilitate the interpretation of research outcomes. It is not directly rooted in empirical data but rather provides a foundation for designing research and making sense of collected data in a coherent and organized manner. There are two variables Interactive learning environment and students' motivation that provided the base to the conceptual framework of the study. The interactive learning environment was being taken as independent variable (The variable that is stable and unaffected by the other variables) while the students' motivation in mathematics learning was treated as the dependent variable (The variable that depends on other factors that are measured). It was being based on two models, interactive learning environment and students' motivation. This interactive learning environment model was used by Myint (2001), was developed by Fraser, Fisher, and McRobbie (1996) and motivation assessment model was developed by Vallerand et al. (1992). Conceptual framework of this study was based on two variables Interactive learning environment and students' motivation.
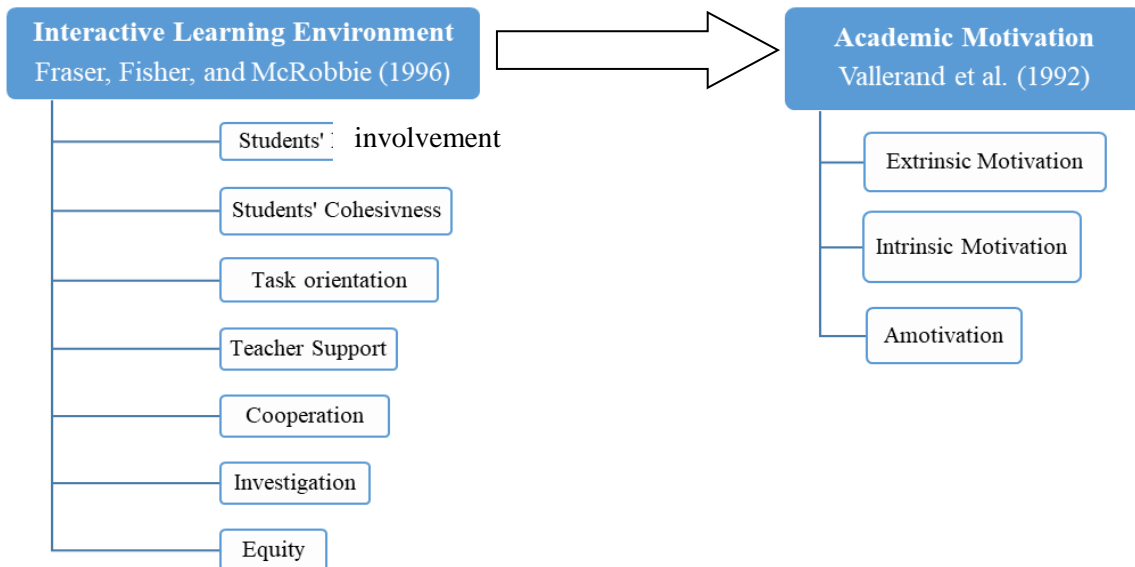
Figure 1.1 Conceptual Framework

1.8.1. Interactive Learning Environment (ILE)

Interactive learning environment was being treated as an independent variable in this research. The interactive learning environment model used in this research was used by Myint (2001) & developed by Fraser, Fisher, and McRobbie (1996). It indicates 7 subareas helpful for the development of interactive classroom environment. These subareas were:
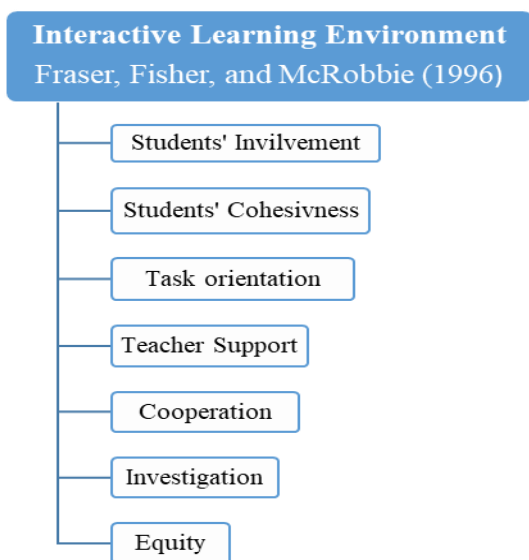
Figure 1.2 Components of Interactive Learning Environment

1.8.1.1. *Students' involvement*

Involvement of learners describes the extent to which learners were attentive and taking keen interest in class. Learner's involvement also means that how student participated in class room activities and to what extent he or she was participating in class room activities.

1.6.1.2 . Students' Cohesiveness

By cohesiveness of students it was assessed that to what extent learners were supportive, helpful and cooperative with each other. Students' cohesiveness is the key factor which may increase the productivity of learning experiences. In other words we can say that cohesiveness is a system in which development to achieve the set objectives, the learners work together in groups and organized the enormous unit to work collaboratively.

1.6.1.3 Investigation

Investigation means the extent of inquiry skill of learners and use of this inquiry skill in problem solving of mathematics classroom and investigation.

1.6.1.4 Teacher support

Guidance provided by teachers or Instructor's provision of assistance, facilitation, collaboration, and demonstration of the concerns in involving students in learning process and its extent to which he is voluntarily supporting them is considered as teacher's support. Similarly teacher is the only individual who can organize and manage the tone of class, create a warm environment, nurture, guide and mentor the students, plays the role of a role model and may listen, see and help his students in hours of troubles.

1.6.1.5 Task orientation

The extent to which a learner performs his or her planned activities within the class and pays his full attention to the activity with full concentration and avoid his thinking's by wondering here and there.

1.6.1.6 Cooperation

The degree to which learners collaborate, cooperate with his or her class fellows while performing the classroom activities. Cooperation means work together for the accomplishment of common areas. In an environment where there cooperation is prevailing, the learners a always in hunt of the consequences that are equally valuable for all the individuals involved in the process of learning

1.6.1.7 Equity: Equity encompasses principles of fairness, justice, equality, impartiality among all students. It operates on the foundation of unbiased treatment tailored to individual needs and requisites. It guarantees fair and inclusive access to opportunities, resources, benefits, and assumptions for each student. Nevertheless, equity also signifies the degree to which teachers cater to students' diverse needs, including offering commendation, distributing questions equitably, and affording every student a chance to participate in discussions during the learning process.

Sultan (2017) used all 7 subscales of "What Is Happening In This Class" and determined the impact of critical thinking on developing positive classroom learning environment. According to the findings of Sultan (2017) all components of "What Is Happening In This Class" were existing in public and private secondary schools. According to the findings of Sultan (2017) this module was found suitable. Moreover considering the age group of 10th-grade students, the cognitive level, cultural nuances, unique characteristics and challenges of the educational setting (school-specific challenges) and requirements of the public schools this model was found best appropriate. The seven subareas within the model work together to create an

interactive classroom environment which is required especially for mathematics and fosters collaboration, inquiry, and equity.

1.8.2. Motivation

In this research, a model used by Utvaer & Haugan (2016) developed by Vallerand et al. (1992, 1993) named as the AMS (academic motivation scale) was being used to assess the motivation level of students' motivation. According to Middleton & Spanias (1999), development of motivation involves seven subscales during the process, there are either extrinsic, or intrinsic. However, intrinsic motivation includes stimulation, accomplishment, and knowledge, while extrinsic includes external, introjection, and identified. It is the reason which makes individuals behave in a certain way/situation. Similarly, Hannula (2006) defines motivations as potential that is assisting in controlling the direct behavior of an individual's emotional aspect. Hannula's definition is considered as complex. He considers the demonstration or manifestation of this potential in conduct, emotion or perception.
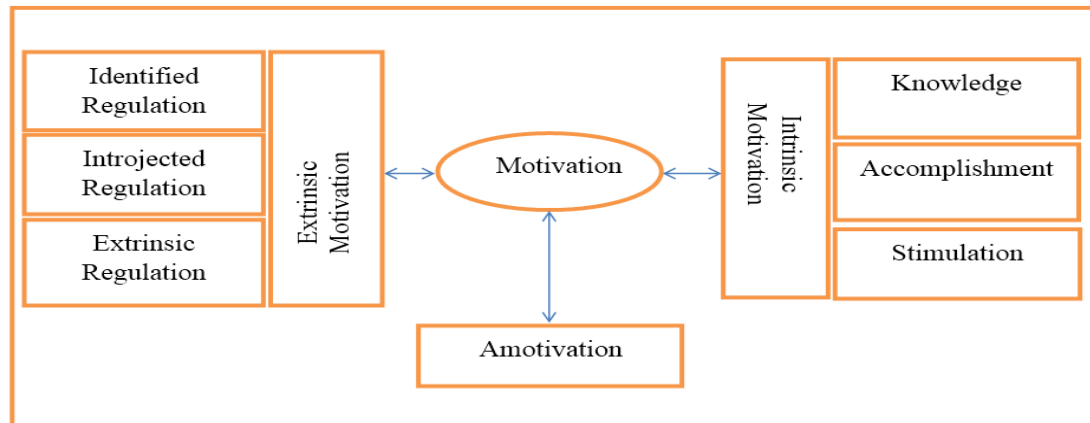
Figure 1.3 The Academic Motivation Vallerand et al. (1992)

1.8.2.1. *Intrinsic motivation*

This type of motivation involves personal actions one take to satisfy him/herself and does not expect anything as a return. In fact it is something which an individual does to make himself/herself feel good or something that gives a sense

of achievement. This is indeed a primary or internal motivator which can be sometimes a challenge to a person posed by himself. For instance, a learner wants to know more about some phenomenon and gain knowledge about something, he reads to satisfy his wish and to gain the sense of calm by going through the book, thus intrinsically motivated to do the reading task. However, here we have divided the intrinsic motivation into further categories:

> *1.8.2.1.1. Knowledge*: The assisted in assessment of the desires to complete an activity which an individual does to satisfy and get delighted by experiencing in learning process.

> *1.8.2.1.2. Accomplishment*: It is to assess the wish for the completion of some task to satisfy oneself with experience and gratification and creativity.

> *1.8.2.1.3.* Stimulation: This is the determinant of the desires for the performance of a task for stimulating an experience.

1.8.2.2. *Extrinsic motivation*

This sort of motivation does not focus on internal satisfaction, rather it is done to gain some external prize, reward or to evade the penalty. Here in this case the motivator remains external as one is not expecting any internal reward like satisfaction and the focus remains on the attention toward the consequences of doing or not performing something. For instance, learners/students remain disciplined and show a nice behavior in the classroom toward teacher to prove themselves as good students in the eye of the teacher. If they do not want to lose good grades, they will study for the earning of the grades. They put their emotions aside and keep trying to do something which in return gives them

external reward though bitter. There are some further divisions of this sort of motivation.

> **1.8.2.2.1.** *Identified Regulation:* the desire for the performance of an activity is done to get the sense of standing and private worth/value.
>
> **1.8.2.2.2.** *Introjected Regulation*: the pressurization and feeling of guilt are assessed in this sort of motivation.
>
> **1.8.2.2.3.** *Extrinsic Regulation:* there is a determinant to assess either the students is performing an activity for the avoidance of any adverse consequence or does it to gain some reward.

1.8.2.3. *Amotivation*

The experience of lacking of motivation or the condition when someone has the deficit to be involved in some task is assessed by amotivation. It is considered by absence of apparent capability or disappointment to acknowledge the consequences or task.

1.9. Significance of the Study

It is considered as an important aspect of the teaching; however, it is very critical to understand either the teachers of mathematics are capable to motivate students to do mathematics effectively in the classroom. This is a matter of investigation for many researchers and educationists and being discussed at many forums these days. One thing is so common in educationists and all the people involved as beneficiaries that the motivation has deep impact on learning and achievements of the students in general. The current research study has the components of theoretical, practical and methodological significance for teaching and learning mathematics at secondary school level. Before this investigation, perhaps there was a deficit in the understanding of the impact of environment on the learning. However, the study is an effort to investigate the influences of interactive settings and similarly its influence on leaning mathematics. However, the study will contribute to different fields

of study, but educational psychology and learning environment will equally benefit from the study. This area of literature was added with further new understanding and reviews while covering on the areas of motivation and learning about interactive environment and their contribution to the students' overall performance, especially in mathematics. The research gap was abridged by the investigation in interactive learning environment and effective learning and understanding of mathematics. This study might provide results for improving school environment in federal area schools in particular and` all over the country in general. It would be helpful for school education ministries to provide facilities for the interactive learning environment.

School administration may also be one of the beneficiaries of the results of this research. By using available facilities they can create a conducive environment which would be interactive and enhance students' achievement in mathematics and can motivate them. This research study aspire to contribute valuable insights to the field of educational research in Pakistan, informing future educational practices, policies, and strategies aimed at enhancing the motivation and achievement of students in mathematics classrooms.

Teachers may also be motivated by the findings of this research to provide a supportive, creative, task oriented, interactive teaching methodology and cooperative environment for learner's motivation to get good grades. It would also be helpful for parents and students to demand the Interactive learning environment from the Government and school administration. This research study would be a mile stone for other researchers to conduct such researches in other subject areas also.

1.10. Research Methodology

1.10.1. Research Approach

To analyze the facts related to the interactive classroom environment at secondary school students and its effects on developing motivation among students the researcher applied quantitative approach.

1.10.2. Research Design

To carry out this research study Ex Post Facto research design was used. An ex post facto research design is a method in which groups with qualities that already exist are compared on some dependent variable. Also known as "after the fact" research, an ex post facto design is considered quasi-experimental because the subjects are not randomly assigned - they are grouped based on a particular characteristic or trait.

While examining the effectiveness of the environment, the current study aims to the exploration of the interactive learning setting. The interactive learning environment which effects learning process of the students during their studies especially in mathematics at secondary school level. Quantitative techniques was employed to draw inferences from cause and effects analysis of the responses obtained from the students for the determination of the effects of interactive setting while motivating secondary school level students. There were two variables in the study. (i) Interactive Learning Environment (ii) Motivation. Interactive Learning Environment was being treated as independent variable whereas students' motivation was treated as dependent variable.

1.10.3. Research Population

All the students of 10th class of the schools working in six sectors of Islamabad capital territory under the umbrella of Federal Directorate of Education Islamabad, which constitute number of 12810 (Boys 5231, Girls 7579) were the population of the study (GoP, MoE, 2019). Detail about school sectors is added to draw a sample representative of the whole population.

Table 1.1

Division of schools in six sectors of Islamabad Capital territory

Sr. No.	Area	Sector	Boys schools	Girls Schools
1.	Urban	Urban I	8	11
2.	Urban	Urban II	9	11
3.	Federal / Rural	Bhara Kahu	7	10
4.	Federal/ Rural	Nelore	8	9
5.	Federal/ Rural	Tarnol	8	8
6.	Federal/ Rural	Sihala	5	8
	Total		45	56

The schools under the directorate of federal education was distributed into six sectors from which two sectors are urban known as Urban I and Urban II. And the other 4 sectors which are rural sectors are composed of Bhara Kahu, Nelore, Tarnole and Sihala. Urban I has 8 boys secondary schools and 11 girls secondary schools. Urban II is comprise of 9 boys secondary schools and 11 girls secondary schools. In Bhara Kahu there are 7 boys secondary schools and 10 girls secondary schools. In Nelore there are nine girl and eight boys secondary schools, while, in Tarnole there are 8 girls and similarly 8 boys secondary schools, whereas, in Sihala there are 8 girls and 5 boys secondary schools. The total number of secondary schools

working under the federal directorate of education are 101 from which 45 are boys secondary schools and 56 are girls secondary schools.

Table 1.2

Population of Study

Sr. No.	Category	No of Schools	No. of Students
1.	Boys	45	5231
2.	Girls	56	7579
3.	Total	101	12810

The total number of students were 12810 which were in class 10 from which 5231 were boys and 7579 were girls.

1.10.4. Sampling Technique

As population has two categories Boys and girls therefore for selection of a justified sample size, form each category of the population, stratified random sampling technique was utilized. 10.5 % students from each stratum were taken as sample. According to Stewart (2018) for large size of population 10% sample size is appropriate.

Table 1.3

Sample of the Study

Sr. No.	Category	Target Sample	No. of Students
1.	Girls	850	770
2.	Boys	650	580
3.	Total	1500	1350

The sample was comprised of 1350 students, 770 girls and 580 boys.

1.10.5. Instrumentation

1.10.5.1. *Interactive Learning Environment questionnaire*

Based on past studies, Fraser, Fisher, and McRobbie (1996) developed a new learning environmental instrument named What Is Happening In This Class? (WIHIC) which incorporates scales that have been used and proven to be significant predictors of learning outcomes.

Table 1.4

Detail of Items in "What Is Happening In this Class" Questionnaire

Sr. No.	Sub Scales	No. of Items
1.	Investigation	8
2.	Equity	8
3.	Involvement	8
4.	Cohesiveness	8
5.	Task orientation	8
6.	Teacher Support	8
7.	Cooperation	8

1.10.5.2. *Academic Motivation scale*

A questionnaire was adapted which was developed by Vallerand et al. (1992, 1993) named as the AMS (academic motivation scale) with seven subscales, including three types of intrinsic motivation (i.e., knowledge, accomplishment, and stimulation), three types of extrinsic motivation (i.e., identified, introjected, and external), and amotivation. 7 subscales consisting of intrinsic and extrinsic motivation are included. Intrinsic motivation types are knowledge, accomplishment and stimulation, while, extrinsic are: identified, introjected and external. Further division is made in the

construction of intrinsic motivation subscales; Identified regulation is the desire for the performance of an activity is done to get the sense of standing and private worth/value. While introjected regulation is the pressurization and feeling of guilt are assessed in this sort of motivation. Similarly, extrinsic regulation is a determinant to assess either the students is performing an activity for the avoidance of any adverse consequence or does it to gain some reward.

Table 1.5

Detail of Items in Motivation Assessment Scale

Sections	Subsections	No. of Items
Intrinsic	Knowledge	5
Motivation	Accomplishment	5
	Stimulation	4
Extrinsic	Introjected Regulation	4
Motivation	Extrinsic Regulation	4
	Identified Regulation	4
Amotivation	Amotivation	5

1.10.6.   Data Collection

Researcher physically approached the schools selected as sample, explained the items of questionnaires and asked the sampled students to fill the questionnaire for the purpose of data collection.

1.10.7. Data Analysis

Statistical techniques utilized for the analysis of the data were as under:

Table 1.6

Data Analysis Techniques

Sr. No	Objectives	Statistics
1.	To explore the practices related to interactive learning environment prevailing at secondary school level.	Mean Score
2	To investigate the level of students' motivation at secondary school level.	Students' Score
3.	To determine the effects of Interactive Learning Environment on students' motivation at secondary school level.	Regression Analysis

1.11. Operational Definitions

1.11.1. Interactive Learning Environment

In this research interactive learning environment is operationally defined as the classroom environment which has students' involvement, Students' Cohesiveness, sense of investigation, cooperation & equity, support of teachers and orientations as determined by using instrument in this research.

1.11.2. Students' involvement

The involvement of the students means that the attentive interest the students had in the classroom learning process.

1.11.3. Students' Cohesiveness

It is the extent of students' friendliness and support to other peers.

1.11.4. Investigation

It is the extent of emphasizing on the inquiry and skills and utilization of these in resolving issues.

1.11.5. Teacher support

The extent of the teachers' support, interest and friendliness in the process of learning of students.

1.11.6. Task orientation

The extent to which it is considered as critical to execute the planned tasks/subject matter and remain focused on the point.

1.11.6. Cooperation

It is the extent of working collaboratively for the achievement of the common/shared aims/objectives.

1.11.7. Equity

The fair mindedness and neutrality to the concerned which basis on the values of uniform/even handed dealing

1.11.8. Motivation

It is a moving force that exists in the learning. It drags one's desires towards the doing of an action/ task in educational context to achieve the set goals as an internal process. It is about the reason for behaving in a certain way. The will of the students/ individuals is driven due to the motivation. The motivated students/individuals are enthusiastic. It is considered as a

phenomenon which is inside/internal in nature. This is the force which directs the actions and behaviors manner. In this research it was determined by means of extrinsic motivation, intrinsic motivation and amotivation.

1.11.9. Intrinsic motivation

Intrinsic motivation was determined in terms of knowledge, stimulation, and accomplishment.

1.11.10.   Knowledge

The assisted in assessment of the desires to complete an activity which an individual does to satisfy and get delighted by experiencing in learning process.

1.11.11.   Accomplishment

It is to assess the wish for the completion of some task to satisfy oneself with experience and gratification and creativity.

1.11.12.   Stimulation,

This is the determinant of the desires for the performance of a task for stimulating an experience.

1.11.13.   Extrinsic motivation

Extrinsic motivation was being determined in terms of identified, interjected regulation and extrinsic regulation.

1.11.14.   Identified regulation

The desire for the performance of an activity is done to get the sense of standing and provide worth/ value.

1.11.15.   Introjected regulation

The pressurization and feeling of guilt are assessed in this sort of motivation.

1.11.16.   Extrinsic regulation

It is a determinant to assess either the students is performing an activity for the avoidance of any adverse consequence or does it to gain some reward.

1.11.17.   Amotivation

The experience of lacking motivation or the condition when someone has the deficit to be involved in some task is assessed by amotivation. It is considered by absence of apparent capability or disappointment to acknowledge the consequences or task.

1.12. Delimitations of the Study

Due to time and resources constraints this research study was delimited to the following:

1. Schools working under Federal Directorate of Education

2. Only public secondary schools

3. Only science students of class 10th

CHAPTER 2

LITERATURE REVIEW

Section I

2.1. General Overview of the Study

Mathematics is "an impenetrable mystery" for the majority of people. Many students find it difficult and boring subject and take no time to opt out when they are allowed to do so. World over poor performance and low participation in mathematics education is a major concern of educationists, government, teachers and parents (Barrington, 2006). Researchers and educationists have speculated about it and cited wide range of possible factors responsible for declining quality of performance and low participation in mathematics (Dinham et al., 2017).

However, most commonly cited factors include: ineffective pedagogy, irrelevant curricula, inadequate teacher preparation, lack of facilities, students' attitude towards mathematics, lack of motivation to learn and uncongenial classroom environment. There is a common agreement that declining state of mathematics education has dire consequences regarding the scarcity of people in the occupations that necessitates a robust mathematical groundwork. Therefore, mathematics has always been at the forefront in all education reforms. In Pakistan right from the first education conference held soon after independence in November, 1947 till today efforts have been made to recover the excellence of education.

The necessity for educational reform in general and mathematics in particular stems from a number of reasons ranging from personal development of individuals to socio–economic and political needs of national curriculum documents, education policies and plans stress on importance of mathematics education for national development and progress.

Mathematics knowledge is a tool to develop rational logical thinking skills of learners. A solid background in mathematics provides sophisticated perspectives and more career options (Wilkins &

Ma, 2002). According to Volmink, (1994) participation in mathematics education determines one's future career "a priori". Studies have revealed that learning in mathematics at secondary school level has an impact on students' performance at college level and influence their future careers as well. Hence proficiency in mathematics is essential for pursuit of further education irrespective of the field of study, better future employment chances with good wages and quality performance at work place (Geary, Hamson & Hoard, 2000). According to Alfan & Othman, (2005) students' declining participation in mathematics education and their poor performance in the subject results in less manpower which severely effects country's economy. The perception of the teacher is a matter for discussion for many researchers. If the teachers perceive the classroom needs and simply emphasizes the overall improvement in the students, the learners perform well and demonstrate that they are fluent, flexible and persistent in learning process. Their efforts are demonstrated in a right way towards academic achievements and eventually they perform well (Peng & Kievit, 2013). Similarly, in some investigations on the subject matter of the setting, it was highlighted that the learners tend to learn according to the environment they are provided with. The role of the environment is unavoidable in the process of learning and same is the case with teaching. The performance level of the teachers and the learners is deeply affected due to environmental factors involved in the classroom learning procedure (Suleman & Hussain, 2014). There are many things which are the part of the environment in the classroom. These are the layouts of the chairs in the classroom, the displaying of the charts, the light and rules for the class etc. All of the things which engage students in learning process are available in the classroom environment. The learning prevails if the students comprehend the teacher as a character who socio-emotionally contributes in the classroom and is considered as facilitator who responds to the learning needs of the learners and enhances the relationship for the overall positive outcomes and adjust the behaviors of the students. In an investigation on classroom environment, the connection of the environment with learning was investigated. The study sample were the 80 learners form intermediate and the exploration was made

on the relationships in achievements at academic context and the environment of the class. The students were randomly selected from the city of Aurangabad. After conduction pre-tests and post-tests, the standard deviation and t-test were utilized to interpret the data. However, 0.05 level was the significant result of the study. Hence, the investigation highlighted the significant difference between the academic achievement and environment.

Similarly, a study was conducted on effects of classroom environment on achievement motivation. All the stakeholders of the school reflected on the different aspects involved in the achievements of students. The academic goals of the students were considered as important factors in learning process. The factors were analyzed which play a vital role in the achievement of set goals. The teacher in the classroom is considered as a major variable (Whitaker, 2004).

Furthermore, all the level are influenced by the expectations of the teachers in the classroom (Tyler and Boelter, 2008). In their view, the expectations are directly influencing the learning process in the classroom, if these are high and positive, the results will be similar. While low or negative expectations are the predicator of low performance in primary, middle and high schools' context. The academic progress is increasing and decreasing with the influence of the expectations of the teachers. Hence, the current study's independent variable is environmental influence, while dependent variable is the achievement of the students. In addition, a study was conducted on girls students of 14.67 mean age. The sample of the study were 30 girls students. By confirming the hypothesis, it was revealed that there are certain factors in environment of the classroom which obviously play a major role in learning and the environment and learning are correlated with each other (Vyas & Joshi, 2001). While examining the perception of both the stakeholders in social context, the study of Stewart (2016) declared students and teachers as stakeholders and actors in the classrooms whole perception changes over time like the role of the actor on the stage. According to Mendell & Heath (2005), it is revealed in many studies that there is the influence of the physical environment in the classroom and the learning is impacted by the attitudes of students and teachers. In views of Moore (2004), the

competency of the students in social context is developed in the environment provided to them as children. According to Mendell & Heath (2005), at preschools the designing of elements remained an overlooked phenomenon. The design may be holistically approached as the learners/students are very much aware of their surroundings. The environment is one of the neglected arenas of the schools where there is less focus of many administrations. The schools are not properly arranging the adequate facility for the layout of the classrooms and therefore fail to meet the needs of learning which cause barriers in desired outcomes. However, parents, teachers and students may be involved in this process. According to Abbas et al., (2012), children learning is directly influenced by many aspects of the physical setting of schools (Abbas, Othman, and Rahman, 2012). These aspects include finishing, furnishing and designing, spatial plans, quality of the air, the pollution, human comforting setting and noise in the premises are most influencing aspects. Abbas (2012) claimed that the Western countries, children are formally developing their cognitive aspect of personality and this helps students mature themselves mentally and ultimately it will enable them to handle situations intellectually unlike the children of the Eastern countries. However, the children are highly influenced by the arrangements in the layout of the class and school. Abas et al. (2012) declared that the learning is witnessed to be better and if the environment is triggering positive behaviors in the schools. Well defined and organized schools provide better places for learning. There is a positive correlation in the development of the children's intellect and schools environment. So, there is a need for the architectural modifications which may be in line with the suitability for the children learning and future goals. There is need for the conducive environment for the learning where students are provided with a space that is important to meet the needs of every individuals. The environment which is well designed and appropriate for the learning is one which improves the learning of slow learners and makes special from normal classes. It may be contributing to the overall readiness in the school especially at early and primary level of the classes. However, despite there is much available

material on the physical environment for learning, yet there is a gap in the existing pool of literature on the physical attributes in mathematics at this level.

There is an increasing interest among developed and underdeveloped countries in enhancement of the overall quality of education especially in mathematics in the schools.

Apart from importance of mathematics for the economic benefits it is considered essential to prepare young people for the numeracy demands of increasingly digital society in general and workplaces in particular. Apart from raising the overall skill level of the workforce, proficiency in mathematics lays stronger foundations to skills for lifelong learning which increases the opportunities to post school education.

The need to enhance students' performance in mathematics has led to search for the range of factors that are responsible for hindering or improving students' understanding and achievement in mathematics (Lamb & Fullerton, 2001).

Robbins and Lauver (2004) are of the opinion that many factors affecting learning were identified and investigated in recent years, while the focus was on the adaptation of the strategies for the enhancement of learning in mathematics (Langley & Carlstrom, 2004). Similarly, the leadership of children in school is investigated by Leithwood et al. (2004) and the physical setting by Lamb & Fullarton (2002). Students' attitude, non–availability of qualified mathematics teachers, ineffective teaching methods, lack of students' motivation and uncongenial classroom environment are some of the factors reported as responsible for declining quality of mathematics education and low participation in mathematics education.

It is commonly accepted fact that children spent more time in classrooms of the schools than in their homes. Classroom is the place where students acquire knowledge and learn different skills required to function as a successful and effective member of the society. Kim, Fisher and Fraser (2000) reported that it is the classroom where students develop and expand the thoughtful of their status in the society & the helps which is proposed. In fact, the children gain knowledge and the skills required

to achieve their future goals in the classroom context. Hence it is important to understand the classroom environment, how and in what ways it affects teaching and learning process.

There is less probability that the learning takes place in a vacuum. However, this is an interplay of a number of factors including human, physical and psycho–social elements of the environment. Human factors including teachers, students and administration/management of the school, physical factors such as curriculum, facilities and socio-psychological factors such as interaction between students and teachers, students with peers, social and cognitive support, cultural background of the learners and teacher etc. are few to mention. Teaching and learning entails interaction in the context of learning. Students interact with their teachers, peers and also with the available resources/material. Many investigations have highlighted the issues involved in formulating and shaping teaching and learning environment. All these factors together constitute the classroom environment and it affects teaching and learning process. According to Wubbels, Brekelmans, Denbrok & Tartwijik (2006) teaching is a complicated task which is executed in a complex environment of the classroom. Effectiveness of learning environments has been the subject of many studies. Learning environment and its effectiveness have been studied and researched from a number of different perspectives. Karemera (2003) in a study of relationship between students' satisfaction with academic environment and their performance, found a significant correlation between students' performance and their satisfaction with academic environment and services received.

Teachers have to perform multiple functions of varied nature at the same time e.g. motivating, instructing, organizing, encouraging and helping the learners to achieve their goals are a few to mention. These roles are different at various situations in the teaching process. Many teachers are equipped with only conventional teaching strategies and are unable to perform with advocacy and effectiveness in the classroom. They are mostly deprived of the pedagogical skills. In this reverence Kim (2000) explained the multidimensional role of teachers. Commonly main role that a teacher performs is teaching and imparting knowledge. Many researchers have tried to differentiate disparate

types of teaching activities, like classroom management, learning activities, and behavior control mechanisms to get hold on the complications of classroom dynamics. Many educationists and researchers have studied and analyzed the instructions from various aspects, e.g. interpersonal skills, classroom management, learning activities and recognition of overlaps between all these perspectives. Wubbels & Brekelmans (2005), on the basis of findings of a research on relationship between characteristics of learning environment and teaching behavior with students' results, have emphasized the importance of learning environment in learning. According to Schoenfeld (2004), some investigations were confined to the learners 'cognitive outcomes and their association with learning environment whereas, some studies have focused on association between learning environment, achievement as well as attitudes.

The abstract of the students is made by the teachers role in the classroom context. Both positive and negative attitudes are considerable the results of the teachers' contribution to the students' accomplishments. The impacts are considered as important for the improvement and adaptation of the pedagogical techniques. However, the environment with dim light, noise and disturbance causes lot of issues in learning pace and optimization. The senior management and the competent authority in this regard may accord approval for the further teachers' recommended resources and setting. Likewise, multimedia, Audio Visual Aids and other teaching aids may be imparted in the classroom scenario. On the other hand, there are many chances of distortion and distraction of the concentration due to lack of skills and appropriate strategies for the class.

There is also an emerging trend in studies on teacher effectiveness and teaching to highlight the accessibility of encouraging conditions for learning. For instance, Prenzel Drechsel & Kramer(2001) declared six encouraging conditions for learning namely relevance of content or subject matter, quality and style of imparting instructions, teacher's interests, social affiliation, competence support and support of autonomy. Research results of Kudari (2016) have favored the significance of these situations in connection with the intrinsic motivation of learners. Teaching has been described by

Scgeerens (2007) as a comprehensive set of conditions which may smooth the progress of teaching and enhance the learning of learners.

Opdenakker & Minnaert (2011) stated that the classroom environment can be arranged and organized in such a way that it brings innovation and creativity and does not uphold a negative learning environment. There are various factors which greatly impact on the setting and process of teaching and learning. However, arrangements in the class are very critical for the utilization of the resources in a proper way which also make classroom environment interactive. Skinner, Kindermann &Furrer(2009) explained that the other aspects also contribute to the overall learning in the classroom. The rules set for the students in the classroom along with the energy or the noise level are some of the noteworthy factors influencing the learning in the classroom. To tackle with issues occurring due to deviation of the set rules of the classroom may lead to disturbance and disinterest in the classroom. If the rules are not properly followed up by the instructor, the students violates rules with no proper discipline of the classroom. Worswick (2004) described association of learners with each other, structure of classroom, arrangement of resources, color scheme of the classroom as contributions to the children success in future. The class could be proved effective if the arrangement are conducive. It is not the case that all of the factors will be influential individually. Though, the abilities in learners are achieved and they prosper. Mostly constructivism supports the environment to be conducive. It is because the constructivism suggests that world has no definite meaning which may be tried for the comprehension, relatively the structure and the ways are multifaceted which will decipher and draw inferences in different dimensions for the interpretation of the events and its meaning. According to Cummings (2001) our views about the life and the world vary from individual to individual. The study by Typhoon International Corp (2004) attempted to find out the relation of Australian students on 'What Happened in the Class' (WHICH) and distributed the questionnaire to the mathematic class students. However, it was found that the attitude of learners was related to the

environment scales. A positive association was found between students' attitude to class, teacher support, learner's involvement, task orientation and equity.

In numerous research studies, the assessment of classroom effectiveness was conducted by utilizing questionnaires (Freser & Aldridge, 2000). Similarly, its other versions in different languages were translated and administered by students of middle and high school. 1081 were the students of Western Australia, however, 1879 were form Taiwan which were of grade 7 & 8. Internal 81 to 0.93 for Australians consistency reliability was ranging from 0.85 to 0.90for learners of Taiwan were established. Very often it is observed that pupils are disinterested, inattentive, unmindful and even insincere towards learning in the educational institutions. With some exceptions, poor attendance in the school, playing truancy or copying and cheating in the examination, have almost become a common practice in the schools. This situation is alarming for both the educators and the parents and requires to be addressed. Vallerand & Ratelle (2002) rightly raised the questions that, in spite of possessing adequate ability, why students refrain from using it in an academic pursuit? Why they evade learning which determines their future progress and prospects? Fraser (2012) in a study on motivation and students learning has adopted aa vital approach to provide answers to these and many other questions related to students' low motivation to learn. According to Omidiyan (2006), there is a permanency, energy and orientation in the behaviors of the motivated students. There are 4 factors which influence the motivation level of an individual. First one is context in which individuals act that is environment and external stimuli. Second factor is temper which means the internal conditions of an organism. The third factor is goal which means goal of behavior, purpose and inclination. The fourth factor is instrument which means instrument or means of achievement of goal.

For the achievement of goals, fulfillment of needs and dispositions, it is essential that one has acquired sufficient motivation to initiate and sustain the action required to achieve the goal or purpose. Mohamadi (2006), the same is true for learning anything including mathematics. It is only the motivation which can stimulate the students to complete their assignments in time and

successfully for sake of achievement of goals or for the acquisition of the professionally desired education. Furthermore, these factor which can enhance learning of mathematics and interactive learning environment can play a vital role to motivate the learners for learning and make better achievements. Interactive learning environments have revolutionized education by incorporating technology to engage students actively in the learning process. This shift has significant implications for motivation and, consequently, learning outcomes, particularly in the field of mathematics. Motivation is a critical factor in a student's ability to acquire knowledge and apply it effectively. This essay explores the intricate relationship between interactive learning environments, motivation, and their impact on general learning and mathematics, offering insights from educational research and contemporary teaching methodologies. Interactive learning environments refer to educational settings that employ digital technology, multimedia resources, and interactive tools to facilitate active participation and engagement among learners. These environments encompass a wide range of tools, from online learning platforms and simulations to virtual reality applications and gamified content. Interactive learning environments aim to shift from passive, traditional teaching methods to active, student-centered learning experiences.

Motivation in education is the driving force behind a student's willingness to learn, persist in the face of challenges, and achieve academic goals. It can be broadly categorized into two types: intrinsic and extrinsic motivation. Intrinsic motivation arises from an individual's internal desires and interests, while extrinsic motivation is driven by external rewards or pressures. Numerous theories, such as Self-Determination Theory (SDT) by Deci and Ryan, have explored the role of motivation in education. SDT posits that autonomy, competence, and relatedness are essential for fostering intrinsic motivation. Interactive learning environments, by providing opportunities for autonomy and competence, can enhance intrinsic motivation among students. Mathematics is often considered a challenging subject that requires a high level of motivation to master. A lack of motivation can lead to math anxiety and hinder students' progress in the subject. Therefore, understanding how motivation

functions in the context of mathematics education is crucial. Interactive learning environments in mathematics can be designed to make the subject more accessible and engaging. Gamified math apps, interactive simulations, and online tutorials offer students opportunities to explore mathematical concepts in a fun and interactive way. This engagement can trigger intrinsic motivation as students experience a sense of achievement and competence when they solve math problems or complete tasks in these environments. Interactive learning environments enhance motivation through various mechanisms. Interactive platforms can provide instant feedback on students' performance, reinforcing a sense of competence and progress, which is crucial for motivation. Gamified elements, such as points, badges, and leaderboards, tap into extrinsic motivation by providing rewards for accomplishing tasks. Over time, these extrinsic motivators can help transition students into more intrinsic motivation. Interactive environments can be tailored to individual learning styles and paces, granting students a sense of autonomy and control over their learning experience. By demonstrating the real-world applications of mathematical concepts, interactive learning environments can highlight the relevance and practicality of mathematics, boosting students' motivation to learn. Motivation plays a significant role in shaping learning outcomes in general and mathematics education. Here are some key ways in which motivation influences learning. Motivated students are more likely to persist in their studies and tackle challenging problems. In mathematics, this persistence can lead to a deeper understanding of concepts. Motivation enhances memory retention. Students who are motivated to learn are more likely to remember and apply what they have learned, both in the short term and the long term. Mathematics often requires creative problem-solving skills. Motivated students are more willing to invest the time and effort needed to solve complex mathematical problems. Motivation drives students to delve deeper into mathematical concepts, leading to a more profound understanding of the subject matter. A plethora of research supports the positive correlation between interactive learning environments, motivation, and improved learning outcomes. A study conducted by Ryan and Deci (2000) emphasized the importance of autonomy support in educational contexts. They found

that providing learners with choices and opportunities for self-regulation enhances motivation and learning. Research by Hidi and Renninger (2006) highlights the role of interest in promoting motivation. When students are genuinely interested in a topic, their motivation to learn and engage with it increases significantly. A meta-analysis by Clark and Mayer (2016) demonstrated that multimedia instructional materials, often used in interactive learning environments, have a positive impact on learning outcomes. These materials can be particularly effective in mathematics education. The work of Gee (2003) explored the potential of video games and interactive simulations to engage students and enhance motivation. Games like "Math Blaster" and "Prodigy" have been shown to improve students' math skills while maintaining high levels of motivation. Interactive learning environments have ushered in a new era of education, one in which motivation is a central driver of student success. Motivation, whether intrinsic or extrinsic, is nurtured through engaging and interactive learning experiences. In the realm of mathematics, where motivation is often critical due to the perceived difficulty of the subject, these environments hold immense potential for improving learning outcomes. Educational research consistently underscores the importance of motivation in education, and interactive learning environments offer a promising avenue for fostering motivation and, by extension, enhancing both general and mathematical learning. As technology continues to advance, educators and researchers should continue exploring innovative ways to leverage interactive learning environments to maximize motivation and promote effective learning across various academic disciplines.

2.2   Interactive Learning Environment

2.2.1. Introduction

Teaching and learning do not take place in a vacuum. In formal education setting learning takes place in a physical space which has quantifiable and perceptible characteristics classroom is the place where teaching-learning takes place. It has been estimated that a student spends up to 15000 hours in the classroom during his/her high school education (Fraser, 2001). The students were supposed to

spend their precious and largest time in schools and classrooms where learning happens. However, the learning demands further skills to be inculcated in children for the survival of the individuals in the society.

Kim, Fisher and Fraser (2000) observed that the students get familiar with the rest of the world and understand their role and places as the citizens. The future of the children is decided at this phase of life. The students improve/ develop their knowledge of the required skills of the life. Classrooms is more than merely a physical space. It is a learning situation including factors ranging from physical set up to social, cultural, and psychological factors. Classroom provides a dynamic set up where there is an interaction between the material and teachers. This interaction takes place in a socio-psychological context. Therefore, what goes on in the classrooms, can profoundly affect students learning outcomes. For example, the strategies adopted during the pedagogical process and for interactive teaching by the instructor and also by students with peers, teacher & materials can affect a range of student outcomes. How these factors effects teaching-learning process has long been a subject of study in educational research? Factors including physical, psychological and social orchestrate the teaching learning situation which is also referred to as classroom environment/ learning environment.

2.2.2. Environmental Settings

In 1930, the notion of learning environment was introduced the connection of the physical environment & connections among individuals are key determinants of behavior (Aldridge and Afari, 2013). A lot of work has been done on concept of the setting and consequences. So, the term learning environment has been variedly defined by different educationists and experts. Makin (2003) with reference to early education, defines the term as an aggregate of conditions and influences of various factors both in the school and in wider context of home and community. According to him these factors include; physical environment (such as lay out, material resources), psycho-social factors for example interaction between peers, teacher and students, with family and community at large. The

prevailing concept of learning environment as an aggregate of socio-ecological factors is based on Moos (1974) socio-ecological approach (Velayuthum, Aldridge & Afari, 2013). According to this approach learner and psycho-social elements of the environment are interrelated. Velayuthm, et al., (2013) , Fraser (2012) has identified three dimensions of psycho-social environment namely: (a). the relationship dimension; (b). Development dimension and (c). System dimension. Relationship dimension refers to personal relationships in a given situation their intensity and quality. This dimension includes level of personal engagement of learner, cohesion, cooperation and mutual assistance between learners. It also includes variety of relationships between individuals, teacher support, and tension in relations. Personal growth dimension focuses on opportunities available for personal growth and development. In learning environment this dimension is reflected in the consideration of autonomous learning. In views of Velayoutham et al. (2013), the classrooms are arranged in a way that the there is a control and students are improving and accepting changes and response in a better way. The research on various dimensions of the physical layout of the classrooms exposed that there are environmental factors which are most important factors in determining students' learning (Fraser,2007, 2012). Research evidence has shown persistence linked in cognition and affective area of their personality (Koul, 2003, Fraser, 2007). Hanrahan (2002) in a study on science teaching opined that classroom could affect the students so much that even before engaging in learning activities they may feel alienated. Dorman, Aldridge and Fraser (2006) claim that when there is an understanding of the learners regarding learning environment, their tendency is toward the better performance. However, one can perceive the classroom environmental impact as positive while the students have the feelings of relatedness, are confronted with challenging tasks, and have freedom to ask questions (Bucholz & Sheffler, 2009). A positive environment has a ripple effects which continuously enhance learning (Young, 2014). Young (2014) describes the positive environment as the one in which students find their mistakes funny, enjoy their success, feel empowered and are actively engaged in learning. While talking about the improvements in students their learning is

boosted and they feel more cultivated when they have positive environment in the classroom and their feelings are of enthusiasm and become more positive in social activities. Furthermore, there is a positive response and the learners become more inclined toward the content, hence become wise in selection of the topics and stay updated. The instructions are more utilized in education context with reasoning and concentration.

2.2.3. Interpersonal and Emotional Context of Learning Environment

 Most of the research studies on classroom environment are based on students 'perception of their classroom (Fraser, 2007). However, according to Zimmerman (3008), in recent studies in psychology, there is an increase in the concentration, and it develops capabilities in the learners as a they feel critically significant. It is also suggested for the enhancement of the attentions of the students toward the motivational aspect that it may be paid to those elements of classroom environment which are likely to have impact on motivations (Urdan & Schoenfelder, 2006). Similarly, the components of the learning environment which stimulate or constraint which affect students' self-regulated learning are important and may be studied further (Zimmerman, 2008). The contribution of the schools and places (classrooms) can be seen in the behavior of the lectures as it is affecting and remains an affective domains (Schunk & Zimmerman, 2007). Teachers may create a favorable social environment to enhance motivation and foster self – regulated learning. The investigations were not made on the examination of the diminution of the learning setting. Despite the significance of the setting in learning one can not ignore the environment of the class. The central point of the focus is mainly the impacts of the environment on the students' learning procedures. In views of Fraser (2001), it does not ensure provision of the complete picture involved in the learning procedures.

According to Wubbels, Brekelmans, Denbrok & Tartwijk (2006) teaching is complex tasks which is executed in an equally if not more, interactive learning environment where a number of different factors are influencing both the teacher and the taught. There are multiple jobs assigned to the teachers to perform at a time. He instructs, motivates the students and organizes to gain the goals

properly. However, it is highlighted that the role of the teachers are multifaceted (Kim, 2000). From many prospects, teaching is investigated by many researchers. Hence, the environment was considered as one of the major area of the investigations. The tasks teachers perform are varied in nature. These are preparations of the interventions and study tasks for the student. It is known as the facilitation and collaboration in educational context. The classroom scenario is a very tedious and complex. It requires lot of energy to perform multiple tasks (Fraser, 2012). Maina (2010) observes teachers' actions and the behaviors they show during the period of class. Managing classrooms, designing activity for a lesson plan and other prospective were the certain tasks performed by the teacher for the learning process. Some responsibilities of the teachers are overlapping with others. Brekelmans (2005), inspired by conducting research on learning environment have focused on effectiveness of teaching, connecting the features of teaching with the environment and the outcomes (Wubbels, 2005). According to Schoenfeld (2004), educational effectiveness studies focusing on students' outcomes as indicator of quality /effectiveness of education, have mainly taken into account students' cognitive achievements i.e. in maths and subjects related to learning languages. Whereas, the study examines which is considered environment also as an important factor affecting outcomes, have explored the link of cognition, accomplishment, attitudes and the environment in the classroom. However, the central point for the studies is the setting or environment and its effective impact on the students' learning. It is the focus on the condition provided for the learning. For instance, the there are few conditions that are helpful in learning process. If the relevancy of what is taught, the instructions are with good quality, the teacher takes interests in teaching process, the stakeholders are socially related, the competence is supported and students are autonomous.

2.2.4. Dynamics of Interactive Learning Environment

An interactive learning environment is characterized by an educational setting that actively engages learners in the learning process through dynamic, participatory, and socially-enhanced experiences. In this environment, students are encouraged to collaborate, explore, and interact with both their peers

and the educational materials, fostering a deeper understanding of the subject matter and promoting critical thinking skills. Interactive learning environments leverage a variety of tools and resources, such as multimedia, simulations, gamification, and online platforms, to create a dynamic and learner-centered approach to education, catering to diverse learning styles and enhancing student engagement and motivation.

The interactive learning environment is appreciated by the researchers if this contributes to the learning of the students (Kudari, 2016). Some researchers view the teaching as a process which boosts the students' learning (Scheerens, 2007). The environment plays an important role in the growth of the students, therefore, the environment of the class need dire attentions due to its deep effects. However, the environment may be friendly for the effectiveness of the instructions (Brophy & Good, 2005). The role of the school as place, it is unavoidable in preparation of the children for future, so, this is mandatory for the management to consider the importance and ensure the schools effectiveness which may require precautionary determines. In opinions of some researchers, the class room is a setup where there is arrangement of the chairs, decoration of the walls with art work and the arrangement of the audio visual aids are necessary for the overall learning of the students in particular the slow learners (Opdenakker & Minnaert, 2011). The environment of the class is affected by many things including the layouts and adjustments of the resources and also other factors like social mileu of the classroom. Skinner, Kindermann & Furrer(2009)and Hannah (2013) have described intangible elements of classroom environment which can affect learner's attention, focus and consequently achievement. These include many things like light in the classroom, the noise level nearby the school building. The overall students' accomplishments are not the exceptions in term of the impact by the factors. The attitudes of the learners also get changed with the environmental issues. There can be an emotional environment as well.

The students' promotion is directly linked with the environment provided to the students and the way a teacher behaves. If the control and organization of the resources are perfect, the students' learning

will be optimized. Rest of the consequences are directly associated with the layout of the classroom. Similarly, the physical environment is also critical and play multiple roles in students learning process. It includes many other elements i.e. paintings on walls, light, wall art, resources. All of these are important elements in determining whether the classroom environment will stifle or support learning. These factors can have individual as well as combined effects in determining the quality of classroom environment. It is not always that the all of them equally effects the learning of children, but if they are considered as collectively impactful, the role of these factor is crucial in strengthen a students' ability to learn. Constructivist theory of knowledge states that the comprehensions of role about the interactions and layouts of the classrooms, we found these are very impactful and help us interact socially. Learners experience the real life situations in the classrooms. Maganga (2016) described that understanding is an individual construction hence different individuals comprehend the interactions and the experiences as differently. (Minaret, Boekaertsand Brabander 2007). Constructivist theory says that the learners based on prior experiences, are constructor of their own knowledge, and utilize the learnt things in future. Further, the new knowledge is also developed for the future understandings.

Ryan & Deci (2009) put much emphasis on creativity. In their view the creativity is a pivotal thing for succeeding in life especially in 21st century. Students are required to be creative in the classroom. This is only possible if the environment is supportive to creativity and problem solving. However, the team work and independence in the class are the part of the environment and management of the teachers. If the students are freely involved and critical thinker, there are chances that they will succeed and get good grades at the end. They stressed that schools may work more on kindergarten like pattern since the kindergarten approach helps to develop creativity and therefore suits the needs of this century. Ryan & Deci (2000) contend that digital tools of today if, properly designed, can play an effective role in education. They suggested that schools can adopt different approaches for the promotion of the creativity in the classrooms. Prenzel, Kramer & Drechsel (2001) found that this is

not only the improvement of the skill, rather it is beneficial for the environment and interaction purpose. The learning is considered as important aspect of teaching. In a classroom, it is must for the teachers to ensure the interactive learning in the classrooms. However, the same is supported by the constructivists as they suggest a conducive environment which is friendly to leaning and be supportive to learning. Charles (2005) found that the environment plays a vital role in the overall progress and interactive learning. In his views, there are multiple ways through which we perceive the world. The world is interpreted differently by all of us, it is not the same for all of us. The events are interpreted and deciphered differently by the individuals. Similarly, the knowledge is constructed accordingly. In an attempt to associate the environment with the attitudes of the students in Australia, a questionnaire was developed and distributed to 490 students of mathematics. The results of the study depicted the associations of the students attitudes with the environment. There are certain positive links in the environment and the attitudes of the individuals and the factors were the equity, involvement, and support of the teachers (Fraser & Aldridge, 2000). While investigation on What is Happening in the Classroom (WIHIC), the student of Taiwan and China were investigated on English usage. It ranged from 0.81 to 0.93 in reliability in Australia and same in Taiwan (Fisher & Fraser, 2000). Very often it is observed that pupils are disinterested, inattentive, unmindful and even insincere towards learning in the educational institutions. Save for the few, poor attendance in the school, playing truancy or copying and cheating in the examination, have almost become a common practice for the students. This is indeed a matter of grave concern to the educators and parents. Vallerand & Ratelle (2002) explained that questions naturally come up that, in spite of possessing adequate ability, why children refrain from using it in an academic pursuit? Why they shirk learning which involves their future progress? However, an attempt has been made to provide answers to all these questions by Fraser (2012). Who has adopted a vital approach regarding motivation towards school or academic motivation. temper, goal, and instructions influence the motivation of the students. It was highlighted that the motivation plays an important role in learning mathematics. The

motivation are critical for the classroom context. Mohamadi (2006) found that the achievement of the goals is directly linked with the level of motivation of the students in the class. Hence, according to Omidiyan (2006), the behavior of the individuals is influenced by the level of motivation. Students are more energetic and remain task focused and show permanency.

Interactive learning environment means more hands-on, real-world process of relying information in classrooms. In interactive learning students are invited to do the activities their-self, participate in the conversation, and draw conclusions. Interactive learning is a hands-on, real-world approach to education. According to Stanford University School of Medicine, 'Interactive learning actively engages the students in wrestling with the material. It reinvigorates the classroom for both students and faculty. Lectures are changed into discussions, and students and teachers become partners in the journey of knowledge acquisition.' Interactive learning can take many different forms. Students strengthen their critical thinking and problem-solving skills using a much more holistic approach to learning. Interactive learning can take place across the curriculum with or without technology. It also requires teacher inspiration.

After studying different types and dimensions of the learning environments, the model developed and by Fraser, Fisher, and McRobbie in 1996 and later employed by Myint in 2001, was found most appropriate according to the demand of subject and cognitive and age level of the learners. It comprises of seven distinct subareas essential for fostering an interactive classroom environment while teaching mathematics. These are "Students' Involvement" delves into the depth of student engagement and participation, emphasizing attentiveness and interest. "Students' Cohesiveness" assesses the support and cooperation among learners, which can enhance the overall learning experience. "Investigation" focuses on students' inquiry and problem-solving skills in the mathematics classroom. "Teacher Support" encompasses the guidance, mentorship, and facilitation provided by educators to actively involve students in the learning process. "Task Orientation" emphasizes maintaining concentration and focus on planned activities. "Cooperation" evaluates the

extent to which students collaborate and work together. Lastly, "Equity" is concerned with ensuring fair, just, and impartial treatment for all students, addressing diverse needs and offering equal opportunities. Together, these subareas provide a comprehensive framework for understanding and analyzing the impact of the interactive learning environment on student motivation and engagement in mathematics education. These subareas cover critical aspects of the student-teacher dynamics and the learning process.

2.3   The Concept of Motivation and its Importance

According to Barikani et al. (2003), motivation means 'to move', this is a word derived from the Latin word 'movere' (Syed et al. 2012; Qayyum 2012). However, it is used to mean many different things however in essence it means to trigger, push, stimulate or influence to take an action or to do something to achieve a goal (Carmen & Elena, 2011; Manzoor,2012). Theorists have given different definitions and interpretations of the term (Celikoz, 2010). Whilein Smith and Rupp (2003) opinioned that, the motivation involves the whole participation. In views of Pouchová (2011), it is declared in many studies that the motivation is in fact a will which is shown by the individuals while taking actions. However, it is the term used for the efforts made by an individual (Navarro, 2008). Motivation is considered as an influence on psychology during the procedure of learning (Letham, 2004; Mitchell, 2002). Motivation is considered as energy (Abbas and Khan). However, it is a driving force (Ruthankoon & Ogunlana 2003). It is a behavior which is goal oriented (Armstrong, 2006). According to Eliasa et al. (2012), investigators definitions are not agreed by the authors. The variation of the definition highlights that there are multiple ways through which motivations can be defined, but interpretations of few authors are considered as valid by some researchers.   The motivation is considered as an effort or prioritizing the endeavors to reach to a point or to complete the task for the fulfilment which may ultimately influence the other motivation (Haivas et al., 2014; Dye et al.,2005).

During the last few years, an increasing tendency toward motivation was observed in researchers. According to Riyono et al. (2012), there were many studies conducted on motivation and its impact on individuals. However, the subject matter of motivation is too beaten and debated. In views of Bhat & Shah (2010), the interest is significant for the comprehension of the level of the performing attitude. Bhat & Shah (2010) conducted research on how the performance of the workers can be motivated (Lut, 2012). In Bouwma – Gearhart (2011) noticed a noteworthy interest was found in the scholars of different subjects i.e. sociology and philosophy (Odde, 2011). There are multiple questions in the mind to resolve regarding motivation and efficiency of the employment. It helps in productivity of the work at workplaces. However, the motivation is acknowledged as one of the most important factors in the society and administration. In views of Çeliköz et al. (2010), for the productivity at the workplace, the motivation is considered to be very important factor (Keleş 2012; Syed et al. 2012; Visser- Wijnveen et al. 2012). There is an emotional aspect related to motivation. Khan et al. (2011), this commitments at job places are the important area where motivation plays an important role in productivity. According to Stanislava (2010), there is always a need for the efforts to develop the formulas for the development of the motivation in organizations and it is one of the most invested area. Çınar et al. (2011) views in a different way that there is always a requirement of motivation. Aworemi et al. (2011), the techniques one applies to the workplace and the approach may encounter with failure if the organization has the employee with less motivation. In views of Zaidi & Abbas (2011) There is always a need to adopt new techniques, approaches and models.

Motivation is an essential psychological phenomenon as it is the driving force that propels animals and humans to initiate and sustain an action to achieve a goal. It is considered important for formal as well as informal learning. Research has revealed that motivation helps to engage in a learning task longer and more persistently which results in better performance. The involvement of the student if ensured in the learning scenario, helps teachers optimize the process of learning. Engagement in is

increase if the learners are well motivated and psychologically and emotionally strong to handle the situations. Motivational lectures are also helpful in increasing the overall success of the students.

Motivation is a phenomenon that changes over time depending upon individual's experience with learning activity and circumstances hence it can be developed and enhanced. Research has also revealed that learning environment plays a crucial role in developing and sustaining one's motivation to strive for completion of a task to achieve a goal. According to Heidi & Renniger (2006), it is suggested that there are some facets which enhance the learning with motivation and cause effective learning.

Many scholars and practitioners are regarding the motivation as one of the factors which influences the overall success at organization (Grammatikopoulos et al. 2013). However, the Hierarchy of Needs is one of the significant theories which contribute to the productivity at workplace. The employability becomes smoother if the employees are well motivated. In views of Maslow, there are few important needs for every individual to be more motivated and the care regarding these needs may increase productivity and well investigated theory. These are self-actualization, self esteem, love and belongingness needs, safety needs and physiological needs.

Viorel et al. (2009), the critics also point toward some of the significant areas. There are many different views, opinions and explanations on the nature of motivation hence any claim of understanding the phenomenon and to know the right approach to it is an arguable issue (Nasri and Charfeddine 2012). According to Netotea - Suciu et al. (2012), a variety of the factors are there which are involved in motivating the students. According to Barbača and Zekan (2011) the productivity at classrooms is dependent on motivation.

All the individuals are different in their capacities and performances, the level of motivation is also varying in individuals. However, to make him/her to initiate and sustain an activity leading to achievement of goals, requires that the phenomenon of motivation and how it works is fully understood. Such an understanding will then help to better categorize the subjects as per their needs,

disposition and environment and take the right type of determines to develop or enhance their motivation. Individuals vary in their needs and disposition hence their will be a significant difference in the requirements of different individuals. The responses of the individuals also vary from individual to individual as some do not response. Hence, there is the variety to gain the desired purpose (Greer, 2013). Quite the reverse, there are individuals who initiate, sustain and complete a task when there is some external reward like appreciation, grade, promotion etc. Both kinds of motivation have their importance in learning as well as at workplace. Psychologists have identified both the types of motivation (intrinsic & extrinsic) each of them have their characteristic features and pros and cons.
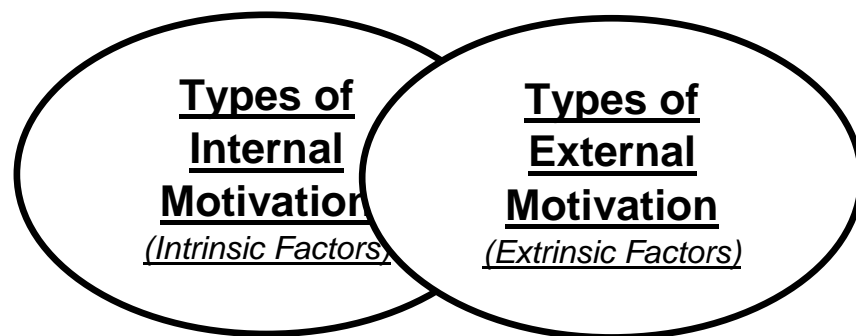
Figure 2.1 Intrinsic VS Extrinsic Motivation (Greer, 2013)

2.3.1. Intrinsic Motivation

There are number of different motivational systems that exist in both human beings and animals. For example, there are systems that drive an organism to eat, to protect themselves, explore and manipulate their environment that leads to curiosity and engagement in different activities. (Ryan & Deci, 2000). The motivation for these activities come from within to satisfy a need regardless of any external reward. There are a number of theories about the nature of intrinsic motivation and how it works. According to one of the most recognized theories intrinsic motivation is based on individual's basic biological needs such as food, water, protection etc. which act as driving force behind their actions.

Beside basic biological needs individuals have psychological needs that are important to develop and thrive. For example, the desire/need for autonomy, relatedness and competence are few to mention. There are multiple needs of an individual which are categorized differently like some of them are undergoing certain changes.

Individuals perform a specific task in response to some stimuli. The within motivation is known as intrinsic and the tasks are performed according to the beliefs of an individual. This is an important factor because they fulfill a desire. Therefore, the activity or action itself is the motivation. The human desire is deeply rooted and highly motivated. These deep-rooted desires that almost all individuals have for example, the desire to: know, be accepted by others, etc. a brief description of various desires which act as motivators for our actions and behaviors is given below.

a.   **Challenge:** Individuals feel motivated to pursue an activity to achieve a goal which has personal importance and success for achieving the set goals is probable, yet inevitably certain.

b.   **Curiosity:** Curiosity could result from a sensory experience that is something in the physical environment attracts our attention and we feel motivated to know more about it. It could also result from some cognitive experience like an activity that we find interesting and feel stimulated to know more about is. Both the sensory and cognitive curiosity enhance our motivation.

c.   **Control:** The desire to have control of oneself and one's environment is another important factor in enhancing intrinsic motivation. According to cognitive evaluation theory events which are effecting persons' experiences autonomy diminish intrinsic motivation (Ryan & Deci,2000)

d.   **Competition:** This is the gaining of the contentment while assisting other while accomplishing a goal can enhance one's motivation. A healthy

competition where people are comparing their routine tasks with others, is a motivating factor.

e. **Recognition:** Appreciation and recognition of one's accomplishment by others can also increase intrinsic motivation.

f. According to self-determination theory there are three important socio-context variable that enhance or impede intrinsic motivation. In views of Deci (2000), these variables are core requirements of the psychology and autonomous understanding. According to research findings, the core psychological needs play a critical role in many aspects of persistence, human fun and achievement of high school students (Vansteenkiste et al, 2004).

g. **Autonomy:** Autonomy is a psychological need of individual for having a choice in initiation, maintenance and regulation of activities. In a classroom situation autonomy works as a continuum from most autonomous to the least autonomous and more controlled environment. According to cognitive evaluation theory events or circumstances which restrict an individual's freedom to choose the activity and mode of performance diminishes intrinsic motivation (Ryan & Deci, 2000).

h. **Relatedness:** Having feeling of being cared and valued by others provides an incentive to perform tasks that are considered important by significant others. It also supports intrinsic motivation (Deci, 2000). Feeling of relatedness with parents and teachers causes great effect on the motivations and participations of students. Research has shown that relatedness with parents enhance behavioral engagement whereas relatedness with teachers improve emotional engagement. However, relatedness with peers has least effects on engagement (Furrer& Skinner, 2003).

i. **Competence:** The feeling of having the ability to perform a task is the third important psychological need which if fulfilled has positive effects on motivation. Jang et al, (2009) in their study found that competence is connected to the inner motivation (intrinsic) in Korean students. Research has revealed that fulfillment of these three innate psychological needs results in many positive outcomes such as, persistence, low anxiety, persistence and high performance (Black & Deci, 2000).

2.3.2. Extrinsic Motivation

When the motivation to perform a task or take an action comes from external sources to obtain a reward or avoid undesirable consequences, it is termed as external motivation. Contrary to intrinsic motivation which involves personal satisfaction and enjoyment external motivation is least self- determined. Actions performed in response to external motivation are regulated by some pressure, obligation or constraints coming from external sources. The external factors could be teacher, school requirements, or even pressure from peers. The behaviors which result in response to external stimuli are sustained as long as the controlling factors are operative. However, the individual may find the activities regulated by external stimuli interesting and joyful or fulfilling and no more an unavoidable obligation and maintain the activity in the absence of controlling factors. Copeland, Pattie and Deci (2010) have presented self-determination in the form of a continuum. They have placed the least self-regulated externally regulated behaviors on one extreme of the continuum and most self-determine behaviors resulting from intrinsic motivation on the other extreme.

Deci et al (2001), have identified four sort of motivational aspects, these are identified regulations, external regulation, integrated regulation and introjected regulation. This

categorization is based on the extent to which a behavior or action is extrinsically regulated.

a. **External Regulation:** The motivation is considered as extrinsic. This is the least self- determined in nature. Behaviors which are controlled by external factors to gain adverse results which are maintained and sustained as long as the controlling factors are operative hence are short lived.

b. **Introjected Regulation** Sometime internal pressures such as ego or feelings of guilt control our behavior. This type of control is termed as introjected regulation. Although the stimuli are internal yet are in control and remain under pressure. Activities associated with introjection are not performed for enjoyment or pleasure they are performed to prevent negative self esteem. The intrinsic motivation is about the internal aspect of the motivation as the individual does not really want to perform these activities or choose them these are regulated by internal pressures.

c. **Identified Regulation** Behaviors associated with identified regulation are motivated by external stimuli but the goals that are to be attained are endorsed and valued by the individual. The motivation is extrinsic but the behaviors are self-determined. Most self-determined and yet externally motivated behaviors are associated with integrated regulation. Regulation of behavior through integration means that the behavior and goals are not only valued by the individual but are also coherent and in harmony with other aspects of the self. However, the motivation is still extrinsic but the behavior is self-determined. Deci et al (2001), have placed intrinsic motivation on far right of the continuum of self - determination and separate from other forms of self - determination associated with extrinsic motivation. Intrinsic motivation is

inherent to the individual and is not a result of internalization or integration. The rang of the self-determination requires examining of the internal part of examination.

2.3.3.   **Amotivation**

Taking of an action or showing performance in a state of lacking motivation. . This could be due to either perceived lack of competency or failure to see any connection between actions and outcomes. This may lead to the feelings of incompetence and uncontrollability. Amotivation may also result in productivity despite there is a failure.

SECTION 2

Theories And Models Related to Variables

2.4   Types of Learning Environment

Creating an interactive learning environment is a complex and multi-faceted endeavor that involves various factors, strategies, and considerations. An interactive learning environment is one that is conducive to learning, promotes engagement, supports diverse learners, and facilitates the achievement of learning outcomes. In this comprehensive discussion, we will explore the key components and characteristics of an interactive learning environment, drawing on research and educational theory to provide a well-rounded perspective. Ambrose. et. Al, (2010) discussed that an interactive learning environment is a setting in which learners can acquire knowledge, skills, and competencies in an efficient and meaningful manner. Such an environment goes beyond physical infrastructure and encompasses psychological, pedagogical, social, and cultural dimensions. To understand what constitutes an interactive learning environment, we can examine these dimensions in detail:

2.4.1   Physical Environment

The physical environment refers to the tangible aspects of the learning space, including classrooms, labs, libraries, and online platforms. An interactive physical environment should provide the following features:

2.4.1.1 Safety and Comfort: According to researchers like Wubbels and Brekelmans (2005), students must feel safe and comfortable in their learning space. This includes physical safety (e.g., well-maintained facilities) and emotional safety (e.g., freedom from discrimination or harassment).

2.4.1.2 Accessibility: The physical environment should be accessible to all, including students with disabilities. It should comply with accessibility standards and provide accommodations when necessary (Burgstahler, 2015).

2.4.1.3 Resource Availability: Learning resources, such as textbooks, technology, and materials, should be readily available and up-to-date (Christensen et al., 2013).

*2.4.1.4 Flexibility***:** Flexibility in the physical environment allows for different types of learning activities. Spaces should be adaptable to accommodate various teaching methods, including group work, hands-on experiments, and lectures (Barrett, Zhang, & Moffat, 2013).

*2.4.1.5 Technology Integration***:** Modern learning environments should integrate technology interactively. This includes access to computers, the internet, and educational software that enhances learning (Hodges et al., 2017).

*2.4.1.6 Environmental Sustainability***:** Green and sustainable design principles can create a healthier and more eco-friendly learning environment (Johnson, 2018).

2.4.2   Psychological Environment

The psychological environment encompasses the emotional and motivational aspects of learning. An interactive psychological environment should:

*2.4.2.1 Foster Motivation***:** Self-determination theory (Ryan & Deci, 2000) highlights the importance of intrinsic motivation. Interactive learning environments should nurture students' sense of autonomy, competence, and relatedness to enhance their motivation.

2.4.2.2 Support Emotional Well-being: Emotional well-being is essential for learning. Learning environments should provide emotional support, counseling services, and stress management resources (Durlak et al., 2015).

2.4.2.3 Cultivate a Growth Mindset: Encouraging a growth mindset (Dweck, 2006) can help students develop resilience and a willingness to embrace challenges. Interactive feedback and a positive learning culture can foster a growth mindset.

*2.4.2.4 Promote Belongingness***:** A sense of belonging is crucial for student success (Walton & Cohen, 2007). Learning environments should be inclusive and respectful, ensuring that all students feel they belong.

*2.4.2.5 Set Clear Expectations***:** Transparent communication of learning objectives and expectations reduces anxiety and fosters a positive learning environment (Ambrose et al., 2010).

2.4.3 Pedagogical Environment

The pedagogical environment pertains to teaching and instructional strategies. An interactive pedagogical environment should:

*2.4.3.3 Emphasize Active Learning***:** Active learning methods, such as problem-solving, group discussions, and experiential activities, engage students more deeply in the learning process (Freeman et al., 2014).

2.4.3.1 Differentiated Instruction: Catering to diverse learning needs is essential. Differentiated instruction (Tomlinson, 2001) adapts teaching methods, materials, and assessments to individual students or groups.

***2.4.3.2 Provide Constructive Feedback*:** Timely and constructive feedback (Hattie & Timperley, 2007) helps students understand their progress and areas for improvement.

***2.4.3.3 Foster Critical Thinking*:** Interactive learning environments promote critical thinking and problem-solving skills. These skills are essential for lifelong learning and adaptability (Paul & Elder, 2006).

***2.4.3.4 Support Inquiry-Based Learning*:** Encouraging inquiry-based learning (Blumenfeld et al., 1991) enables students to explore topics, ask questions, and seek answers independently.

***2.4.3.5 Connect to Real-World Relevance*:** Demonstrating the real-world relevance of content can increase student motivation and engagement (Dewey, 1938). Students should understand the practical applications of what they are learning.

***2.4.3.6 Promote Peer Learning*:** Collaboration and peer learning (Springer et al., 1999) can enhance students' understanding and problem-solving skills.

2.4.4 Social and Cultural Environment

The social and cultural environment relates to the interpersonal and cultural dynamics of the learning community. An interactive social and cultural environment should:

2.4.4.1 Encourage Collaboration: Creating a collaborative culture (Vygotsky, 1978) where students work together, share knowledge, and learn from one another fosters a supportive learning common.

***2.4.4.2* Celebrate Diversity:** Embracing and celebrating diversity (Banks, 1993) by promoting cultural awareness and inclusivity enriches the learning experience and prepares students for a multicultural world.

***2.4.4.3 Support Cultural Sensitivity*:** Building an environment that is culturally sensitive and respectful (Gay, 2002) helps students appreciate different perspectives and engage in meaningful cross-cultural dialogue.

*2.4.4.4 Promote Global Awareness***:** Exposure to international perspectives and global issues (Merryfield, 1995) can broaden students' horizons and prepare them to be responsible global citizens.

*2.4.4.5 Provide Leadership Opportunities***:** Offering opportunities for students to take on leadership roles within the learning community can empower them and enhance their sense of responsibility (Komives et al., 2009).

2.4.5   **Technological Environment**

In today's digital age, technology is an integral part of learning environments. An interactive technological environment should:

*2.4.5.1 Ensure Access to Digital Resources***:** Equitable access to digital resources, including devices and internet connectivity, is crucial (Harrison et al., 2016). Addressing the digital divide is essential to prevent disparities in learning.

*2.4.5.2 Offer Blended Learning Opportunities***:** Implementing blended learning (Graham, 2006) by combining in-person and online learning experiences allows for flexibility and accommodates different learning preferences.

2.4.5.3 Leverage Learning Management Systems (LMS): A robust Learning Management System (LMS) can help organize course materials, assignments, and assessments. It streamlines communication and collaboration (Picciano, 2017).

*2.4.5.4 Use Educational Apps and Tools***:** Educational apps, tools, and platforms (Means et al., 2013) can enhance engagement and interactivity. These resources include virtual labs, simulations, and collaborative software.

*2.4.5.5 Support Data-Driven Decision-Making***:** Data analytics can monitor student progress and identify areas where additional support may be needed (Arnold & Pistilli, 2012). Data-driven insights can inform instructional adjustments.

*2.4.5.6 Ensure Digital Literacy***:** Promoting digital literacy skills (Eshet-Alkalai, 2004), including digital citizenship, information literacy, and online safety, is essential for navigating the digital landscape interactively.

*2.4.5.7 Address Privacy and Security***:** Prioritizing the privacy and security of student data (Mishra & Koehler, 2006) is paramount. Compliance with relevant data protection regulations and best practices is crucial to safeguarding sensitive information.

An interactive learning environment encompasses various dimensions, each contributing to the overall quality of the learning experience. While this discussion has provided a detailed overview, it's essential to recognize that interactive learning environments are context-specific and may vary depending on the age group, subject matter, and cultural context of the learners.

Creating such environments requires collaboration among educators, administrators, designers, and policymakers, and it necessitates ongoing assessment and improvement. By integrating research-based practices and considering the physical, psychological, pedagogical, social, cultural, and technological aspects discussed here, educational institutions can cultivate environments that empower learners, promote academic achievement, and prepare individuals for success in a rapidly changing world.

2.5.   Learning Theories Related to Learning Environment

It is very difficult but important for the teachers to create interactive setting where learning prevails. The authentic method's provision is almost impossible for many for creating interactive learning environment because learning environments were developed to best fit and assist the specific learning theory. There are multiple theories which come up with many suggestions on the process of learning. These theories cause lot of changes in social and cultural arena of the students' life. The philosophical area of the learning and pedagogy are mostly defined by the environment. The material and the conditions of the learning, the curriculum and the social context vary in different contexts. However, there is an association in the leaning theories and their descriptions as these are supportive to each

other in many cases. Each theory has characteristics which are shared in some ways with the others. The learning environment becomes interactive and conceptualized if the physical context is well designed. The enhancement of the knowledge, improving skills, understanding the complex phenomenon and improvement of skills is known as learning. These abilities are either active or passive in nature. This also takes conscious and unconscious efforts. Learning to jump is an active and conscious learning, while breathing while sleeping is an unconscious thing. The environment/ setting for the learning can be different for different individuals. These settings can be formal and informal i.e. interactive sessions, interviews, classrooms and autonomous learning at home. The theories support learning are known as learning theories. Behaviorism, cognitivism and constructivism are the famous theories of learning.

2.5.1. Behaviorism

There are multiple learning theories which have different features. Psychologists of 19th and early 20th century considered that the phenomenon of learning starts after the birth as we born with no inborn capabilities. Tabular rasa is a Latin term, used for the blank slate which means human newborn baby has nothing in his mind when he is born, however he is nurtured through the behaviors in the environment. According to Squires & McDougall (1994) and these behaviors are either positive or negative reinforcements. Skinner (1904-1990). the main advocate of the theory called behaviorism. In views of Behaviorists, the learning is demonstrated through exposition of an individual to an external stimulus which changes the action and the desired response occurs. There are two ways of responses either the reinforcement is rewarded with a reward or it is not rewarded as an undesired response. The theory is well supported by the experimentation and does not consider cognitive and other processing like affective as this is something which is not possible to observe. Visible/ operant changes were observed in the behaviors of the individuals during the experimentation. Harzem (2004) considers the authority (teacher) as responsible for the transformation of the knowledge. The transformation is, hence considered as absolute phenomenon.
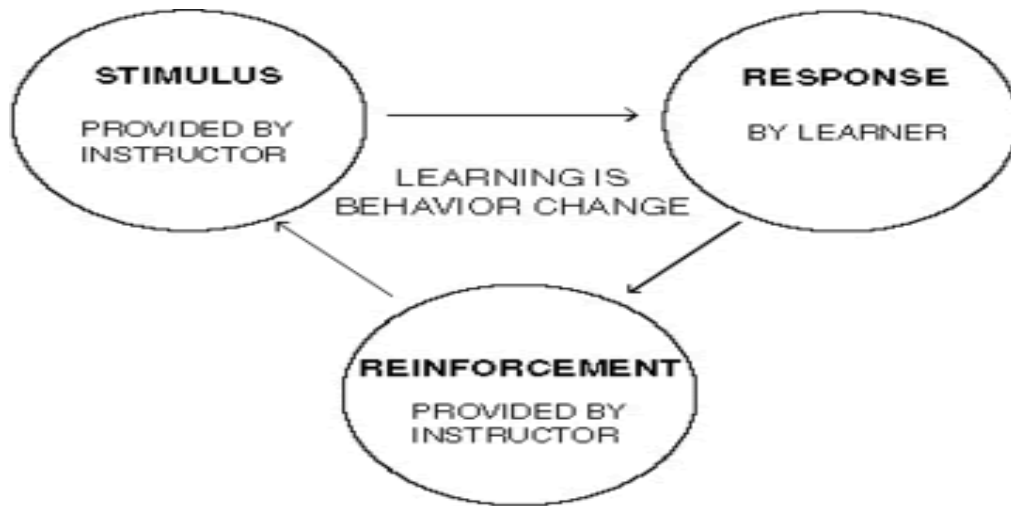
Figure 2.2 Behaviorism

The behaviorism promotes the traditional teaching practice in the class which suggests the teaching techniques like lecturing and teacher centered approaches. Its focus remains on 'carrot and stick' for the positive and negative reinforcements (reward or punishment). For the behavior modifications, teachers are to adopt any one of them. According to Henry Ford's opinion, learners are provided an environment where there is a single building with multiple *stories*. The learners are moving with the emerging to the other classes until they are finished product. In views of Bennet & Le Compte (2001) the flexibility is not provided and the teacher remains an authority in the class.

2.5.2. Cognitivism

There is another theory known as Cognitivism. After the criticism on the B.F. Skinner's Behaviorism, the cognitivists with a new school of thought found that the learning is not accounted in all aspects by the behaviorism. Gagne (1984) states that the researchers rejected this approach by claiming that it does not include the cognition as a process for learning. However, problem solving, memorization and thinking were ignored during the learning process and the focus remained on the human behaviors only. Alternatively, while explaining the learning procedure, the mental process is focused by the theory of Cognitivism. The cognitivists believe that the mind is explore-able and the newborn baby born with inborn knowledge. The human mind is considered as 'black box' that requires further explorations. Semple (2000) states that the mind works like a computer as it received command and

process for the behavior, similarly, human mind need to receive information to process for further behavior. The 'schema' is the construction of the knowledge according to behaviorists. Schemata is responsible for the changes in learning of the individuals. There is not a passive role of the learner. He is supposed to be the active character in learning process and his participation remains active through out the learning process. Environment of the school promotes curiosity and inquiry are the important aspects of the learning procedure. However, there are some similarities of the schools of the thoughts. Cognitivists also consider learning as objective and absolute like the knowledge is considered by the behaviorists. The schools buildings are mostly with two or various walkways linked for the interaction to the outdoors.

The interior of the classrooms is similar to the other classrooms. However, the corridors, and walkways are unlike other building. The students are allocated according to their scores and categories. Furthermore, the teacher's place is again In front of the class and his role is considered as active in the learning process.

2.5.3. Constructivism

The behaviorists approach toward learning was again challenged and criticized by the constructivists as another broader school of though in psychology. Constructivism is of the opposite opinion to the claim of behaviorist who assume mind as a blank slate (tabular rasa), the constructivism posits that the learning is not a process of acquiring, but it is construction of knowledge. In views of Syed, Anka Jamali & Shaikh (2012), the level of the development in society, culture and the background an individual has, helps in construction of the knowledge of the individual. The knowledge is constructed through experiences and with the development in cognition (Boyle, 2004).

Jean Piaget (1896-1989) articulated the mechanism through which the knowledge is internalized (Swift & Hwang, 2013). The learning is interpreted by the experience and knowledge constructed and based on the prior/existing knowledge of the learners. In views of Semple (2000), the learning is modeled as a procedure which is active rather than passive. The school of thought of constructivists

contradicts with cognitivism as the emphasis of cognitivism is not on individual. The constructivism emphasizes the individual's nature and construction of knowledge during learning process. The interactions are considered as important factors of learning and the role of learners in learning is critical as the responsibility lies on learners' mayers.
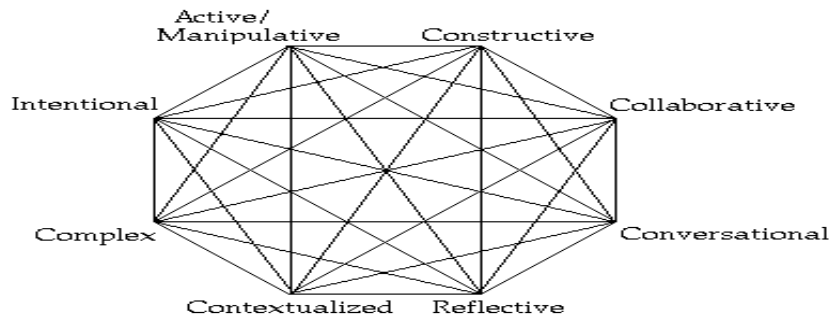
Figure 2.3 Constructivism

The setting of the learning/ environment is unlike other theories. It promotes collaboration, cooperation and experiences. The classrooms are designed in way that these are student centered. The teachers' role as instructor is transfer to a 'facilitator'. Brain based theory is another learning theory emerged recently by the neuroscientists (Szczepanowski, Wierzchon, Traczzyk, & Cleeremans, 2013). The establishment of the theory and its findings are concerned with the function of brain and it proposed that learning occurs in a better way if the environment is social, safe and comfortable. From the very beginning, the environment for such learner is not at huge level. The schools of thought which implemented constructivism are rare. In 1990s, in Texas, The Nola Dunn Academy in Burleson adopted brain based learning philosophy and it can be considered as an example of such school. This school was located in an oldest building which is 40 years old. The brain based learning was implemented in the school and succeeded in management in passing test scores over 25% state average. The academy adopted certain required changes in the environment for learning.

The building housed different interactions which are suitable for peer-learning and provided different spaces to different teams of learners. The environment is made emotionally safe and stimulating which is comfortable for learning as it sets the environment like a living room. Students are not

supposed to be restricted to their classrooms, rather they are free to sit and read at any place of their choice. They may learn

2.5.3. Social Cognitive Theory

Another theory of learning was presented by Bandura in 1986. It considers the reciprocal constructions of the functions of human through environment and personal influence. According to this school of thought, the belief and though are the personal influences which are also constructing human functioning. Environment and behaviors are the other series of interactions. Classroom and self regulatory are the examples of environment and behaviors. The theory discusses the personal (beliefs) environmental (classrooms) and behavioral (self-regulations) determinants. The human actions are the source of development. Human agency is considered as engaging in development of the abilities. The self beliefs are the controlling factors which make a learner exercise something. Bandura views that the thoughts influence the human as agents and they control the thought as well. The cooperative learning and constructivism are the theories provided with the foundation by integral theory. The focus of the social cognitive theory is on the individual and it demands the behavior changes as interventions. Environmental factors are also very important in consideration of this theory. Many teachers undermine the environmental factors and require certain changes in the classrooms. Hence, there is also a need to work on emotional aspect of the personality of the learners.
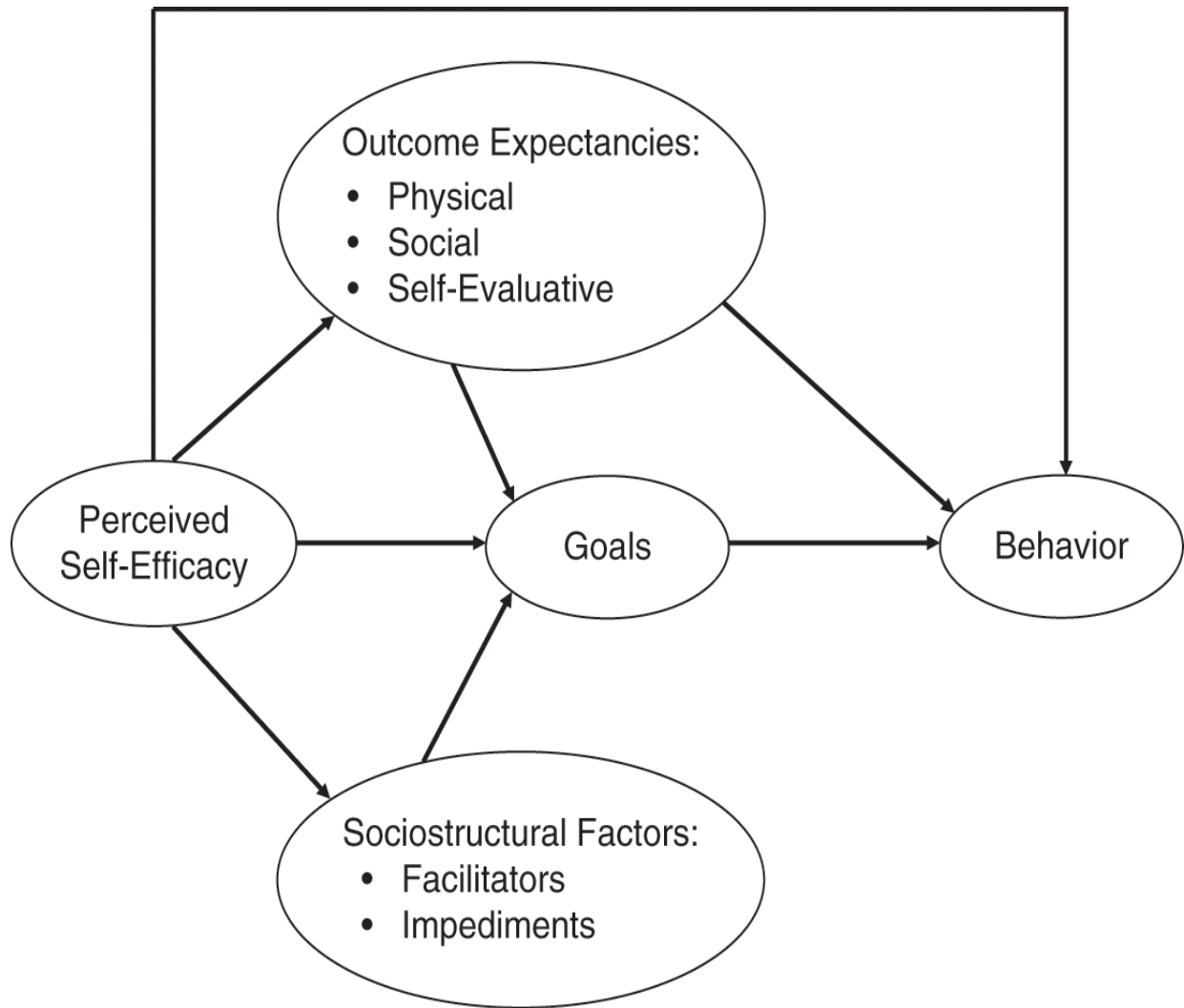
Figure 2.4, Social cognitive theory

2.5.4. Overview of Learning Environment Researches

Different approaches were utilized to determine the relationship between learning environment and the learning. Utilization of students & teachers' perceptions about learning environment is one of the most common approach to assess learning environment (Fraser, 2012). Other methods include direct observation of the classroom events by an external observer or by participants. Incorporating the perceptions of students and teachers as part of a broader assessment strategy can provide a well-rounded understanding of the learning environment's strengths and weaknesses. However, it's important to recognize that while these perceptions offer valuable qualitative insights, they should ideally be complemented by quantitative data and objective observations to ensure a more comprehensive assessment. Low inference

determines tap specific events in the classroom e.g., amount of teacher talk, and/or number of students' questions etc. Perception studies focus on high inference variables such as students' judgement of teacher's support, fidelity or students' autonomy to take an action (Graetz). In research on learning environment qualitative as well as quantitative methods are used. There are a number of studies which use both qualitative as well as quantitative determines to assess learning environment.

According to Smith & Pelligrini, (2000) during the last 3 decades, learning environment was internalized and diversified. Aldrige and Fraser (2000)has reported nine classroom environment assessment instruments which are based on three dimensions of learning environment. There are as follows:

a) The learning Environment inventory (LEI)

b) Classroom environment Scale (CES)

c) My Class Inventory (MCI)

d) Individual Classroom Environment Questionnaire (ICEQ)

e) College and University Classroom Inventory (CUEI)

f) Questionnaire on Teacher Interaction (QTI)

g) Science Laboratory Environment Inventory

h) Constructivist Learning Survey (CLS)

i) What Is Happening In this Classroom (WIHIC)

In 1960s, LEI was developed by considering the Walberg's contribution. According to Harvard Project Physics, Learning Environment Inventory was developed which modified the one hundred and five items.

After analyzing all models and instruments based on those models "What Is Happening In This Class? (WIHIC) Interactive Learning Environment questionnaire was adapted.

Although the WIHIC is a relatively new instrument, it has been utilized in Asia frequently. It has been translated into several Asian languages and cross-validated. An English version has been cross-validated in Brunei Darussalam with samples of 644 Grade 10 Chemistry students (Riah & Fraser, 1998) and 1188 Form 5 science students (Khine & Fisher, 2001). Three studies have validated and used an English version of the WIHIC in Singapore. Chionh and Fraser (2009) reported strong validity and reliability for both an actual and a preferred form of the WIHIC when it was responded to for mathematics and geography subjects by a sample of 2310 students in 75 senior high school classes. Khoo and Fraser (2008) used the WIHIC with a sample of 250 adults attending computer courses in 23 classes in four Singaporean computing schools. Peer and Fraser (2015) used the WIHIC with 1081 primary science students in 55 classes. A Chinese version of the WIHIC has been developed for use in Taiwan and cross-validated with a sample of 1879 junior high school students in 50 classes (Aldridge & Fraser, 2000; Aldridge, Fraser & Huang, 1999). Chua, Wong, and Chen (2011) developed a Chinese-language version of the WIHIC based on the Taiwanese version of Aldridge, Fraser, and Huang (1999). This is a bilingual instrument with every item presented in both English and Chinese. Detailed procedures were used to develop this Chinese version, which was cross-validated with a sample of 1460 students in 50 classes. The WIHIC has been translated into the Korean language and validated with a sample of 543 Grade 8 students in 12 schools (Kim et al., 2000). The WIHIC has been translated into the Indonesian language and used with university students in computing-related courses. The validity and usefulness of the WIHIC have been established for samples of 2498 university students in 50 computing classes (Margianti, Fraser & Aldridge, 2001) and 422 students in 12 research methods classes (Soerjaningsih, Fraser & Aldridge, 2001). Also, the WIHIC was used with 594 students from 18 classes in Indonesia, and 567 students from 18 classes in Australia are investigating the strength of the associations between students' perceptions of their classroom environment and

their attitude to science (Fraser, Aldridge & Adolphe, 2010). The WIHIC has been cross-validated and used in several studies in North America among:

a) 573 elementary science students in Florida by Pickett and Fraser (2009)

b) 525 girls prospective elementary teachers in a large university in California by Martin-Dunlop and Fraser (2008)

c) 30 National Board Certified secondary school teachers and 927 students in Miami, Florida by holding and Fraser (2013)

d) 172 kindergarten students and 78 parents in Florida by Robinson and Fraser (2013)

e) 661 middle-school mathematics students in California by Ogbuehi and Fraser (2007)

f) 1434 middle-school science students in New York by Wolf and Fraser (2008).

It was also used by Myint (2001) to explore the prevailing practices regarding interactive learning environment. Aldridge & Fraser (2000) designed the instrumentation on the environmental impact which is known as WIHIC and incorporated certain scales needed for proving significance predicator for the overall outcome. These additional scales were modified and also utilized to determine the existing concerns of the teaching practice i.e. equity and fairness. Other scales were utilized for the cohesiveness, involvement, support, orientation and cooperation. (Myint, 2000). Interactive learning environment will be an independent variable in this research. It was used by Myint (2001). It was named as WIHIC that It indicates 7 subareas of the environment which makes the class room environment interactive. These subareas are:

2.4.7.1 Students' involvement

According to Mckee & Brooks, (2011), the energy given physically and psychologically in the schools is referred as the involvement of the students. The engaging behavior of a teacher plays a prime role in the overall growth of the learners of his/her classroom. The academic and class participation is vital in regard to the

improvement of the skills and accomplishment. Students with high self-esteem are more involved in the learning and remained more involved in the classroom activities. As they are confident, their self-esteem level is high because of the image they have about themselves (Astin 1984). The environmental issues are always factors affecting the learning in academic context. Involvement may be of different types and at different levels. Involvement could be scholastic, such as spending considerable energy and time to studying, participating in class room activities and involvement and interaction with peers for the validation of the thoughtful idea or staying for long hours in the campus interacting with students and faculty. Involvement also includes participation in extra-curricular activities such as engaging in activities of student organizations. Students' involvement can have significant impact on their experience. Students' involvement reflects the extent of their attentive interest. This workhorse strategy is easy to use and effective in achieving most of the goals. Research has shown that student involvement makes significant contribution in positive outcomes of undergraduate college student experience (Foubert & Grainger, 2006).

2.5.4.1. Students' Cohesiveness

The sense of oneness in a form of group or the binding of the students in learning process which brings solidarity and makes the students hang together is the cohesiveness from students' part. They are tightly knit to show a mutual conduct and remain supportive to one another. Group cohesiveness refers to the characteristics of the group which effectively binds group members to one another gives a feeling of solidarity and oneness and to the group as a whole (Hysa, 2016). Summarizing the descriptions of cohesiveness given by different authors e.g. Wagner and Hollenbeck (2010) Myer (2010) cohesiveness can be described as the degree to which group members on the basis of some common characteristics (knowledge, background,

mentality etc.) They feel connected and remain in contact as a group & strive to remain together. Attractiveness is the key factor in cohesion. Operationalized and socialized students are the cohesive students in a group during the learning process. Socialization among group members referred to as social cohesion is dependent upon similar knowledge background, mentality, values etc. (Hysa, 2016). Once social cohesion is developed, operationalization cohesion or task cohesion can be established resulting in group members performing a task together to achieve a common goal.

In classroom situation the cooperation of the students with each other while they are supporting each other during an activity. They become more productive and take help from the peers. The experience is gained from class fellows who help each other while learning. Moreover cohesiveness is considered as a system which organizes and produce the units called groups. The groups are supportive in making students share the common objectives and perform tasks together. The team work is performed with each other's help which ultimately helps students improve their collaboration skills and they get trained for the future life and become task oriented (Tsai, 2003).

2.5.4.2. Investigation

In the literature investigation, inquiry, experiment, practical activity /work have been used interchangeably. All these terms refer to learning through experience. Miller's point of view is different about the practical activities. The students given freedom to choose the tasks of their own choice. They are not provided with the instructions on the content and design questions to address themselves. The activities are multiple and sometimes the characteristics are defined. They are trained on the outlines and analysis but the instructions are not clear. These activities are including investigations, experiments, and some practices (Miller, 2010).

According to constructivism, the persons construct their knowledge by connecting the ideas and experience with the knowledge the possess. According to Brandford et al. (1999) this assists them construct and form the comprehension of the matter. (Bransford et al., 1999). According to Piage and others like Vygotsky, and Bruner, the learning is a cognitive process which is an active rather than passive in nature.

The learner's involvement is the central focal for the modern teaching. Many teachers are not performing well as they are not updated with the new knowledge and skills regarding pedagogy. They apply too beaten strategies which are conventional and rejected by many educationists in past few years. However, the learners are responsible to construct the knowledge and ideas. This process involves either assimilation of new information into an existing framework, or modifying the existing knowledge to accommodate new information. Investigative approach promotes active learning as during investigation process learners have to make links in existing information and create their mental model for further construction of the understandings and knowledge. Investigative approach promotes active learning involve the kind of cognitive activity deemed necessary for learning. The knowledge is gained through learning actively. The problems are also solved through the construction of the ideas and inquiry skills. The development of problem- solving skills is fundamental to intellectual development and are vital for 'learning how to learn".

The investigative learning strategies provide opportunity to apply the skill of inquiry and their use in problem solving and investigation. This promotes the long termed learning of the individuals and makes learning easy by imparting effectiveness. The decision making and collaboration along with communication are the other skills which are promoted through this sort of learning. The individuals are given opportunities to get teacher support, task orientation, cooperation and equity (Wong, Hodson, Kwan &Yung, 2008).

2.5.4.3. *Teacher support*

According to Windschitl, Thompson & Braaten (2007), only a teacher is the person who can manage the classroom by setting the tone, building the effective environment. The students are supported and nurtured in a way that they feel mentored. The teachers as a role model extends support in enabling students handle difficult tasks and improve the confidence level. The support provided to enhance overall learning and skills. The role of a teacher is unavoidable in the classroom and his support is considered as an affective thing for the learning process. Teacher support refers to a variety of functions and creating a conducive environment.

Teacher's support as used in   research on classroom   environment refers to students' beliefs regarding their teacher's attitude towards the student   e.g. the teacher cares about them, and has developed personal relationships with them and values the relationship (Fraser cited in Patrick and Ryan, 2003). It is highlighted in some investigations that the relationships between the students and teachers are helpful in involving students in learning.

Wubbles & Brecklmans. (2005) in review of research on student teacher relationship in the classroom have cited research studies which showed a positive relationship between interpersonal relationship between students and teacher and students' cognitive and affective outcomes. According to them Breklemans (1989) found a positive relationship between proximity and students' motivation for physics. Trickett & Moos (1974) found that the interest in activities and tasks increases when the students find the teacher supporting them. In views of Fraser & Fisher (1982), this perception leads the learners to maintain good grades and take interest in tasks (Midgley et al., 1989). However, in Patrick & Ryan 2003) views, research has also shown a positive relationship between

teachers' support and students positive behavior. Well supported students are not disruptive in the class.

2.5.4.4. *Task orientation*

Task orientation is the behavior that refers to how the students' value the task, focus on the task, and are devoted to complete it. Students' task orientation ability is an important area of study. Many research studies have been conducted to understand students' goal orientation and its impact on their performance. Goal orientation pertains to students' beliefs about their ability, achievement and effort. According to Lawson (2005) goal orientation is an aspect of achievement motivation and it affects success in many fields. The future of the next generation depends on how they are dealing with their assigned tasks. The success in handling the pressure and managing the workload is the completely dependent on task orientation and the performance shown over and within the timeline.

Goal orientation is an important social cognitive theory of achievement motivation. Cognitive psychologists have identified many types of goal orientations for example become goal oriented and adopt performance approach. According to Peer (2007), the students master the goals or task-oriented goals pertain to ensure competency, grown personality, increase adoptive enhancements and ultimately master the setting/environment.

According to Ames (1992), those having mastery goal orientation success means the mastery of the learning and improvement of the performance. (Ames, 1992 cited in Basit & Raman, 2017).

Task oriented goals have been related to many variables for example; willingness, commitment, and perseverance. Students having mastery-oriented goals are intrinsically motivated and adopt learning strategies which are more effective such as

they seek when needed, learn from their mistakes, willing to change their strategy if it does not work, and are willing to take risks. However, in views of Harackiewicz et al. (2002), the outcomes are much focused than the performance of an individual. Elliot & Dweck (2005) state that this is the extrinsic motivation.

2.5.4.5. Cooperation

Students work together and cooperate by sharing common values and shared goals. Students cooperation prevails when there is mutual understanding and they are willing to benefit each other in a learning context. The support provided to the students in learning process guarantees the learning optimization. The learners benefit individually, being in groups or in pairs they work together and perform tasks with responsibility. They feel more possessive and attached with each other as team members which improve their collaboration and team work skill. When students work in teams for shared goals they cooperate and encourage each other the collaboration prevails. Peer encouragement helps to enhance motivation to work and pay more attention to the task which is beneficial for the students and teachers to enhance the learning and rub up the teaching procedure (Hamid, Zakaria, and Islam, 2012).

2.5.4.6. Equity

According to Rogoff (2003), it is considered as fairness and even handling. In views of Blankstein & Noguera (2016), equity in the classroom means, that all the learners are given according to the desire and necessity to be successful in life. In teaching learning process, equity means the treatment of the teachers in distributing, praising, questioning, providing opportunities and discussing equally with all the learners. Favoritism is an unacceptable behavior of the teachers which is against the equity and majority of the students get deprived of the equal treatment.

2.6. Important Classifications and Models of Motivation

In views of Keles (2012), number of theories of motivation were presented which suggest and classify motivation and categorize it into content and process theories. It is declared that there are various needs of the individuals. According to content theories, when an individual's need is not fulfilled he or she is aroused to take some action to satisfy the need. Barikani et al. (2013) declares that there is a necessity to ponder on the theories which base on the need for the explanation. It influences the behaviors and process of learning in the students. According to Hannula (2006), motives of the students are considered as important to comprehend their behavioral needs. Only the assessment of the aspects of motivation are not the major points to ponder, rather it focuses on development of the triggers which are directly involved in motivating the students to improve their learning procedure. However, authors thinking on the matter led students to change their concepts and behaviors. Students desire an environment where there is everything available for motivating themselves. The educational setting must be varying from the conventional classrooms which were not engineered for the motivation purpose. However, the learners desire an environment that is helpful and supportive. There is a need for substitutional pedagogical techniques in the classrooms which alternatively motivate students learning and capacitate the conception unlike passive classrooms did. It is always a priority of the students to be more impactful. They want collaboration and participations for interactions with peer and teachers, but the learning settings are not favoring these elements in traditional classrooms. In short, there is no ambiguity regarding students desire to learn and grow if there is an environment available to motivate and facilitate the learning. Content theories describe the factors which motivate the individuals to take a specific action. These theories do not indicate as to why an individual opts for a specific behavior when several other options are also available (Cinar et. al. 2011). Whereas process theories address to why questions and describe how an individual evaluates the available options and chose a specific course of action. These theories also describe the factors which effects the outcomes of the action (Chelladurai, 2006). In the

context of employee's motivation and behavior. The needs of the employee are always highly satisfied if he is highly motivated physiologically and the needs of security will be fulfilled. Whereas process theories suggest that motivation to take a specific action and subsequent satisfaction do not results from needs fulfillment, this is depending upon the understanding, analyzing and evaluation. The both sides of the work are evaluated. Similarly, Udechukwu (2009) found that the content theories endeavors to regulate the precise motivation and need for the satisfaction. According to Gopalakrishnan (2012), the process theory, states that the cognitive process which includes in motivating an individual to engage in a behavior which is a psychological aspect.

However, by considering the theories, psychological processes energize, initiate, direct and sustain motivation. A number of theories have been classified as process or cognitive theories. In views of Jeans and Murphy (2009), these theories are Vroom's Expectancy Theory, Equality theory by Adam Smith, Goal Setting Theory, Operant Learning Theory, and Reinforcement Theory (Viorel et al., 2009). The motivation models are differently designed by the researchers at different levels like in last decades, Abraham Maslow, Douglas McGregor and Frederick Herzberg presented their models on motivation. In the next section   there is a discussion on the models of motivation.

2.6.1.   Models of Motivation

In the past, many theorists presented their theories and models on motivation and applied different approaches for the proposal of these models. The theorists intended to present an all inclusive sort of model which meets all the requirements. Mawoli & Babandako (2011), states that the models were always a try to add something new to existing knowledge. However, early models and influences were interpreted and discussed in coming passages.

2.6.1.1.   *Scientific Management Model*

According to the Frederick W. Taylor (1915), the motivation is something which can be received form financial incentives received. Similarly, Peters et al. (2010) found that this is the external motivation (Daft & Marcic, 2008). In views of Rajput et al.

(2011), this is also known as carrot which means increasement in salary, maximizing the wages, provision of the bonus or offering offices etc. This is considered as an urging force for the employees at workplace (Steidle, Gockel & Werth, 2013). However, it is suggested that the rewards be given to the working ones as carrot, while to those who are not performing well, be given the punishment or penalty as the stick.

2.6.1.2.   *Hawthorne Effects Model*

According to Hunter and John et al. (2012) Elton Mayo's (1880 – 1949) theory is a one of the breakthroughs in theories of motivation. In views of Khan et al. (2011), this is a theory motivating employees. Saefullah (2012) states that the theory suggests the emphasis on meeting of the need of the employees. The employee's treatment according to the needs is an important factor in views of Cinar et al. (2011), while Sandhya & Kumar (2011) consider financial incentives as better encouragements.

2.6.2.   Theories of Motivation

The motivation theories are categorized generally into content and process theories which can be easily understood by describing them separately. The content theory is one which talks about what is motivation? On the other hand the process theories talk about the occurrences. As far as the cognitive aspect of the theories is concerned, the discussion in these theories is about how the thoughts influence the level of one's motivation. How the influences are noticed and perceptions are made about the world around us. These theories are about the mindset, construction of thought process and conception about the world around us. It talks about the modifications in thought process. Among these theories, there are certain theories which can be applied to learning in the classrooms. The process and content theories are not the same, but the content is unlike process theories. Content theories are about the human behaviors, while the process is about the attitudes. There is a categorization of the theories of

motivation and these are regarding employees and their needs. These theories are considered as important for the employability. However, the human behaviors are mostly driven by these theories. There is an implication and application of these theories in educational context for the learning process of the students. Hence the content theories are distinct from the process theories of motivation as content theories' focus remains on what and the process theory is unlike and focused on behaviors. These are the primary and earliest theories of motivation. These theories create huge impact on the managerial and practical policies. In an academic context, these are acceptable at a minimum level. However, the content theories are different from process theories and are related to the fulfilment of the needs of the individuals. It is not the completely covered in in content motivation theories that it demotivates or motivate the individuals. In views of Hunter (2012), the content theories are concerned with the influence and process of motivation, while the process theories are concerned with explanation of how these are occurring.

2.6.2.1. *Content Theories of Motivation*

Below are the major content theories:

i.   Maslow' needs hierarchy

ii.   Alderfer's ERG theory

iii.   McClelland's achievement motivation

iv.   Herzberg's two-factor theory.

2.6.2.2. *Process Theories of Motivation*

Major process theories are as under:

i.   Skinner's reinforcement theory

ii.   Victor Vroom's expectancy theory

iii.   Adam's equity theory

iv.   Locke's goal setting theory

The deficit of motives and the whole aspects of individuals' motive are not explained by the particular and one motivation theory. So, all the theories are serving the function of techniques development which is supportive for other theories.
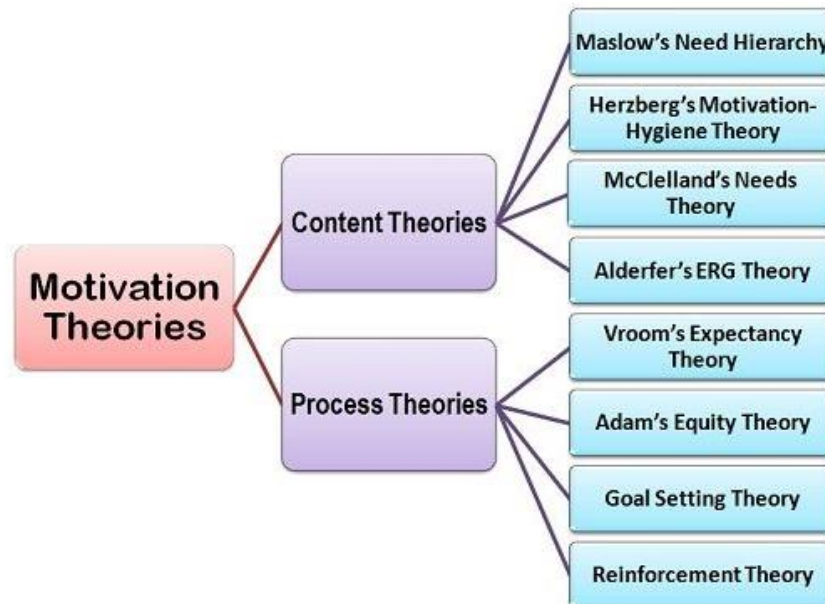
Figure 2.5 Motivation Theories

i.   **Maslow Hierarchy of Needs by Abraham Maslow (1940)**

The history of the man has prioritized human needs are the driving force behind motivation to initiate, and sustain a behavior to satisfy their needs. It was first established in 1940 by Abraham Maslow. The theory is famous as it is the initial and acknowledged (Cooke et al. 2005). Maslow has identified five categories of needs and presented them as sequential hierarchy from the lower to higher order including; physiological, safety &Security, belongingness & love, Self actualization and self esteem. The needs of the students are various either physiological or psychological (Bagozzi et al. 2003).
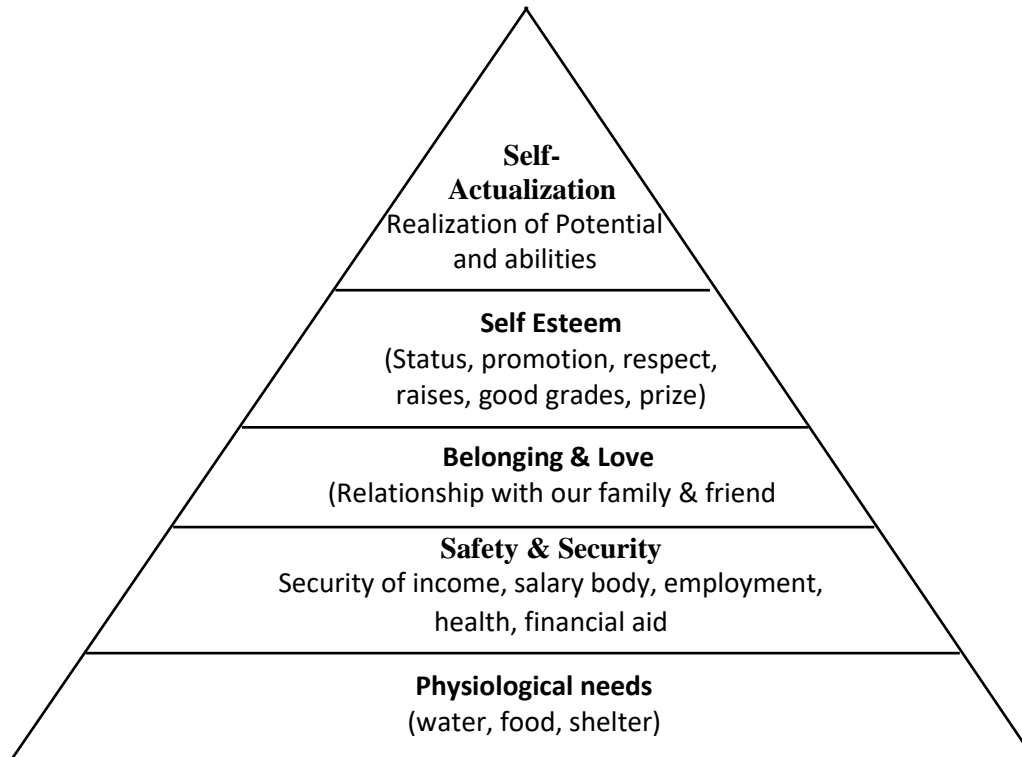
Figure 2.6, Human Needs Theory Adopted from Gargasz, (2010)

According to Maslow the phenomenon of motivation can be comprehended in virtue of Hierarchy of Needs. In his theory, the smallest discontented need converts the main, or the greatest commanding and noteworthy force in encouraging the individual, as shown in Figure 2.3. The most dominant need spurs motivation and activates an individual to take action to fulfill it. However, the needs which are fulfilled do not motivate. When lower or basic needs are satisfied individuals strive to seek higher need. The pyramid is used to define Maslow's hierarchy of needs.

a. **Physiological Needs**

We as human require different things to survive. Sleep and hunger are the basic physiological needs which are biologically required. The optimal functioning of the human body requires the satisfaction of all these things. Theses physiological needs are prioritized by Maslow as these are the basic and most critical for the survival of a person.

b. Safety

In the pyramid, the next need is the safety. There is always a requirement of safe environment right from early childhood. As a child will react with fear or anxiety when he or she does not feel safe. In adults safety needs are more apparent in disasters like floods, or during war. The need for safety is also exhibited when we prefer more familiar options in life or take determines to ensure future security like purchasing insurance policies or contributing in saving accounts.

c. Love and Belonging

Maslow placed the need to feel loved, accepted and belonging to social group, at the third position in the hierarchy of needs. Once the physiological and safety needs are fulfilled individuals develop the need to build social relations. Fulfillment of this need was not a priority before but when the first two categories of needs are fulfilled belongingness becomes the top priority. One needs not only to be loved but also to extend their love to others. The individuals also desire and feel the need of belongingness and want to be accepted by the society to meet their social needs. After the presentation of the theory of Maslow, there were many researchers conducted to find out the effects of these needs. For instance, being socially well connected benefits in a better performance at workplace and those who are not good at social linking, are facing negative circumstances. Sense of belonging helps learners build belief and interest in the academic activities and increases the engagements and participation during performances in groups, individual activities and home assignments. In

class activities along with outdoor activities are improved if the students are well motivated.

d. **Esteem**

Every one of us have high or low self-esteem. This reflects an individual's perception about his/her physical characteristics, abilities, attitudes, behavior and feelings (Levine & Smolak, 2002). It is also about acknowledging positive and negative aspects of oneself and despite being aware of negative aspects feeling good (Eldred, Ward, Dutton and Snowdon 2004: 7). According to Eldred et al. (2004) self -esteem has two related aspects of worth and competence. According to Maslow, the need of self-esteem has two components; feeling confident and good about oneself, acknowledged in a social context. When we are appreciated by people around us, it creates a feeling of acceptance and being valued.

e. **Self-Actualization**

Maslow placed the need for self- actualization at the peak of pyramid. It refers to drive to accomplish one's potentials to achieve self-fulfillment. In simple words it means we are achieving what we think are meant to achieve. Fulfillment of this need is rare. According to Maslow less than one percent people of the population are self-actualizers (Schultz, Duan.P. & Schultz, Sydney. Allen, 2010). Self-actualization or feeling of fulfillment is different for everyone. For one person it could mean inventing something while for another it simply means helping others.

f. **How People Progress Through the Hierarchy of Needs**

There are multiple needs and the requirements to meet them as per Maslow's opinion. The needs are not particularly mentioned in hierarchy of

needs. For instance, the expression freedom and fairness in a social context are not highlighted in the Maslow's hierarchy of needs. These are the things that enable individuals to satisfy the needs. Furthermore, to satisfy these needs, the information regarding the world around us is required to be learnt and understood. This understanding of the world around us helps us fulfil the needs and become safer and self-actualized. The more we are clear about the thing, the more we will perform. It is an inbuilt need of human to know about the people around us.

Considering the Maslow's presentation of the needs, it is acknowledged in the theory that the needs are not all/noting phenomenon. Consequently, full satisfaction of the needs is not required to satisfy the other needs. It is also suggested in Maslow's point of view that the people require to meet the needs partially and the lower needs in the theory are the needs which are mostly inclined by people. People tend to focus on these need in general. Furthermore, behaviors modify the needs of individuals and it can be one individual. One need may meet other needs. For instance, if a person is served with dinner by an individual, he is also promoting the sense of belonging in that person.

ii.   **Motivational-Hygiene Model /Two Factor Theory**

In the 1950s and 60s Frederick Herzberg an American psychologist's presented theory known as Motivational-Hygiene Model. The Motivational-Hygiene Model, also known as the Two-Factor Theory, was developed by Frederick Herzberg in the 1950s. It's a psychological theory that focuses on the factors that influence job satisfaction and dissatisfaction in the workplace. Herzberg's theory is often applied to organizational and educational settings, including learning in general and learning mathematics in particular. Herzberg's Motivational-Hygiene

Model, or the Two-Factor Theory, provides a valuable framework for understanding the factors that influence motivation and satisfaction in the context of learning, including learning mathematics. By recognizing and addressing both motivational and hygiene factors, educators and institutions can create environments that foster student motivation, engagement, and academic success. Herzberg's theory has been applied to the field of education, recognizing that the factors influencing motivation and satisfaction in a classroom setting are similar to those in a workplace (Herzberg, F. 1968). These factors are:

Motivational Factors in Learning (Satisfiers): These factors are related to the content of the work and include aspects such as achievement, recognition, responsibility, advancement, and the work itself. When these factors are present and adequate, they lead to satisfaction and motivation.

a) **Achievement**: Students are motivated when they experience success and accomplishment in their learning endeavors. Positive reinforcement and recognition for their efforts enhance motivation. Success in solving math problems or understanding mathematical concepts can boost a student's confidence and motivation in the subject.

b) **Recognition**: Acknowledgment and praise for a student's achievements, whether through grades, awards, or verbal recognition, can boost motivation and self-esteem. Publicly acknowledging and rewarding students for their mathematical accomplishments can encourage further engagement.

c) **Responsibility**: Allowing students to take ownership of their learning by providing choices and opportunities for independent decision-making can increase motivation. Allowing students to explore mathematical concepts at their own pace or giving them opportunities to solve real-world math problems can foster a sense of responsibility and motivation.

d) **Advancement**: In an educational context, advancement can be linked to progression to higher levels of learning or opportunities for enrichment and specialization. Providing opportunities for students to tackle more advanced math topics or participate in math competitions can motivate them to excel.

e) **The Work Itself**: The intrinsic interest and engagement with the subject matter can serve as a powerful motivator. When students find a topic personally relevant and intellectually stimulating, they are more likely to be motivated to learn. Encouraging a genuine interest in math through engaging and relevant teaching methods can be a strong motivator.

Hygiene Factors in Learning (Dissatisfiers): These factors are related to the work environment and include aspects such as salary, job security, working conditions, company policies, and interpersonal relationships. When these factors are inadequate or problematic, they lead to dissatisfaction but do not necessarily motivate when improved.

a) **Rewards**: In an educational context, this can refer to external rewards such as grades or extrinsic motivators. While these can prevent dissatisfaction, they may not lead to long-term motivation.

b) **Educational stability**: A stable learning environment with clear expectations and consistent support can reduce anxiety and create a conducive atmosphere for learning. Consistency in teaching methods and support especially in mathematics classrooms can reduce anxiety and create a stable learning environment.

c) **Classroom conditions**: Comfortable and safe classroom settings with access to necessary resources can contribute to a positive learning environment. Providing a well-equipped classroom with necessary math materials and resources can enhance the learning experience.

d) **School policies**: Fair and consistent policies, such as grading policies and classroom rules, can reduce dissatisfaction and create a sense of equity. Fair and consistent grading policies and curriculum standards are essential for creating a conducive learning environment.

e) **Teacher-student relationships**: Positive relationships with teachers and peers can enhance motivation and satisfaction in the learning process. Positive relationships with math teachers, characterized by approachability and support, can significantly impact a student's motivation to learn math.

iii.   **Herzberg's Theory VS Maslow's Theory**

In views of Khan et al. (2011), there is a firm relationship along with similarities in Herzberg and Maslow's theories. However, Barbuto & Story (2011) state that it is considered that the Maslow belief provided base to the content based motivations. According to Vránová (2011), the similarities are existing in both the theories. These are parallel theories which identify the similar needs. This similarity is observed in Herzberg's hygiene that is identified as similar to the need of the Maslow's theory. Sahoo et al. (2011), however, in motivator needs are similar to the Maslow's higher order needs: recognition, growth and achievement are similar to self actualization and self esteem. According to Marques (2011), the model of Maslows' theory was developed horizontally.
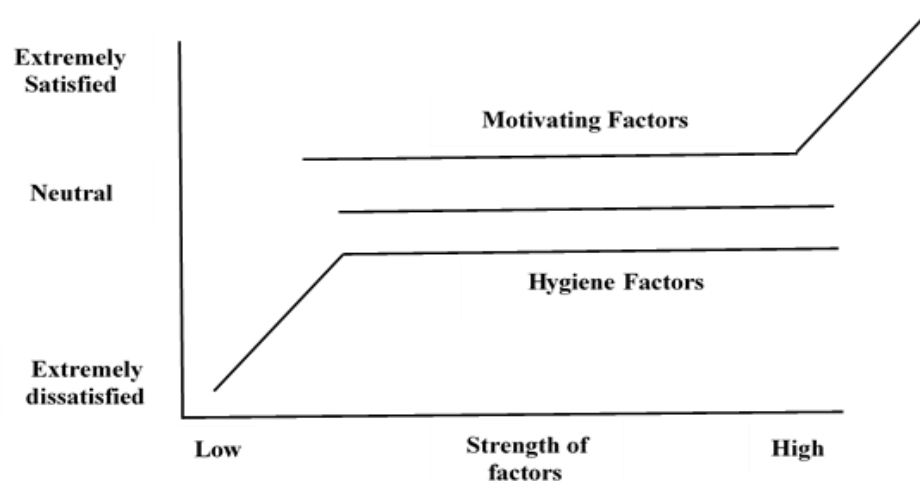
Figure 2.7, Herzberg's Two Factor Theory

iv.   Alderfer's Need Theory

Need based theory is the alternation of the Hierarchy of Needs (Clayton Alderfer, 1972). Maslow's model was amalgamated into three further needs. Gopalakrishnan (2012) stated that there are three categories of needs suggested by Alderfer that includes existence, relatedness and growth and all of them are known as ERG. However, the needs required for the survival are called the existing needs. These are the needs for the survival for example water, air and food (Borkowski, 2005; Jindal-Snape and Snape 2006). These are similar to the Hierarchy of Needs of the Maslow. Therefore, relatedness refers to need to develop and sustain the relations in a social and family context. This category corresponds Growth's needs refer to individual's intrinsic creativity and the potentiality while making it useful contribution in the society and opportunities for personal development and growth. Anyim et al. (2012) stated that this category represents Maslow's higher-level needs of self-actualization. Similarly, Hierarchy of need reveals that Alderfer did not suggest a strict step wise progression from basic to higher level needs. According to this, the operation is in the one level at a time if a person could not achieve needs of a certain level, he/she would seek next level. For example, if an individual fails to achieve needs of progress and development. He/she will try to develop social contacts with peers, or other important members.

Different categories of Alderfer's hierarchy of needs are related in three different ways:

a.   **Satisfaction – Progression**

The lower level of needs cause the satisfaction of the higher level need because the individuals seek higher level needs as a result of fulfilling lower level needs. In ERG theory it is not necessary. Progression to upper level needs does not depend on satisfying lower level needs.

b. **Frustration – Regression**

It means that an individual may regress to lower level needs if higher level needs are not satisfied. It also suggests that an individual may seek an already achieved need if a higher- level need is not fulfilled. For example if growth and development needs are not met one may regress to safety needs such as buy insurance policies or invest in different schemes.

c. **Satisfaction- strengthening**

It means that an already satisfied need can maintain satisfaction of the needs which are of lower level, needs of higher level need to be fulfilled.

v. **Douglas McGregor Theory of X and Y**

Douglas McGregor's theory X & Y in 1960s presented the different concepts. In views of Harell & Daim (2010), Douglas McGregor has drawn heavily on Maslow's work (Hunter 2012). However, he has presented it in simple and easy to understand language (Adair, 2011). McGregor was of the view that the assumptions that managers make about human behavior profoundly affect the leadership and management approaches that they use. He categorized the assumptions into two categories which he named as this theory.

It is the human nature which provided base to this theory with an assumption that human beings are lazy, do not like to put physical and mental effort to achieve organizational goals, do not like to take responsibility and prefer to be directed and led. According to this theory employees need to be forced or threatened of punishment to make them expend effort to achieve organizational goals.

MCGREGORS's THEORY X & Y

Theory X	Theory Y
Need to control	Capable of Self Direction
Avoid responsibility	Seek responsibility
Worker seek Security	Can make good decision
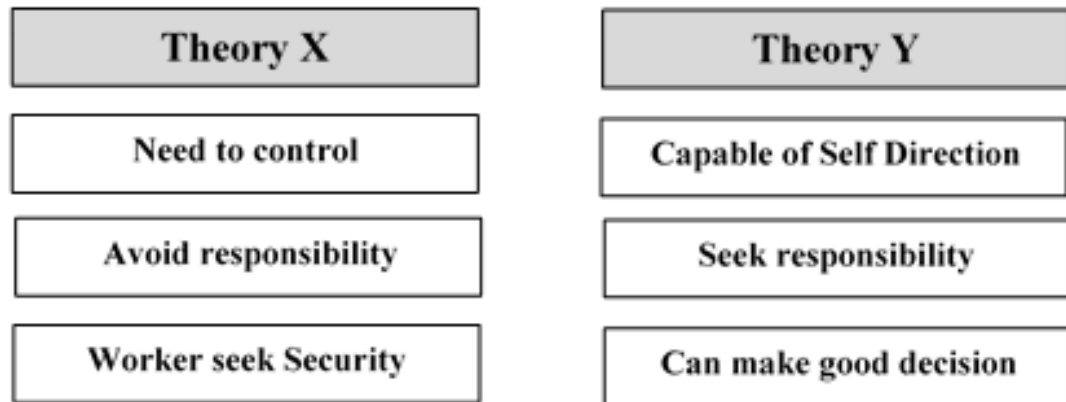
Figure 2.8 Douglas McGregor Theory of X and Y

Theory Y is in sharp contrast to theory X regarding the leadership assumptions. Theory Y is based on participative style of management in which employees are self-motivated and self-directed and maximum output is accomplished with least effort by the manager to accomplish the organizational objectives. According to theory Y leadership makes the following assumptions:

Human beings do not dislike work. They are self-motivated and self-directed. They are ambitious and like to take greater responsibilities.

a. Human beings are imaginative and creative. As employees they can solve organizational problems.

b. Employee's commitment to organizational goals depends upon rewards they get for achievements. For an employee satisfaction of ego and self-actualization needs are the most significant rewards.

However, this theory (X and Y) contrastingly show different models and assumes in a different way the managerial hold on the subordinates that may not be similar to the common behaviors. Furthermore, the attitude provide the basis to these theories, while the focus is not on the attributions. Barbaca and Zekan (2011) claimed the Maslow's lower level needs as

dominating. Hofstede (1994) declared that the esteem needs will help individuals accomplish the needs of the employees if recognized.

vi. McClelland's Need Theory

McClelland proposed his need theory in 1960s. Lussier & Achua (2007) stated that this theory aims to the predication and explanation of the performance and behaviors of the human on major three needs basis. These needs are: achievement, power and affiliation. The theory is also called as three needs theory or acquired/ learning theory. As it suggests that specific needs are acquired and shaped during life time of individuals (Daft, 2008). McClelland's theory proposes that most of the people learn or acquire the needs of achievement, power and affiliation, during their life time in different combinations and are motivated by them to varying degrees. (Daft, 2008; Lussier & Achua, 2007).

a. Need for Achievement

Need for achievement, as the name indicates refers to achieve something in what we do. It is described by the researchers that the needs for accomplishment are there unconsciously happening and are perfect accomplishing our goals. According to Daft (2008) the Achievement is referred as a wish to achieve, attainment and the standardization, and task achievements of the realistic goals. People motivated by the need for achievement usually set difficult objectives. They prefer to be result oriented on their work to get feedback. Individual efforts are accomplished in an excellent way (Lussier & Achua, 2007).

b. Need for Power

The need for power is described as an unconscious process of influencing and attaining authorities. However, there is a desire of the control over the people around. The desire to impact and influence other is the need for Power shown by the individuals.

c. **Need for Affiliation**

McClelland (1961, cited in Moore, Grabsch & Rotter, 2010) describes the need for affiliation as desire to establish, maintain   or restore a cooperative, sustainable and positive links with others. Daft (2008) has also described the needs for the affiliations and wish to get attached and make closeness with others. They want to be in contact of others.

There are some similar features in McClelland's and Maslow theory (Taormina & Lao, 2007). However, the Maslow's 3rd categorization of the needs for belonging and love is almost same as McClelland's need for affiliation. Jindal, Snape and Snape, 2006), It seems that McClelland has drawn on; Yang (2011) Maslow's work (Mobbs and McFarland 2010)
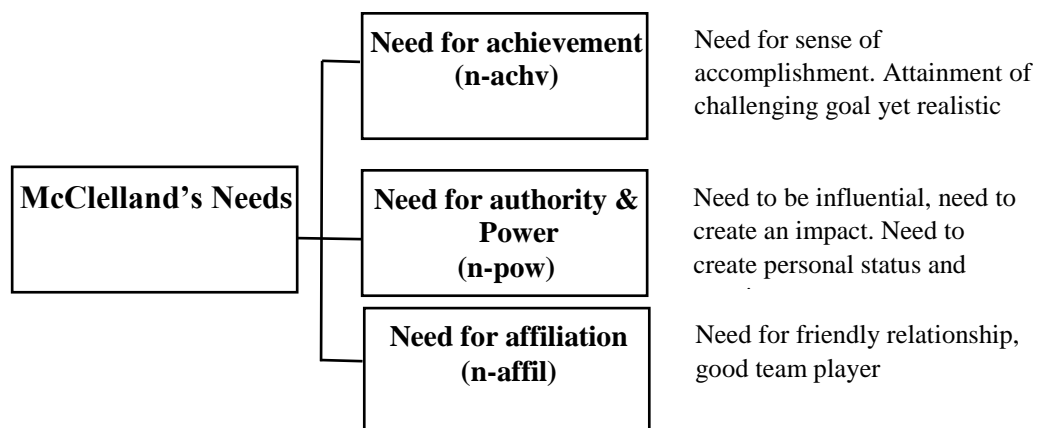
Figure 2.9, McClelland's Needs Theory

2.5.2.2. Process Theories of Motivation

The choice of individuals is rather focused in the Process theory to choose a certain course of action and try to explain why actions are initiated.

i. **Skinner's Reinforcement Theory**

The Operant Conditioning is one of the most famous theories in history. B.F Skinner's early theory of motivation that describes human behavior. In simple terms it is easy to comprehend

that the individuals are more focused on the tasks if it is rewarded and avoid those behaviors for which they are punished. This premise is also referred to as "law of effects". The theory of operant conditioning provides great insight into individuals' behavior. Skinner's theory provided the base to the conditioning theory later. According to reinforcement theory human behavior is the function of its consequences (Gordon, 2007) that is if a behavior results in positive consequences it will be strengthened and will tend to be repeated. However, in case of negative consequences the behavior will weaken and is not likely to be repeated. People learn to behave in a particular manner from the consequences of their previous behavior. Positive reinforcements, e.g. monitory rewards, verbal appreciation, promotion, for any other form of incentive (carrot) it can be increase the reoccurrence of the similar behavior time and again. Furthermore, it is used in operant conditioning and behavior analysis refers to the process of enhancing the probability of a behavior by providing a response immediately after the performance of the action or behavior or shortly after it (Gordon, 2014). Reinforcement theory focuses on emotions and feelings of each person, concentrating on the changes he/she goes through during the course of action or some behavior. It is an effective way of controlling an individual's actions and behavior (Gordon, 2014). This theory states that stimuli can format the behaviors of the individuals. The implication and application of this can be seen in different scenarios. e.g. in training of animals, and to motivate employees.

Reinforcement theory includes four approaches, namely:

1.   Positive reinforcement

2.   Negative reinforcement

3.   Punishment

4.   Extinction

The performance of a learner reoccurs if he/she is rewarded on this. Hence, the positive grades, scores and encouraging feedback of the teacher causes a great change in students'

performance and makes the behavior recur again and again. Teachers require precision of the thing for the comprehension and expectations can be there if the positive reinforcements are there. On late arrival in the classroom, the student with positive reinforcement modifies his behavior and become punctual.
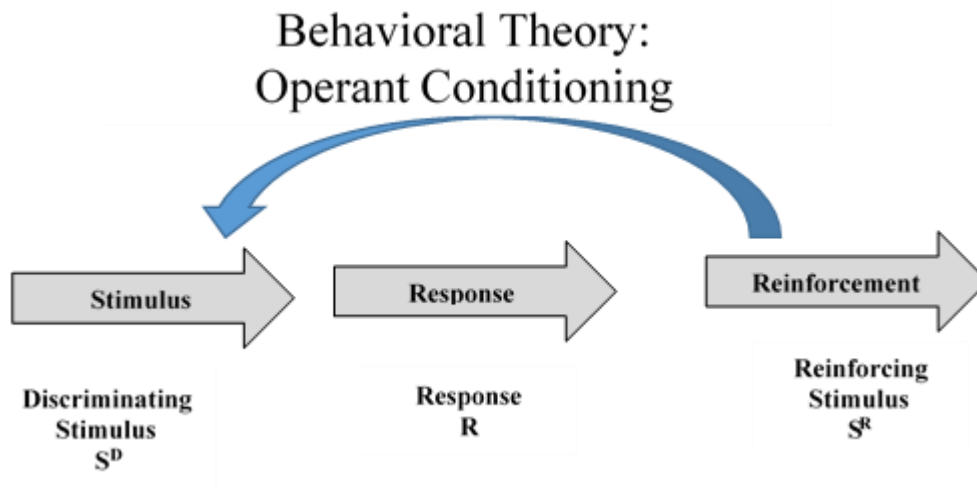
Figure 2.10, Skinner's reinforcement theory

ii. **Vroom's Expectancy Theory**

Expectancy is a theory which integrates many of the concepts from other theories and covers many aspects of motivation that other theories have missed. This theory is a general theory and can be applied in a variety of situations such as choosing between; different jobs, going to work or not, working hard or not and many other issues can be addressed by expectancy theory. The emphasis is placed on the equity and the contents. In the theory of expectancy, the actions and behaviors are alternatively chosen (Bardwell, 2004).

This theory explains two related aspects of motivation: direction of action that is selection of an alternative when two or more options are available and second is intensity of effort that is how much effort to expend a selected alternative behavior. The decision to choose an alternative is determined by our perceived probability of the consequences of the chosen course of action.

The definition of Vroom highlighted the processing that controls choice of the individuals in the shape of volunteer behaviors. The desired outcome demands decisions made from the decisions. The involvement and engagement in some sort of task/activity is strongly determined by the 3 factors as below:

 a. Expectancy

 b. Instrumentality

 c. Valence

Expectancy refers to one's belief that the endeavors will be resulting the results in achieving the goals. Instrumentality Best performance caused by the belief will result in some reward for example, recognition, appreciation, promotion, raise in salary, self- satisfaction or any other benefit. When the reward is the same for all performances given the instrumentality is low. The value an individual puts on perceived rewards is termed as valence. The value an individual places on rewards is based on his/her needs, preferences and goals.

The instrumentality, expectancy, and valence are the increased organized to control motivation.
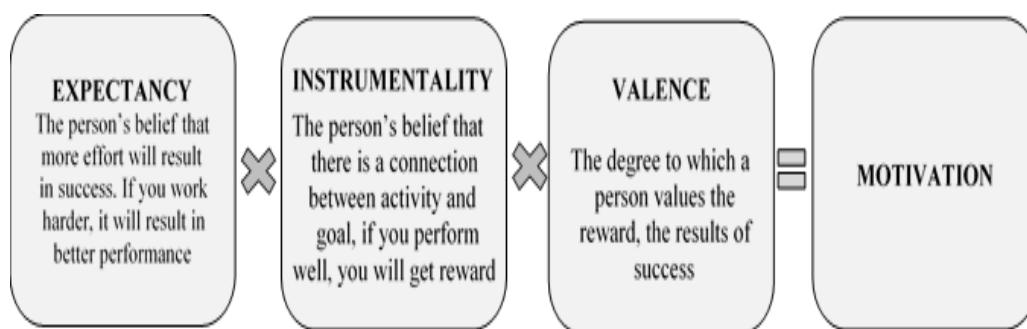
Figure 2.11, Vroom's expectancy theory

v. Adams' Equity theory

Equity is a source of motivation for many individuals as it is stated in equity theory. This is about fairness and the endeavors.
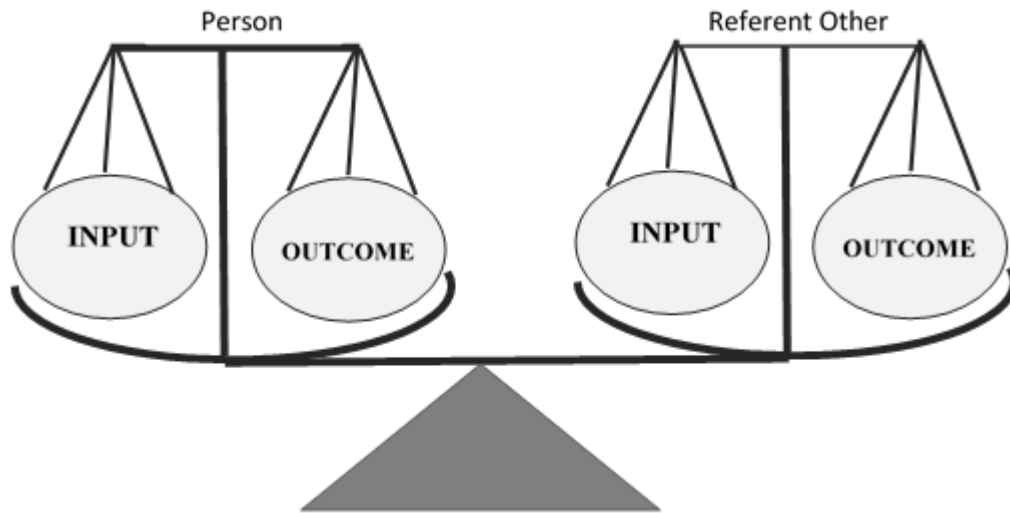
Figure 2.12, Adams' equity theory

The learning adopts the form of input in the classroom like efforts, participation, writing, and experiences. The students expect to get good results after the inputs in the form of efforts. However, the certification, scores and recognizing of the effort are the rewards. The inequity is witnessed when there is difference of the performance and rewards. Getting good grades encourage the students and improve their learning.

The feelings of being unable is promoted if the student does not get good grades. Furthermore, persuasion of the student is reduced. The motivation level is decreased when a student fails to get good marks. It ultimately impacts the performance of the student. Distress in the classroom is observed when students do not get better marks and the inequity prevails. The learners can not perform well if they are not motivated to study at ho me. Learners who do not work hard or study do not get good grades. However, the need differences in individuals is not considered in the equity theory. It does not talk about the need based instructions. Their personality is not considered as important if they are not given individual attentions. The inculcation of the motivation through inequity in the students is valuable for the students, despite it is perceived differently by the students.

vi. Locke's Goal Setting Theory

Furthermore, expectancy theory is quite similar with the goal setting theory (Bhat and Shah, 2010). The emphasis is on the setting of the specific goals and challenges which is considered as one of the major concern of the goal setting theory. The motivation is determined by commitments and goals. The behaviors are further modified and developed through description of the goals. The students are encouraged to perform well if they achieve the goal. The sense of accomplishment encourages the individuals to work with full energy. The set goals are helpful in many fields and it is applicable to various fields and tasks. The management of the behaviors demand more from the performer. The recommendations are adopted by learning about the psychological aspects of the behaviors. The techniques to incorporate the goal setting is so common these days . The reflection play an important part in the improvement of the overall performance. The feedback is considered as pivotal figure for attaining the abilities for the enhancement of the creativity and job related skills. Goal setting theory has become so popular in these days.
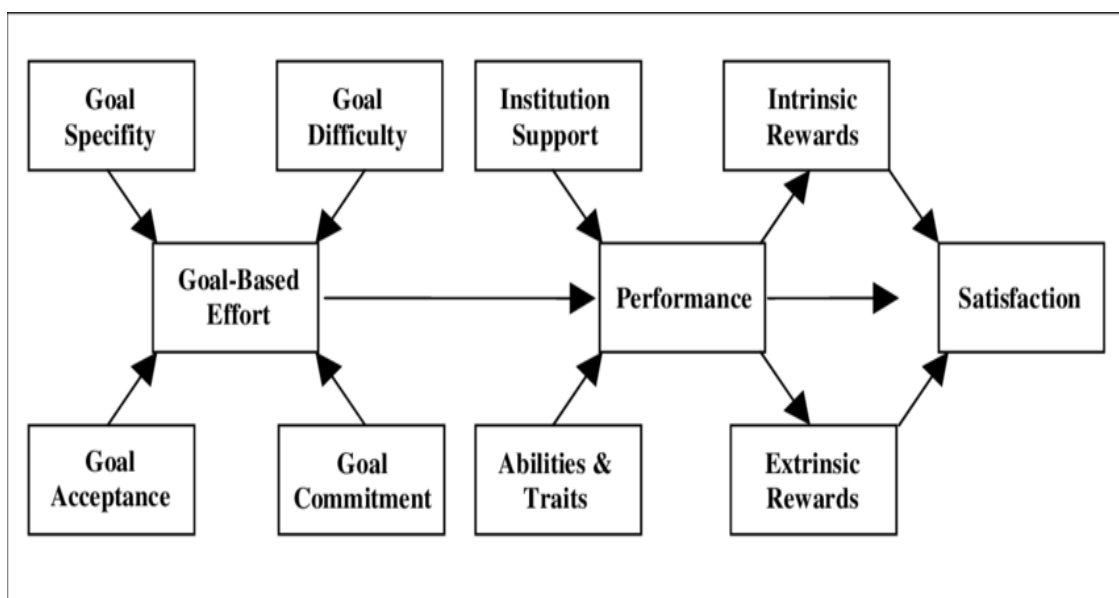
Figure 2.13 Process of motivation according to goal-setting theory

Section III

2.7. **Discussion**

The environment is considered as a critical factor for the learning process. Interaction which are safe emotionally and physically are mandatory to avoid the frustrations and exchange of the ideas in learning context. The students and teacher may be comfortable to interact with each other. There may be an environment which allows freedom and it may be respecting the equality both emotionally and physically. The physical environment may include the structure and setting of the chairs provide the safety and comfort to the students for optimization of the learning process. It may be supportive and ventilated where students feel freedom for discussions and interactions. The hygienic condition of the school environment plays a vital role in supporting learning and motivating them to improve and satisfy their physical needs. The effectiveness of the learning is dependent on the environment provided to them. If the environment is emotionally safe and physical appropriate, the learning effective is possible for all the individuals. Traditionally, the teacher centered classroom were designed to focus on the teachers as authority in the classrooms, however, the role of the teachers is now shifted to the role of facilitator. The minimum interactions were not increased to the maximum level and the attentions are now not only restricted to the teacher, rather these are equally given to the learners in the classrooms. Students' interactions with teachers are welcomed in classrooms to develop the personalities of the learners and improve their skills required for their future life. The nose level in the classroom is required to be minimized for the smooth process of learning. The layout of the classrooms demands few changes and need to be orderly and ventilated. Narum (2004) recommended drastic changes to the classroom. He allowed the discussion and noise during learning procedure. The principal may hear the laughter and noise in the learning environment. It is also suggested that the engagement in the classroom may be encouraged. The environment of the school may also be reflecting the mission of the school. The versatility

and flexibly in the classroom may prevail to encourage students to do many things and students may feel easy to adopt the change in need. Rydeen & Erickson (2002) found that classroom learning environment very important for motivating the learners for learning. He supported the aesthetics and ownership of the students. According to his opinions, privacy, comfort and sense of place may be creating the community which is supported in the environment of the schools. The collaboration in teaching is being adopted by USA schools where there is a change in the models of teaching. The environment is required to be the collaborative. Likewise, the classrooms may ensure provision of such environment be suits the learning where student and teachers are comfortable to exchange the ideas and may debate on different issues (Kelly, 2004). The schools may allow the access to the computer for individual tasks to meet the needs of the individuals in the premises of the schools. Graetz & Goliber (2002) underscore the critical role of the classroom learning environment in driving learner motivation and enthusiasm towards educational pursuits and found it very significant. The technical and traditional approaches be allowed in the classrooms and the school environment may permit both the application in educational context (Aspden & Helm, 2004). The environment guarantees the success of the students if it allows classroom engagements and gain learning experience. The participants may be active in their participations and processing of the education. Graetz & Goliber (2002), in his research highlighted the pivotal importance of the classroom setting in fueling learner motivation and passion for educational endeavors, emphasizing its profound significance. Temperature in the class may be maintained so that it may not aggravate the feeling of the students. The temperature of the classroom must be considered for the optimization of the learning. The classrooms be created in a way that the light is proper. Physical environment play an important role in the development of the students learning. Space in the schools be provided for the interactions and discussions and classes may not be crowded. The students must feel easy and free to ask questions in the classroom.

Environment of the classrooms is required to be compatible with learning needs. Rabby (2001) found that the motivation basis on the components of internal drives comes from learning environment. However, the individual motivation level deeply impacts the performance. The organizations are run by the people and the working of the employees is enhanced if they are well motivated and set free to contribute to the organization. It is the people who work for the organizations and their contribution is critical. For the optimization of the functioning at workplace, the employees require motivations. The motivations are best increased by providing an interactive learning environment (Panagiotakopoulos, 2013). Dysvik & Kuvaas (2010) accentuated the essential role played by the classroom learning environment in propelling learner motivation and eagerness towards educational objectives and found it as highly significant. For an organization, to be responding to the external changes, the organization need to combine the motivations and strengths of the employees (Kuo, 2013). The current study discusses the motivational techniques how these can be utilized for the employment. The flow of motivation helps management to build a culture where significant interactions are witnessed. The culture of the organization is vital for the employees. It may be accordingly and in line with the set objectives of the organization (Barney & Steven Elias, 2010) claims that the extrinsic motivation is critical for the interactions and lessen stress and frustration in the workplace. It is well known fact by the leaders of the organizations that success at workplace is because of the collaboration and passion of the employees. Gignac & Palmer (2011) stated that the results are improved by the people who work hard and are well motivated. The researchers utilized the multiple frameworks based on the motivation theories in the literature. However, only few dimensions were covered by researchers which shown a gap in the literature.

Furthermore, the achievements of students at schools are the evidence of their performance and motivation. The overall performance or achievement shown by a student shows how much

he has improved the knowledge and skills in the context of school. The well being of a person is indicated by the schools and it establishes the future and status. Considerable attentions were paid by the researchers during the investigations to the factors contributing to the higher performance and grades of students at schools. It is found in many investigations that the physical environment is vital in influencing the learning and success of the individuals. The temperature in the classroom and noise level are the factors that are impactful and the classroom settings need to be orderly. According to Corpus, McClintic-Gilbert & Hayenga (2009), the overall achievements in the school are dependent on the environment of the school. The belief of the student is another factor discussed in the present study. The focus is on the aspects which are related to the environment of the school. Motivation and success are the central focus of the study and the reasons are discuss which cause changes in the behaviors of the individuals. The motivational energy is provided by the cognitive elements which are directly connected to the environment. According to Ludtke, Robitzsch, Trautwein & Kunter (2009), the intrinsic motivations is the source of motivations for many people but the psychological and pedagogy related triggers are also the factors that affect learning of the individuals. According to Frenzel, Pekrun & Goetz (2007), there are certain observable factors which also contribute to the optimization of the learning process i.e. school's building, resources being used, and interactions. It is also highlighted in various studies that the interpretation of the environment is prediction of the behavior of an individual. The more he is motivated, the more he will perform. The support provided by the teaches is undeniably important as it is very helpful to create an environment of learning which is conducive in nature. The teachers extend their help to improve the learning and engaging the students in active learning process. They facilitate the individuals to maintain optimization and to modify the learning. The students belonging to the school and achievements are very much related thing and are considered as critical for the researchers who empirically investigated the

studies. The student – teacher relationships are considered as significant by Wentzel & Battle (2011) as they considers these relationships are responsible for the attainment of the goals. Similarly, the social behaviors of the students are depending on the teachers' support provided to the students. The support provision of the peers is also considered as an important predicator of the accomplishment. The children are motivated by the support extended by the peers in the classrooms. Gregory & Weinstein (2004) considered students as socially responsible when they follow the rules of the schools. The attention regulation is connected to the support provided by the peer and the absentees are also because of the behavior of the teachers. In many studies, it is suggested that the school transition are caused by the environment in the schools. However, the suggestions of the literature are about the transition in the school causes low grades in many settings. In many cases it effects learning in a negative way that students deteriorate and stutter during the process of learning. In views of Schneider et al. (2008), the deteriorating motivations are witnessed in schools where there is no proper support provided by the teachers. Similarly, the decision making is another skill which is highly affected due to the motivation and poor student and teachers' relationship. Autonomy and independent are affected if the interactions between the stakeholders in the classroom are not suitable.

Ryan & Patrick (2001) found that the achievement is directly linked with the support provided by the teachers. The care and grades also increase and sometimes decrease the motivation level of an individual and their independence, engagements are sometimes low because of the low motivation level. Ludtke et al. (2009) depicted that the environment is impactful on the overall accomplishment of the students. However, Wentzel & Battle (2001) also examined the interactions and belief of the students as predicator of future.

CHAPTER 3

RESEARCH METHODS AND PROCEDURES

For the achievement of the outcome and to meet set objectives of current study, the procedure is elaborated in this chapter. However, the effectiveness of the environment remained the central concern throughout the investigation. Similarly, motivation is another aspect which is considered as most important factor during the process of investigation. Interactive learning environmental impact on motivation are other respective apprehensions, therefore, Interactive Learning Environment's effects were assessed in the designated study.

3.1. Research Paradigm

A positivist research paradigm was found appropriate for studying the "Effects of an interactive learning environment on students' motivation in mathematics at the secondary level." Positivism is a philosophical stance which asserts that knowledge should be based on empirical, observable, and measurable phenomena. Positivism assumes that there is an objective reality that can be studied, measured, and understood. Positivism's emphasis on objectivity, quantification and generalizability.

Positivism is a philosophical research paradigm that emphasizes the use of empirical, observable, and measurable data to understand and explain the social and natural world. Positivism places a strong emphasis on empirical observation, meaning that researchers seek to gather information through direct sensory experience or measurement. This focus on observable data is seen as the most reliable way to gain knowledge. Positivist research strives for objectivity by attempting to eliminate personal bias or subjectivity from the research process. Researchers aim to be impartial and neutral in their observations and interpretations. Positivism typically involves the collection and analysis of quantitative data, which can be measured and expressed numerically. This enables researchers to perform statistical analyses to identify patterns and relationships in the data. Positivist research often

begins with the formulation of hypotheses, which are specific, testable statements about the relationships between variables. These hypotheses are then tested using data to determine their validity. The goal of positivist research is to produce findings that can be generalized to broader populations or situations. Researchers aim to draw conclusions that have applicability beyond the specific context of the study. Positivism assumes that events and phenomena have causes and can be understood through the identification of these causes. It is fit in for this study because it seeks to establish cause-and-effect relationships. Positivism is closely associated with the scientific method, which involves systematic data collection, hypothesis testing, and the use of logic and evidence to draw conclusions. This method is considered the most rigorous and reliable way to gain knowledge. Positivism is often associated with quantitative research methodologies, such as experiments, surveys, and statistical analysis. These methods provide precise, numerical data that can be analyzed objectively.

Positivist research often seeks to break down complex phenomena into smaller, more manageable components. This allows for a systematic examination of individual variables and their relationships.

In social sciences, positivism is associated with the belief that social phenomena can be studied using the same empirical and objective methods as natural sciences. Researchers in fields like sociology and psychology use positivist approaches to investigate human behavior and social structures.

3.2. Research Approach

To analyze the facts related to the classroom environment at secondary school students and its effects on developing motivation among students the researcher applied quantitative research approach. It is mostly observed that the research approaches qualitative and quantitative are generally taken as opposing. According to Creswell (2013) Numerical data was analyzed through quantitative approach to explain the mathematical data collection and the methods applied to interpret such data was mathematical based. However, it is a common misconception among individuals that for quantitative data it is mandatory for data to be in mathematical form. Other quantitative data can be non-

quantitative data i.e. academic motivation of students which can be converted into quantitative data by utilizing the instruments for determining of motivation level. For the interpretations of the quantitative data, mathematical, statistical determinants and numerical data analysis techniques can be implied. For this purpose, surveys and the manipulation techniques in the form of questionnaires can be utilized.

3.3. Research Design

In this research Ex Post Facto research design was used to accomplish the study. Ex post facto means "after the fact," and translated in Latin to "from a thing done afterward." An ex post facto study utilizes this meaning due to the fact that the independent variable is something that has already happened or something that cannot be manipulated. The dependent variable serves as the "afterward" aspect of ex post facto research, as it is affected by something that has already happened or a characteristic or trait that cannot ethically or physically be controlled.

Ex post facto design, also known as "after-the-fact" research, is defined as a research method that looks into how an independent variable (groups with certain qualities that already exist prior to a study) affects a dependent variable. This entails particular characteristics or traits of a participant that cannot be manipulated. Ex post facto design is considered a quasi-experimental type of study, which means that participants are not randomly assigned, but rather grouped together based upon specific characteristics or traits they share. Ex post facto research focuses on how actions that have already occurred can predict certain causes. Therefore, a researcher cannot manipulate or modify actions or behaviors that have already occurred, or specific traits and characteristics a participant embodies. This type of research study tests hypotheses to locate cause-and-effects relationship between the independent and dependent variables.

Therefore, the research design was based on collection of information about prevailing practices related to class room learning environment and its analysis for the assessment of the effectiveness of the interactive learning environment on the motivation level of the learners at secondary schools in

classrooms of mathematics working under the umbrella of Federal Directorate of Education Islamabad.

3.4. Overview of Objective No. 2

To investigate the level of student's motivation at secondary school level.

Second objective of the research study was trailed by the analysis of data collected by motivation assessment scale (MAS). Student's score was calculated by using SPSS to determine the level of student's motivation. Student's motivation was distributed into levels which were maximum and extraordinary. In this study the motivation is considered as a dependent variable which is the effect of the interactive environment. The motivation varies time to time as it is sometimes extraordinary, medium and lowered sometimes. In views of Omidiyan (2006), energy is present in motivational behavior of a person and it is providing permanency & task's orientations. The motivation is a capability which inborn and innate phenomenon. There are few factors which are involved in influencing the environmental aspect including the context, temper, goal, and instrument. The context is in fact the external stimuli which affects the most during nurturing procedure, the temperament is something which is indeed an internal aspect. The third factor is goal which means inclining toward a purpose. Whereas, the forth factor is instrument which means instrument for achievement of goal.

For the achievement of goals, fulfillment of needs and dispositions human being acquire the sufficient motivation. Especially for students of mathematics motivation for learning mathematics is necessary. Mohamdi (2006) states that it is only the motivation which can stimulate the students to complete their assignments in time and successfully for sake of achievement of goals and accomplishment necessary for professionalism.

3.5. Research Variables

This research study was based on two variable interactive learning environment and students' motivation. Interactive learning environment was treated as independent variable while students' motivation was dependent variable.

3.5.1. Interactive Learning Environment (Independent Variable)

Interactive learning environment was further subdivided into seven sub-scales which are as follows:

3.5.1.1. *Students' Involvement*

By involvement of learners describes us the extent to which learners is attentive and taking keen interest in class. Learners involvement also means that how student participate in class room activities and to what extent he or she is participating in class room activities.

3.5.1.2. *Students' Cohesiveness*

By cohesiveness of students we assess the extent to which the learners are supportive, helpful and cooperative with each other. Students' cohesiveness is the key factor which may increase the productivity of learning experiences. In other words we can say that cohesiveness is system in which development gets connected in a logical form. For the accomplishment of the task, the task units are well organized to meet overall objectives consequently

3.5.1.3. *Investigation*

Investigation means the extent of inquiry skill of learners and use of this inquiry skill in problem solving of mathematics classroom.

3.5.1.4. *Teacher support*

The support of a teacher is observed when he/she extends the support to facilitate, involve and aids in learning process. Furthermore, teacher is the only individual who

can organize and manage the tone of class, create a warm environment, nurture, guide and mentor the students, plays the role of a role model and may listen, see and help his students in hours of troubles.

3.5.1.5. *Task orientation*

The extent to which a learner performs his or her planned activities within the class and pays his/her full attention to the activity with full concentration and avoid his/her thinking's by wondering here and there.

3.5.1.6. *Cooperation*

The degree to which learners collaborate, cooperate with his or her class fellows while performing the classroom activities. Cooperation means work together for the accomplishment of the common objectives. The cooperation is seen in the setting when the students are helpful to each other and search for their own advantages in a group as a member.

3.5.1.7. *Equity*

Equity is explained as fairness, justice, equality and impartiality with all student, which is based on rules of even handed dealing. It also means providing as much as advantage, suppositions or freedom to one student as it will be given to the other peers. The term equity denotes the meaning as the extent to which the equal treatment of teachers with all student including giving praise, allocation of questions, all chances and opportunities to be comprised in debates.

3.5.2. **Students' Motivation Level (Dependent Variables)**

Students' motivation has further three sub-scales which are as follows:

3.5.2.1. *Intrinsic motivation*

This type of motivation involves personal actions one take to satisfy him/herself and does not expect anything as a return. In fact it is something which an individual does to

make himself/herself feel good or something that gives a sense of achievement. This is indeed a primary or internal motivator which can be sometimes a challenge to a person posed by himself. For instance, a learner wants to know more about some phenomenon and gain knowledge about something, he reads to satisfy his wish and to gain the sense of calmness by going through the book, thus intrinsically motivated to do the reading task. However, here we have divided the intrinsic motivation into further categories:

3.5.2.1.1. Knowledge

It involves measuring the depth of an individual's desire to finish an activity driven by the satisfaction and delight they derive from the learning process, all with the ultimate goal of enriching their knowledge.

3.5.2.1.2. Accomplishment

Its is the desire to perform an activity, which brings satisfaction and delight through the process of learning, all with the ultimate aspiration of finding joy in its accomplishment.

3.5.2.1.3. Stimulation:

This is the determinant of the desires for the performance of a task for exciting an experience.

3.5.2.2. **Extrinsic motivation**

This sort of motivation does not focus on internal satisfaction, rather it is done to gain some prize, reward or to avoid the penalty. Here in this case the motivator remains external as one is not expecting any internal reward like satisfaction and the focus remains on the attention toward the consequences of doing or not performing something. For instance, learners/students remain disciplined and show nice behavior in the classroom toward teacher to prove themselves as good students in the eye of the teacher. If they do not want to lose good grades, they will study for the earning of the grades.

They put their emotions aside and keep trying to do something which in return gives them external reward though bitter. There are some further divisions of this sort of motivation.

3.5.2.2.1. *Identified Regulation:*

The desire for the performance of an activity not only for the inherent enjoyment or utility but also as a means to boost the self-esteem and feel a greater sense of personal significance and value.

3.5.2.2.2. *Introjected Regulation:*

The pressurization and feeling of guilt are assessed in this sort of motivation.

3.5.2.2.3. *Extrinsic Regulation:*

There is a determinant to assess either the students is performing an activity for the avoidance of any adverse consequence or does it to gain some reward.

3.5.2.3. **Amotivation**

The experience of lacking of motivation or the condition when someone has the deficit to be involved in some task is assessed by amotivation. It is considered by absence of apparent capability or disappointment to acknowledge the consequences or task.

Detailed description of the variables used in the current study is as under.

Table 3.1

Description of Research variables

Independent Variables	Dependent Variables
Interactive Learning Environment	**Motivation**
i. Students' involvement	i. **Intrinsic Motivation**
ii. Students' Cohesiveness	a. Knowledge
iii. Investigation	b. Accomplishment
iv. Teacher support	c. Stimulation

v. Task orientation	ii. **Extrinsic Motivation**
vi. Cooperation	a. Identified Regulation
vii. Equity	b. Introjected Regulation
	c. Extrinsic regulation
	iii. **Amotivation**

3.6. Population

12810 students were considered as population for the current investigation (GoP, MoE, 2019). These students were studying in class 10th, public secondary schools of Islamabad working under Federal Directorate of Education. According to available record in IT Section of FDE (data base) there were 5231 boys and 7579 girls studying in public secondary schools (2018-2019). A detailed list of school with students' strength was obtained from IT Section of Federal Directorate of Education (FDE) Islamabad. According to the information obtained from IT Section of Federal Directorate of education, there are 101 public secondary schools from which 45 were boys' schools and 56 were the schools for the girls of Federal Directorate of Education, Islamabad. Thus, 12810 students studying in class $10^{th}$of the public secondary schools of FDE were treated as the population to carry out this research.

Table 3.2

Population for the Study

Sr. No.	Category	No of Schools	No. of Students
1.	Boys	45	5231
2.	Girls	56	7579
3.	Total	101	12810

3.7. Sampling Technique

A sampling technique is a way used in statistics to select a subset (sample) of individuals, items, or data points from a larger population for the purpose of drawing conclusions or making inferences about the entire population. Sampling is often employed when it is not feasible or practical to study an entire population due to constraints such as time, cost, or resources. The process of selecting a sampling technique is a crucial step in designing a study or experiment. The choice of a sampling technique depends on various factors, including the research objectives, the characteristics of the population, the available resources, and the precision required for the study. In this research for drawing a sample from population, researcher clearly articulated the goals and objectives of the study. Defined the population, constructed sampling frame and ensured that the sampling frame is comprehensive and accurately representing the population. Furthermore, by considering the nature of research and need of data, proportionate stratified random sampling technique was utilized. Proportionate stratified random sampling technique is employed in research to ensure that subgroups within a population are fairly and accurately represented in the sample. This method improves representation, enhances precision and increases the generalizability of research findings by dividing the population into strata based on relevant characteristics and sampling each stratum proportionally to its size or significance in the population.

Proportionate stratified random sampling is a technique of sampling that involves the division of a population into smaller subgroups known as strata. In proportionate stratified random sampling, or stratification, the strata are formed based on members' shared attributes or characteristics, such as educational attainment etc. In this research strata were made on the basis of gender, It is the most commonly used sampling technique as its incredibly prompt, uncomplicated, and economical. In many cases, members are readily approachable to be a part of the sample. Furthermore, it was tried to approach all the sectors of federal area to get a sample representing the characteristics of whole

population. As in the current research the proportionate stratified random sampling technique has been utilized and 10.5 % from each stratum was selected randomly.

Sample Size

3.6.1 Steps of Proportionate Stratified Random Sampling

To perform proportionate stratified random sampling for this study with a population of 12,810 students and a desired sample size of 1,500 students, these steps were followed:

Step 1: Clearly defined the population, which consists of 12,810 students studying in class 10th in public secondary schools in Islamabad under the Federal Directorate of Education (FDE). The lists of the students were downloaded.

Step 2: Identified Stratification Criteria which was done on the base of gender. The two strata were drawn , one for "boys" and the 2nd for "girls."

Step 3: Stratum Formation Separated the population into the two strata:

a. Stratum 1: Boys (5,231 students)

b. Stratum 2: Girls (7,579 students)

Step 4: Calculate the proportion of students in each stratum relative to the total population:

c. Proportion of Boys: 5,231 / 12,810 ≈ 0.427

d. Proportion of Girls: 7,579 / 12,810 ≈ 0.573

Step 5: Sample Size Allocation: Allocated the sample size of 1,350 students across the two strata in proportion to their sizes. Multiply the proportions by the desired sample size:

Sample size for Boys: 0.427 * 1,500 ≈ 640 boy students

Sample size for Girls: 0.573 * 1,500 ≈ 860 girl students

Step 6: Random Sampling within Strata: Within each stratum (boys and girls), random sampling technique was performed to select students for the sample. A random number generator or another randomization method may be used to select students from each

stratum. But in this research a software named as "SUDAAN" was used to draw sample from each stratum.

Sample size can be defined as the subset of a population required to ensure that there is a sufficient amount of information to draw conclusions (Sekaran & Bougie, 2010). Kumar et al. (2013) described sample size in terms of the "total number of subjects in the sample". Simply, it refers to the number of respondents or observations to be included in a study. As the numbers of the both categories were not equal, the major division was made by dividing the population into two categories. Girls public secondary schools and boys public secondary schools and there were 5231 boys studying in 45 boys secondary schools of FDE, whereas 7579 girls were studying in 56 secondary schools of the FDE. Thus number of girl students was greater than boys' students. So, for the justification of equilibrium of share, sample designated from both the divisions were about 10 % each. However, 1281 students from which 523 were boys and 758 were girls, must be considered to respond properly as representatives (sample). As it's a fact that all respondents do not respond or fill the questionnaire properly therefore to avoid any difficulty on advance stage 1500 respondents were given questionnaires in the beginning and 1411 questionnaires were collected back from the respondents. Out of these 1411 questionnaires received from the respondents, 61 were not appropriately filled and rejected for the incompletion of the filling.

So, for the analysis of the data, only 1350 respondents' response was considered which are as under:
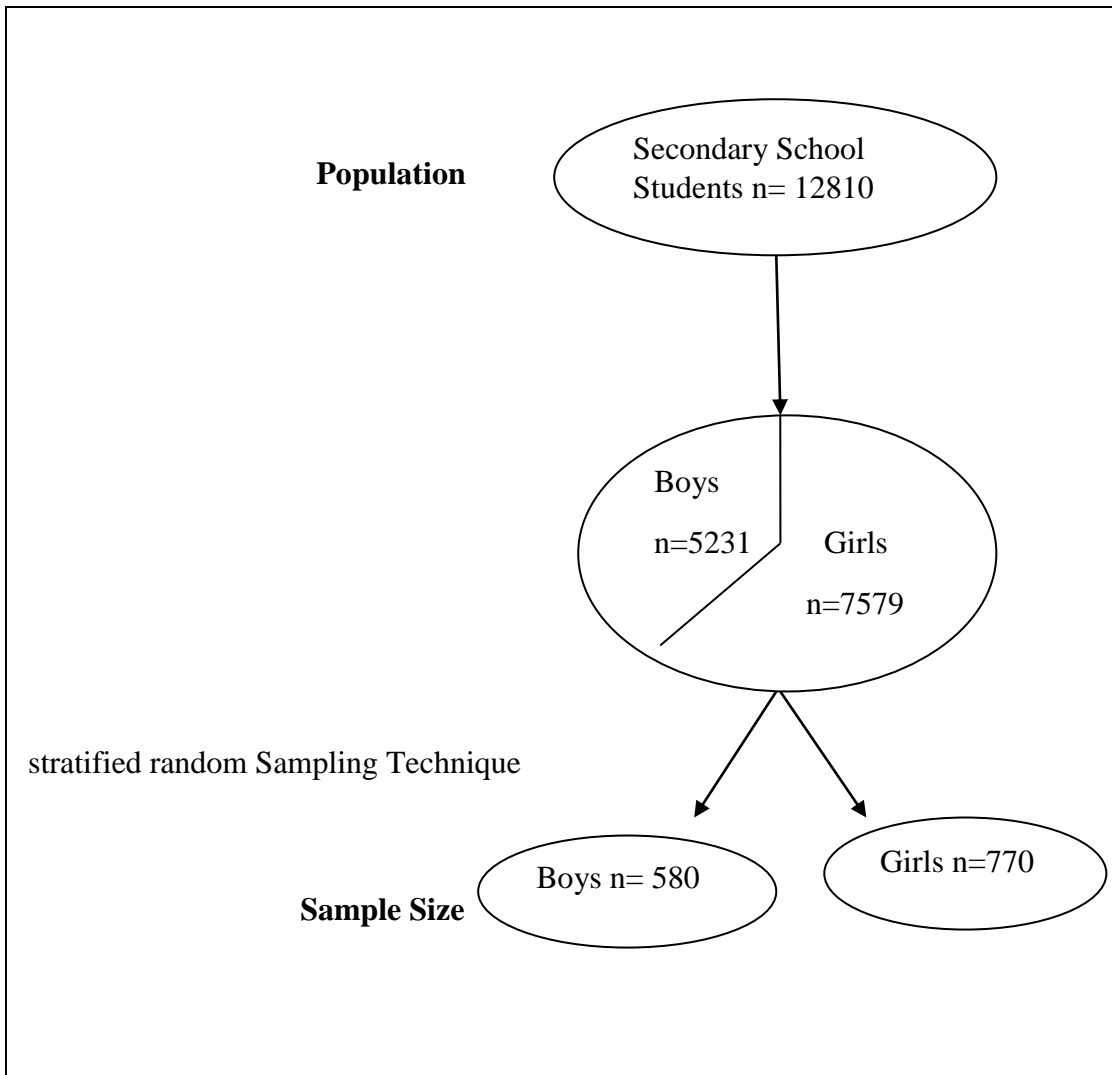
Figure 3.1 Sampling Procedure

The schools designated for the data collection purpose are depicted in table as under:

Table 3.3

List of Schools Selected as Sample

Sr. No	Name of School	Level	Frequency	Percent	Cumulative Percent
1.	Islamabad Model College for Girls, G-8/4 IBD	VI - XII	123	9.1 %	9.1 %
2.	Islamabad Model College for	VI - XII	119	8.8 %	17.9 %

Girls, G-9/2

3.	Islamabad Model College for Boys, G-6/2	VI - XII	141	10.4 %	28.3 %
4.	Islamabad Model College for Boys, G-7/2	VI - XII	163	12.1 %	40.4 %
5.	Islamabad Model College for Boys, I-10/1	VI - X II	151	11.2 %	51.6 %
6.	Islamabad Model College for Girls, F/7- 2 Islamabad	VI – XII	115	8.5 %	60.1 %
7.	Islamabad Model College for Girls, I-10/4	I – XII	110	8.1 %	68.2 %
8.	Islamabad Model College for Girls, Thanda Pani F.A P.O Nelore Islamabad	I – XII	151	11.2 %	79.4 %
9.	Islamabad Model College for Girls, Pind Malkan SEC Sihala Islamabad	I – XII	86	6.4 %	85.8 %
10.	Islamabad Model College for Boys, Tarnol	I – XII	95	7 %	92.8 %
11.	Islamabad Model College for Girls, Bhara kahu	I – XII	98	7.2 %	100 %

Out of 101 schools eleven (11) schools were selected at random which was more than 10 % of total population. Above table revealed that from those 123 students were selected from Islamabad Model College for Girls, G-8/4 (VI – XII) which was 9.1% of total population. 119 students were selected from Islamabad Model College for Girls, G-9/2 (VI – XII) which was 8.8% of total population. 141

students were selected from Islamabad Model College for Boys, G-6/2 (VI – XII) which was 10.4 % of total population. 163 students were selected from Islamabad Model College for Boys, G-7/2 (VI – XII) which was 12.1 % of total population. 151 students were chosen from Islamabad Model College for Boys, I-10/1 (I – XII) which was 11.2 % of total population. 115 students were selected from Islamabad Model College for Girls, F /7-2 Islamabad (VI – XII) which was 8.5 % of total population. 110 students were selected from Islamabad Model College for Girls, I-10/4 (I – XII) which was 8.1 % of total population. 151 Islamabad Model College for Girls, Thanda Pani F.A P.O Nelore Islamabad (I – XII) which was 11.2 % of total population. 86 students were selected from Islamabad Model College for Girls, Pind Malkan SEC Sihala Islamabad (I – XII) which was 6.4 % of total population. 95 students were selected from Islamabad Model College for Boys, Tarnol (I – XII) which was 7 % of total population. 98 students were chosen from Islamabad Model College for Girls, Bhara kahu (I – XII) which was 7.2 % of total population.

3.8. Tool Construction

For the determination of the students' motivation level and exploration of the prevailing practices in the classroom, two questionnaires were adapted. However, the closed ended questions were utilized in both the questionnaires. Closed ended questions are utilized for the description of attitudes and beliefs. Closed ended questions were used because of the nature of ease and time budgeting characteristics of these questions. There is a variation in the close ended questions which is quite advantageous. The respondents are expected to answer in relevance. The specification of the options is given for the respondents therefore, these are considered as beneficial for the collection of data.

Especially in this research respondents of the study were secondary school students and the questions included in the questionnaire are the close ended in nature. Interactive Learning Environment questionnaire was adapted as used by Myint (2001) and developed by Fraser, Fisher, and McRobbie (1996), to explore the prevailing practices regarding interactive setting. The designing of the questionnaire to explore the prevailing practices related to WHICH. However, this was based on

seven subsections. This questionnaire was developed to explore and determine the prevailing practices related to class room environment.

Academic Motivation Scale (AMS) used by Utvaer & Haugan (2016) and developed by Vallerand et al. (1992, 1993) was adapted for the determination of the motivational aspect in the learners. It was consisted of three sub scales i.e, (i.) intrinsic motivation which is further subdivided into three categories which is also subdivided into three categories.

3.8.1. "Whats' Happening In this Class" Questionnaire

What Is Happening in the Class Questionnaire (WIHIC) was developed by Fraser, Fisher, and McRobbie (1996) which was adapted. It was based on 56 items and had seven subsections. The first section was related to students' cohesiveness, students' engagement in the classroom, their cooperation, equity and the support. Every sub section was consisting of 8 items. Thus questionnaire was comprised of total 56 items.

Table 3.4

List of Items in " Whats, Happening In Class" Questionnaire

Scale	Subsections	Items
What Is Happening In the Class Questionnaire		56
	a. Investigation	I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8
	b. Equity	E_1, E_2, E_3, E_4, E_5, E_6, E_7, E_8
	c. Student Involvement	SI_1, SI_2, SI_3, SI_4, SI_5, SI_6, SI_7, SI_8

d. Student Cohesiveness	SC_1, SC_2, SC_3, SC_4, SC_5, SC_6, SC_7, SC_8
e. Task orientation	TO_1, TO_2, TO_3, TO_4, TO_5, TO_6, TO_7, TO_8
f. Teacher Support	TS_1, TS_2, TS_3, TS_4, TS_5, TS_6, TS_7, TS_8
g. Cooperation	C_1, C_2, C_3, C_4, C_5, C_6, C_7, C_8

3.8.2. Academic Motivation Scale (AMS)

A self reported tool was used to collect data for assessing motivation level of the students. The use of self-reported tools in research is better due to their capacity to access subjective human experiences, their applicability across diverse research domains, their participant-centered approach, accessibility and efficiency, psychometric properties, flexibility, and potential for complementing other data sources. According to John & Srivastava (1999), Self reported tools empower researchers to explore the intricacies of the human psyche, inform evidence-based practices, and advance knowledge across various fields. While acknowledging their advantages, researchers must also considered methodological rigor, transparency, and ethical considerations while designing and implementing self-reported measures to ensure the validity and reliability of their research outcomes. Zell, Krizan, and Teeter (2015) emphasize, "Self-report measures are essential for assessing individuals' subjective experiences, which are integral to understanding human behavior and psychological processes." Whether it's assessing attitudes, emotions, or motivations, self-report instruments offer a direct means of

tapping into the rich tapestry of human consciousness. As Deci and Ryan (2012) assert in the context of motivation research, "Understanding people's self-reports of their motivation and engagement is crucial because these reports reflect their subjective experiences and perceptions." This participant-centered approach fosters a deeper understanding of the human condition and contributes to the credibility of research outcomes. In this study this tool was designed for the students to provide information about their motivation level therefore it was better to use a self reported tool.

Motivation assessment scale was also adapted. It was used by Utvaer & Haugan (2016) and developed by Vallerand et al. (1992, 1993) to assess academic motivation of learners. It has three major divisions which are amotivation, extrinsic motivation and intrinsic motivation. The further division of intrinsic motivation is in certain uneven subscales. For the knowledge assessment of the desires for the performance of the activities and experience of the satisfaction. The achievement of the motivation of intrinsic nature assessed the wants for the performance of the activity for the pleasure and stimulation. Contrastingly, extrinsic motivation has further 3 subscales of motivation which are discussed as (1) identified regulation to assess gaining of the values and desire of the performance. Similarly, there is (2) introjected regulation that is for the assessment of the desires of pressure. Hence, the purpose of the extrinsic regulation is to assess either students' participation is for the rewards of negative outcomes. The lacking of the motivation is assessed by the amotivation. Detail about the number of variables is as under:

Table 3.5

Detail of Items in Motivation Assessment Scale

Motivation Assessment Scale	Sections	Subsections	Items
	Intrinsic Motivation	1. Knowledge	IMK1, IMK2, IMK3, IMK4, IMK5
		2. Accomplishment	IMA1, IMA2, IMA3, IMA4, IMA5
		3. Stimulation	IMS1,IMS2, IMS3, IMS4
	Extrinsic Motivation	4. Introjected Regulation	EMI1, EMI2, EMI3, EMI4,
		5. Extrinsic Regulation	EMER1,EMER2,EMER3, EMER4
		6. Identified Regulation	EMIR1, EMIR2, EMIR3, EMIR4
	Amotivation		A1, A2, A3, A4, A5
Total No. of Items			31

3.9. Validation of Instrument

Content validity is necessary to determine either the tool is appropriately developed to measure all the aspects of the construct. This type of validation is done by consulting the experts of the subject. The current study covered the area as a combination of education and educational psychology, the data collection instrumentation is done and referred for the consultancy form the educational experts as well as has expertise in educational psychology also were contacted for validation of tool. The panel comprised of 5 distinguished specialist members. Researcher personally visited each member and provided the appendixes A & B to them. Appendix A is the cover letter and a questionnaire and the

appendix B is the certification. The experts' examination of the research instrument is done under the considerations of the set objectives of the study. They worthy experts suggested certain modifications in the questionnaires and provided certificate after the changes in the instrument. The instrument validation panel was consisted of worthy Asst. Prof Dr. Muhammad Tanveer Afzal (AIOU, ISLAMABALD), Associate Prof. Dr. Qudsia Riffat (Ex Chairperson of Science Edu. department, Faculty of Education, Allama Iqbal Open University, Islamabad), Associate Prof. Dr. M. Ajmal (Chairperson, Department of Distance Non Formal & Continuing Education department, Faculty of Education, Allama Iqbal Open University, Islamabad). They were Lecturer Imran Bukhari (National Institute of Psychology Quaid e Azam University Islamabad) and Dr. Amara Afsheen Educational Psychologist. Moreover chairman / HOD of different department in Allama Iqbal Open University assisted in recording validation of the instrument.

3.10. Pilot Testing

One boys' secondary school and one girls' secondary school were the selected for the piolet testing. The questionnaires distribution was made in 50 students (25 girls and 25 boys). One week was given to the respondents to answer the questionnaires. 42 out of 50 students returned the questionnaire after the pilot testing and two of them were having incomplete information, therefore, rejected by the researchers. SPSS (20th Edition) was utilized for the 84% response rate. However, "What Is Happening In the Class (WIHIC)" was found reliable 0.87 and Motivation Assessment Scale (MAS) was found reliable in terms of Cronbach's Alpha i.e. 0. 81. Similarly, the "What Is Happening In the Class (WIHIC)" was based on seven sub sections viz (i) Student cohesiveness, (ii) Student Involvement, (iii) Teacher Support (iv) task orientation, (v) Equity (vi) Investigation and (vii) Cooperation while Academic Motivation Scale (AMS) was comprised of three subscales. Pilot testing was required to determine the validity and reliability of the both tools which is as under:

3.10.1. Reliability of the Instruments

The reliability of the tools was considered as a critical component of the recommendations of the reusage in the similar conditions. It was ensured that the reused tools will not cause further errors as found in the current circumstances. It is reliable with the degree of confidence and tested with the pilot trailing for the correlational aspect of the sections in the designed questionnaire. The 40 responses received were analyzed and the reliability was measured in terms of Cronbach's Alpha which was found 0.87 of "WIHIC", and 0.81 of MAS. However, the reliability was found reliable (in term of item total relationship). Certain minor modifications were made in the questionnaires' by the researcher. The reliability score in details are highlighted in the table.

Table 3.6

Statistical Reliability Analysis of Research Tools (n=40)

Tool		Reliability	Items
What Is Happening In the Class		0.87	56
	Investigation	0.83	8
	Equity	0.89	8
	Involvement	0.91	8
	Cohesiveness	0.86	8
	Task orientation	0.84	8
	Teacher Support	0.93	8
	Cooperation	0.96	8
Motivation Assessment Scale		0.81	31
	Knowledge	0.79	5
	Accomplishment	0.95	5
	Stimulation	0.89	4
	Introjected Regulation	0.91	4
	Extrinsic Regulation	0.80	4
	Identified Regulation	0.81	4
	Amotivation	0.85	5

According to above table the final results were found substantiated (100%) level of confidence. WHICH was at 0.91 and found quite reliable. Similarly, AMS was at 0.93 Cronbach's Alpha with similar reliability and both the questionnaires used with the fair amount of confidence. The geographical limitations were considered during the investigation as it is specified in Islamabad, Capital Territory. There is no assurance of reliability if it is utilized outside of the context. However, the subsection describes the correlational calculation of the reliability.

Table 3.7

Item Total Correlations of What Is Happening in the Class (n=40)

Item	Correlation	Item	Correlation	Item	Correlation	Item	Correlation
SC1	.399*	SI1	.522**	TO1	.312**	C1	.499**
SC2	.522**	SI2	.383*	**TO2**	**.699****	C2	.496**
SC3	.301**	SI3	.496**	**TO3**	**.19****	C3	.443**
SC4	.431**	SI4	.313**	TO4	.380**	C4	404**
SC5	.531**	SI5	.405*	TO5	.239**	C5	.399**
SC6	.431**	SI6	.369	TO6	.344**	C6	.344*
SC7	.646**	SI7	.655**	TO7	.503*	C7	.362*
SC8	.512**	SI8	.562**	TO8	.409*	C8	.23**
TS1	.216*	I1	.315*	E1	.600**		
TS2	.281*	I2	.390	E2	.345*		
TS3	.310*	I3	.301**	E3	.351**		
TS4	.452**	I4	.600**	E4	.603**		
TS5	.335*	I5	.362*	E5	.469**		
TS6	.605***	I6	.503**	E6	.565**		
TS7	.543**	I7	.540**	E7	.483**		
TS8	.527**	I8	.465*	E8	.488**		

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

The items having score less than .30 were rephrased. Item TS1, TS2, TO3, TO5 and E8 were rephrased to make language easy according to the understanding of the students.

Table 3.8

Item Total Correlations of Motivation Assessment Scale (MAS)

Item	Correlation	Item	Correlation
IMK1	.410**	EMI3	.246**
IMK2	.317*	EMI4	.341*
IMK3	.423**	EMER1	.519**
IMK4	.245**	EMER2	.449**
IMK5	.403**	EMER3	.162**
IMA1	.587**	EMER4	.538**
IMA2	.546**	EMIR1	.476**
IMA3	.588**	EMIR2	.558**
IMA4	.339**	EMIR3	.649**
IMA5	.511**	EMIR4	.272**
IMS1	.301**	A1	.414**
IMS2	.664**	A2	.378**
IMS3	.230**	A3	.397**
IMS4	.430**	A4	.356**
EMI1	.600**	A5	.167**
EMI2	.461**		

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

Item IMK4, IMS3, EMI3, IMIR4, EMER3 and A5, scored less than .30.Therefore these 8 items were improved and curtailed it according to the understanding of the respondents.

Table 3.9

Inter Section Correlation of What Is Happening in this Class(n-40)

	Cohesiveness Student	Involvement Student	Support Teacher	Investigation	Cooperation	Equity	Orientation Task	WIHIC
Correlation	1							
Student Cohesiveness	.450*	1						
Student Involvement	.309**	.332*	1					
Teacher Support	.40**	.58**	.590**	1				
Investigation	.629**	.679**	.819**	.659**	1			
Cooperation	.452**	.340**	.481**	.469**	.324**			
Equity	.634**	.432**	.591**	.319**	.332*	1		
Task Orientation	.452**	.340**	.481**	.469**	.304**	.309**	1	
WIHIC	.575**	.521**	.411**	.387**	.598**	.340	.481	1

**. Correlation is found significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

Thus the intersection ** Correlation is noteworthy at the 0.05 level (2-tailed).

The variables of WIHIC are highlighted in the Table No. 3.9 which was found statistically significant. Its correlation at 0.05 level (2-tailed). However, it was shown that the correlation with each in the sub factors is significant. The range of intersection correlation, was from .304** to .819**. The maximum correlation was .819** which was found between "teacher support" and their "sense of investigation". The minimum correlation was .304**which was found between "Investigation" and "Task Orientation".

Table 3.10

Item Total Correlation of Motivation Assessment Scale (MAS)

	Knowledge	Accomplishment	Stimulation	Regulation Identified	Regulation Interojected	Regulation Extrinsic	Amotivation	MAS
Knowledge	1							
Accomplishment	.550*	1						
Stimulation	.359**	.393*	1					
Identified Regulation	.410**	.328**	.590**	1				
Interojected Regulation	.629**	.679**	.729**	.459**	1			
Extrinsic Regulation	.452**	.340**	.481**	.469**	.314**	1		
Amotivation	.634**	.432**	.591**	.309**	.332*	.344**	1	
MAS	.505**	.421**	.611**	.387**	.398**	.340	.481	1

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

Table 3.9 indicated the intersection correlation of major variables and sub variables of the Motivation Assessment Scale. It indicated that all major and sub variables were statistically significantly correlated. The range of correlation was .729** to .314**.However, the significant collection was found in the variables which was found at 0.05. So, correlation .729** was between the stimulation & introjected regulation whereas lowest correlation was found .314** which was between introjected regulation and extrinsic regulation.

3.10.2. Revision of the Research Tool for Final Test

It is highlighted and revealed that the correlation is significant during the period of analysis of the correlation in reliability process. So, it was as depicted in the table regarding WHICH that item No.

TS1, TS2, TO3, TO5 and E8had correlation less than .30, therefore these item were rephrased according to the understanding of the students.

Likewise in Motivation Assessment Scale IMK4, IMS3, EMI3, IMIR4,EMER3 and A5, had correlation less than .30, thus these was also rephrased according to the understanding of the respondents.

Table 3.11

Revision of What Is happening In This Class Questionnaire

Item Code.	Old Statement	Item Strength	Revised Statement
TS1	The teacher takes a personal interest in me.	.216*	My maths teacher provides me individual help in academic matters.
TS2	The teacher goes out of his/her way to help me	.281*	My maths teacher help me when I am confused.
TO3	I know the goals of this class	.380**	I know the goals for mathematics class.
TO5	I know, whatever I am trying to accomplish in the class	.190**	I am clear what I may know/learn in my maths class.

Table 3.11 elaborates the item codes, there old statement, there strength and revised statement of " What Is happening In This class" Questionnaire .

Table 3.12

Revision of Motivation Assessment Tool

Item Code.	Old Statement	Item Strength	Revised Statement
IMK4	Study of Mathematics demands me to learn logics and novelty	.245**	Study of Mathematics demands me to learn new things and get new knowledge.
IMS3	I feel gratification while discussing mathematics problems in class.	.230**	I feel pleasure while discussing mathematics problems in class.
EMI3	I think learning of mathematics will provide me best opportunities.	.246**	I think learning of mathematics will give me more carrier choices.
IMIR4	I take interest in learning mathematics because I want to show myself that I can do.	.272**	I take interest in learning mathematics because I want to show myself that I can succeed to solve maths problems.
EMER3	I take interest in learning mathematics because I want best future	.162**	I take interest in learning mathematics because I want to have 'the good career' later on
A5	Solving maths problems is pathetic for me.	.167**	Solving maths problems is boring for me.

3.10.3. Reliability of the Final Tools

Reliability of both the tools were ensured after final data collection. Following Table No. display the reliability of both the instruments.

Table 3.13

Reliability of the Questionnaire used. (N=1350)

Tool	Variables	Reliability	No. of Items
What Is Happening In the Class		0.91	56
	Investigation	0.89	8
	Equity	0.85	8
	Involvement	0.93	8
	Students' Cohesiveness	0.85	8
	Task orientation	0.89	8
	Teacher Support	0.83	8
	Cooperation	0.96	8

The reliability (i.e. 0.91) reflected in the Table 3.13 may be graded as excellent for the scale. The scale was divided into seven major variables (students' cohesiveness, teacher support, cooperation among students, equity, task orientation, students' involvement and investigation. Reliability of the students' cohesiveness was found as .85, investigation was 0.89, equity was determined as .85, students' involvement was found as .83, task orientation was determined as .89, teacher support was .83 whereas the reliability of cooperation among students' was determined as .96. According to these values all variables of the tool "What Is Happening in the Class (WIHIC)" was found reliable.

Table 3.14
Reliability of the Motivation Assessment Scale (MAS) (N=1350)

Tool	Variables	Sub Variables	Cronbach's Alpha	No. of Items
Motivation Assessment Scale			.93	31
	Extrinsic Motivation		.91	12
		Introjected Regulation	0.81	4
		Extrinsic Regulation	0.87	4
		Identified Regulation	0.93	4
	Intrinsic Motivation		0.86	11
		Knowledge	0.91	5
		Accomplishment	0.85	5
		Stimulation	0.78	4
	Amotivation		0.87	5

Regarding Motivation Assessment Scale (MAS), the overall reliability (i.e. 0.93) considered as good for the scale. The scale consist of three variables i.e Extrinsic Motivation, Intrinsic Motivation and Amotivation. The Reliability of variables considered such as extrinsic motivation, intrinsic motivation and Amotivation, was found 0.91, 0.86 and 0.87 respectively. These values of reliability showed that the all three variables very found highly reliable. It is clear from the Table No. 4.2 that the first variable i.e extrinsic motivation is further divided into three sub-variables which are introjected regulation, extrinsic regulation and identified regulation. Reliability of these sub-variables was 0.81, 0.87 and 0.93 respectively. According to these values of reliability the it was concluded that these variables were also extremely reliable. The second variable of "Motivation Assessment Scale (MAS) was also divided into three sub-variables i.e. knowledge, accomplishment and stimulation,

Reliability of these sub-variables was 0.91, 0.85 and 0.78. These values of reliability showed that the first two sub-variables of intrinsic motivation were highly reliable while the third variables i.e. stimulation was also found reliable.

3.10.4. Correlation of the Tools

Item total correlation and inter section correlation of items was also checked for the both research tools using by using 20th Edition of Statistical Package for Social Sciences.

Table 3.15
Item-total Correlation Of What Is Happening In The Class (WIHIC) (N=1350)

Item	Correlation	Item	Correlation	Item	Correlation	Item	Correlation
SC1	.499**	SI1	.522**	TO1	.312**	C1	.499**
SC2	.522**	SI2	.383**	TO2	.699**	C2	.496**
SC3	.301**	SI3	.496**	TO3	.541**	C3	.443**
SC4	.431**	SI4	.413**	TO4	.585**	C4	404**
SC5	.531**	SI5	.405**	TO5	.439**	C5	.399**
SC6	.431**	SI6	.369**	TO6	.344**	C6	.344**
SC7	.646**	SI7	.655**	TO7	.503**	C7	.362**
SC8	.512**	SI8	.562**	TO8	.409**	C8	.432**
TS1	.436**	I1	.315**	E1	.600**		
TS2	.481**	I2	.390**	E2	.345**		
TS3	.510**	I3	.301**	E3	.351**		
TS4	.452**	I4	.600**	E4	.603**		
TS5	.335**	I5	.362**	E5	.469**		
TS6	.605**	I6	.503**	E6	.565**		
TS7	.543**	I7	.540**	E7	.483**		
TS8	.527**	I8	.465**	E8	.488**		

** reflects Correlation significance at 0.01 level (2-tailed)

The Table 3.15 depicted "item-total correlation" of the scale "WIHIC" adapted (see Myint, 2001) and then developed a questionnaire keeping in view the classroom learning environment. It consists of 56 items in total. As it was discussed earlier; this scale had seven variables which are cooperation among students, task orientation, students involvement in their work in mathematics classroom, equity, teacher support, students' cohesiveness and students' investigation while solving mathematics problems. Moreover, item-total correlation of the scale was also found significant (see Table 4.3). The range of the correlation was from .301** to .699**. SC3 (Third component of Students' Cohesiveness) has minimum correlation while TO2 (Second component of Task Orientation) has maximum correlation.

Table 3.16

Inter Section Correlation of What Is Happening In The Class (WIHIC) (N=1350)

	Student Cohesiveness	Student Involvement	Students' Support	Teacher Support	Investigation	Cooperation	Equity	Task Orientation
Student Cohesiveness	1							
Student Involvement	.450**	1						
Teacher Support	.659**	.532**	1					
Investigation	.410**	.628**	.590**	1				
Cooperation	.629**	.679**	.849**	.659**	1			
Equity	.452**	.740**	.481**	.869**	.734**	1		
Task Orientation	.452**	.740**	.581**	.469**	.604**	.589**	1	
Classroom learning Environment	*.835**	.821**	.811**	.687**	.598**	.740**	.681**	1*

** indicates Correlation significance at 0.01 level (2-tailed)

The major variables considered (see Table 3.16) regarding measuring "WIHIC" was found significantly correlated at 0.05 level of significance. The range of intersection correlation appeared to be .410** to .869**. The maximum correlation i.e. 0.869** was found between "cooperation among students" and "sense of investigation" whereas the minimum correlation found was .410** that was between "teacher support" and "students' cohesiveness".

Table 3.17

Item-total Correlation of Motivation Assessment Scale (MAS) (N=1350)

Item	Correlation	Item	Correlation
IMK1	.410**	EMI3	.461**
IMK2	.317**	EMI4	.546**
IMK3	.423**	EMER1	.519**
IMK4	.745**	EMER2	.449**
IMK5	.397**	EMER3	.687**
IMA1	.697**	EMER4	.538**
IMA2	.546**	EMIR1	.776**
IMA3	.588**	EMIR2	.558**
IMA4	.739**	EMIR3	.649**
IMA5	.446**	EMIR4	.672**
IMS1	.521**	A1	.414**
IMS2	.664**	A2	.878**
IMS3	.730**	A3	.597**
IMS4	.321**	A4	.356**
EMI1	.600**	A5	.767**
EMI2	.561**		

** Correlation significance at 0.01 level (2-tailed).

Regarding Academic Motivation Scale (AMS), the item-total correlation is shown in a Table 4.17 The Scale/Tool was used by Utvaer & Haugan (2016) to assess academic motivation of learners. As discussed earlier that this tool deals with three major variables i.e. intrinsic motivation, extrinsic motivation and amotivation. Each of first two variables was further subdivided into three sub-variables. So it led to 31 total items included in the Scale/Tool developed so far. The "item-total correlation" of the scale was found significant that falls within a Range i.e. 0.317** to 0.878**. The item termed as "IMK2" (i.e. second item of knowledge dimension of Intrinsic Motivation" has minimum correlation i.e .317**.

Table 3.18

Inter Section Correlation of Major Variables of Motivation Assessment Scale (MAS) (N=1350)

	Extrinsic Motivation	Intrinsic Motivation	Amotivation	Motivation
Extrinsic Motivation	**1**			
Intrinsic Motivation	.765**	**1**		
Amotivation	.655**	.875**	**1**	
Motivation	.581**	.545**	.575**	**1**

** Correlation significance at 0.01 level (2-tailed).

The major variables of Motivation Assessment Scale (MAS) was found statistically significantly correlated at 0.01 level (see Table 3.18). Moreover, the item-total correlation range was found within 0.545** to 0.875**. The minimum correlation between motivation and intrinsic motivation found

0.545**, whereas the maximum correlation between amotivation and intrinsic motivation was found 0.875**.

Table 3.19

Inter Section Correlation of Major and Sub Variables of Motivation Assessment Scale(MAS) (N=1350)

	Knowledge	Accomplishment	Stimulation	Regulation Identified	Regulation Interojected	Regulation Extrinsic	Amotivation
Knowledge	1						
Accomplishment	.550**	1					
Stimulation	.659**	.493**	1				
Identified Regulation	.710**	.528**	.890**	1			
Interojected Regulation	.629**	.679**	.849**	.459**	1		
Extrinsic Regulation	.452**	.840**	.481**	.569**	.304**	1	
Amotivation	.634**	.832**	.591**	.549**	.732*	.598**	1
Motivation	.505**	.421**	.611**	.387**	.398**	.640**	.481**	1

** Correlation significance shown at 0.05 level (2-tailed)

The intersection correlation of major variables and sub variables of the Motivation Assessment Scale (MAS) appeared as significant at 0.05 level of significance (see Table 3.19) It was also found that highest correlation was 0.89** which was among stimulation and identified regulation whereas lowest correlation between introjected regulation and extrinsic regulation was found .304**.

3.11. Data Collection

Collecting the data is considered as one of the major task in the study. The authorities of the concerned schools were consulted and their permissions were taken on reference letters. The permission by the authorities helped the researcher to visit the Federal Directorate of Education Islamabad to seek permission from director schools to collect data from secondary schools working under FDE. After getting permission from director schools the process for the collection of the data was begun. However, the personal visits were made to collect the data. The sample schools were visited by the researcher personally for the purpose of data collection. Special request was made by the school principals and mathematics teachers to spare their class time and allow the researcher to visit the classes during their period

(Maths period) . Availability of maths teacher during the researcher's instruction was assured. As respondents were the secondary school students therefore the researcher distributed the questionnaires among the students, read the questionnaire loudly, answered the questions raised by teachers and students and guided the teachers and students to be honest while responding to the item of the tools. Researcher also provided guidelines to the respondents about questions of the questionnaire about which they felt confusion. Then the mathematics teachers were assigned the duty to guide the students and take back the questionnaires from the students after filling completely. Respondents were given one week to fill the questionnaire and they were asked to return the tool to their maths teacher. Students' were asked to take help for filling of the questionnaires from their maths teacher. For further support in answering the question and removing the ambiguities of the respondent's researcher visited each school after five days of distribution of questionnaires (It was already promised with the teacher as well as students that after five days researcher will again visit them. So please encircle the questions in their questionnaires which they were unable to understand).

3.12. Scoring Process of the Research Tool

Academic Motivation scale (AMS) was adapted by the researcher for the purpose of assessment of motivation secondary school students' while learning mathematics. Thus the scale / tool was rated on five (5) point "Likert scale" . Respondents were asked to respond against each option. All these options were ranging from, five (5) to one (1) showing their preferences of responses which are " 5 = Almost Always" , " 4 = Often", " 3 = Some times" , " 2 = Seldom" and " 1 = Almost ever" .

3.12.1. Scoring Process of Level of Motivation for Secondary School Students

Further these all responses were marked by calculating the score obtained from the responses given by the respondents. There were 31 items included in the scale. Hence the minimum possible score was 31 (31 x1 = 31) and the maximum possible score was 155 (31 x 5 = 155). As the highest value was 155 and lowest value was 31 therefore the range was 31 to 155. This range (31 to 155) was distributed in three levels which was " low" , " medium" and " high" . The scoring / marking of the responses to compute the level of the motivation was grounded on succeeding divisions :

1. Score 31 – 71 = Low

2. Score 72 – 113 = Medium

3. Score 114 -155 = High

Table 3. 20

Levels of Motivation of the Secondary School Students while learning Mathematics

Variable	Score	Levels of Motivation
	31 – 71	Low
Motivation	72 – 113	Medium
	114 – 155	High

3.12.1.1. Scoring Process of Level of Intrinsic Motivation for Secondary School Students

Further more the responses of the respondents were scored by calculating the score obtained by the respondents. 14 items were included in this scale. In this segment the minimum possible score was 14 (14 x1 = 14) and the maximum possible score was 70 (14 x 5 = 70). As the highest value was 70 and lowest value was 31 therefore the range was 14 to 70. This range (14 to 70) was also distributed into three levels which was also known as " low" , " high" and " medium " . The scoring of the responses to calculate the level of the motivation was based on following divisions :

1. Score 14 – 32 = Low

2. Score 33 – 51 = Medium

3. Score 52 - 70 = High

Table 3. 21

Levels of Intrinsic Motivation of the Secondary School Students while learning Mathematics

Variable	Score	Levels of Motivation
	14 – 32	Low
Intrinsic Motivation	33 – 51	Medium
	52 – 70	High

3.12.1.2. Scoring Process of Level of Extrinsic Motivation for Secondary School Students

In this section the responses were allocated by calculating the marks / scores obtained by the sampled respondents. 12 items were included in this section of scale. Thus the minimum possible score was 12 (12 x1 = 12) and the maximum possible score was 60 (12 x 5 = 60). As the highest value was 60 and lowest value was 12 therefore the range was 12 to 60. This range (12 to 60) was divided into three levels which was   " low" , " medium" and " high" . The marking/ scoring of the responses

furnished by the sampled respondents to calculate the level of the motivation was constructed on following divisions :

1. Score 12 – 27 = Low

2. Score 28 – 43 = Medium

3. Score 44 - 60 = High

Table 3. 22

Levels of Extrinsic Motivation of the Secondary School Students while learning Mathematics

Variable	Score	Levels of Motivation
	12 – 27	Low
Extrinsic motivation	28 – 43	Medium
	44 – 60	High

3.12.1.3. **Scoring Process of Level of Amotivation for Secondary School Students**

Further the responses were scored by calculating the score obtained by the respondents. There were only 5 items included in this section. Thus the minimum possible score was 5 (5 x1 = 5) and the maximum possible score was 25 (5 x 5 = 25). As the highest value was 25 and lowest value was 05 therefore the range was 5 to 25. This range (5 to 25) was divided into three levels which was " low" , " medium" and " high" . The scoring process of the respondents' responses to calculate the level of the motivation was grounded upon the following detachments :

1. Score 05 – 11 = Low

2. Score 12 – 18 = Medium

3. Score 19 - 25 = High

Table 3. 23

Levels of Amotivation of the Secondary School Students while learning Mathematics

Variable	Score	Levels of Motivation
	05 – 11	Low
Amotivation	12 – 18	Medium
	19 – 25	High

This scoring process was used to determine the students score.

3.13. Data Analysis

The analysis of the questionnaire was done through statistical package for social Sciences (SPSS) 20th edition. However, statistical techniques like Cronbach's Alpha, Reliability Test were utilized to determine the reliability of the tool, while for the analysis of the data, Mean score was used to explore the prevailing practices related to Interactive classroom learning Environment while students' score was used to determine the motivation level of the learners while learning mathematics. To determine the effects of Interactive learning environment on students' motivation linear regression was used.

Table 3. 24

Data Analysis Techniques

Sr. No	Objectives	Statistics
1.	To explore the practices related to interactive learning environment prevailing at secondary school level.	Mean Score
2	To investigate the level of students' motivation at secondary school level.	Students' Score
3.	To determine the effects of Interactive Learning Environment on students' motivation at secondary school level.	Regression Analysis

3.13.1. Assumptions of Using Linear Regression

Regression analysis is a statistical technique for studying linear relationships. Regression analysis is done for one of two purposes:

1. In order to predict the value of the dependent variable for individuals for whom some information concerning the explanatory variables is available.

2. In order to estimate the effects of some explanatory variable on the dependent variable.

   There are four assumptions associated with a linear regression model:

   1. Linearity: The relationship between X and the mean of Y is linear.

   2. Homoscedasticity: The variance of residual is the same for any value of X.

   3. Independence: Observations are independent of each other.

   4. Normality: For any fixed value of X, Y is normally distributed.

3.14. Limitation of the Research

The characteristics or methodology of the design' limitation are impactful and influencing the findings of the study (Price, 2004). The generalization is constrained, during the emergence of the investigation, findings' utilization and the results determined the methodology and validity of the results (internal and external). There were few constraints faced by the researcher during the investigation as there was a scarcity of the resources for the investigation. However, the assessment of single aspect of the interactive learning environment's impact on mathematics learning on students' motivation was only limitation of the study. There are multiple reasons for not adding the other aspects of the research problems.

Students were advised to fill it themselves after reading and understanding honestly. Mathematics teacher of each class was also advised to spare them for few minutes and ask them to fill. However it's a limitation that it may not be 100% ensured that each and every student has filled it him or her self after reading and understanding it carefully.

3.15. Ethical Considerations of the Research

While conducting research on the effects of an Interactive Learning Environment on students' motivation in mathematics of 10th-grade students, the following ethical considerations were taken into account.

i. It was ensured that the participants are fully informed about the purpose, procedures, potential risks, and benefits of the study and their participation was entirely voluntary.

ii. Students were not being coerced or pressured to participate. It was ensured that participants' privacy was protected by anonymizing their data. Collected data was stored securely and only shared aggregated findings that do not identify individual participants.

iii. It was also ensured that the research procedures, questions, or tasks do not cause harm, distress, or discomfort to the participants. Potential risks, were tried to be minimized, and appropriate measures were in place to address any negative emotional or psychological effects.

iv. It was also ensured that participants are selected fairly and that the study does not discriminate against any group based on factors such as gender, race, socioeconomic status, or disability.

v. These fundamental rules were considered as most important and the respondent were not forced to response. The respondents were asked to fill in the questionnaire if they are willing and their names were optional in the questionnaires.

vi. The privacy of the respondent on the cover letter is kept which will never be disclosed and shown to the authority for any reason. However, nothing personal is asked in the questionnaires. In this way, the director schools of the Federal Directorate of Education Islamabad was asked for the permission.

CHAPTER 4

ANALYSIS OF THE DATA

The analysis of the collected data along with the discussions and explanation of the provided information in both questionnaires; "Academic Motivation Scale" and "What Is Happening In This Class" are discussed in this chapter. However, there is a base to the study on the assessment of the effects of the interactive class room learning environment on students' motivation of the secondary school students studying in the 10th class in public secondary school under Federal Directorate of Education Islamabad.

Already developed tools were not used because of difference of environment and culture of Pakistan with those countries where those were developed and used. The literature was considered during the development of the questionnaire of the study. So, the research was conducted on learning environment and motivation of learners. The instruments used to collect the information was also referred to the worthy experts of the filed for validating it under the supervision and guidance of the experts. However, the members were distinct as there were 3 specialists from education and the rest of 2 were from the field of psychology. The adapted questionnaires were modified and the changed recommended with made according to the suggestions provided by the worthy experts under the kind supervision of the supervisor and ultimately improved the questionnaires. Validity certificate was provided by these experts. After obtaining validity certificate reliability of the tools were pleaded. For this purpose pilot study was conducted.

Section I

4.1. Prevailing Practices Related to Interactive Learning Environment

Objective No1:"To explore the practices related to interactive learning environment prevailing at secondary school level."

Table 4.1

Major Prevailing Practices Related to Interactive Classroom Learning Environment.

Variables	N	Mean	Mean of the Mean	Status
Students' Cohesiveness	1350	36.66	4.58	Often
Students' Involvement	1350	27.64	3.45	Mostly
Teacher Support	1350	27.64	3.45	Mostly
Investigation	1350	23.27	2.81	Sometimes
Cooperation	1350	28.89	3.61	Mostly
Equity	1350	29.08	3.63	Mostly
Task Orientation	1350	29.18	3.64	Mostly
Valid N (listwise)	1350			

Table 4.1 indicated the major prevailing Practices Related to Interactive Classroom

Learning Environment. Mean of Interactive Classroom Learning Environment related to Students' Cohesiveness was 36.66 whereas mean of mean was 4.58 which declared Students' Cohesiveness as the most prevailing practice related to Interactive Classroom Learning Environment. Students' Involvement scored mean of 27.64 and 3.45 was determined as mean of mean. Whereas Teacher Support score 27.64 as mean and 3.45 as mean of mean score. Interactive classroom learning environment related to Investigation scored mean of 23.27 and mean of mean score was 2.81 which

declared Investigation as the least prevailing Interactive Classroom Learning Environment. Interactive classroom learning environment related to Cooperation scored mean of 28.89 and mean of mean score was 3.61. Interactive classroom learning environment related to Equity scored mean of 29.08 and mean of mean score was 3.63. Interactive classroom learning environment related to Task Orientation scored mean of 29.08 and mean of mean score was 3.64. From above table it is clear that students' cohesiveness was most prevailing classroom practice while students' investigation was least prevailing classroom practice whereas all other variables like equity, teacher support, task orientation, cooperation among students and students' involvement related to Interactive classroom learning environment was found at medium level.

Section II

4.2. Secondary School Students' Motivation Level

Objective No. 2: To explore the level of Motivation of the Secondary school students.

Table 4.2

Level of motivation of the secondary school students (N=1350)

Variable	Score	Levels of Motivation	n	Percentage
	31 - 71	Low	37	2.7%
Motivation	72 - 113	Medium	697	51.6%
	114 - 155	High	616	45.6%

The level of motivation of the secondary school students is presented in Table 4.2. For this purpose score was divide into three levels ranging along 31-71 for low, 72-113 for medium and 114-155 for high level of motivation respectively. The results thus obtained from the above Table revealed that

only 2.7 students had low level motivation, 51.6% had medium level of motivation and 45.6% had high level of motivation. Thus it is evident from the above Table that majority of the student had medium level of motivation.
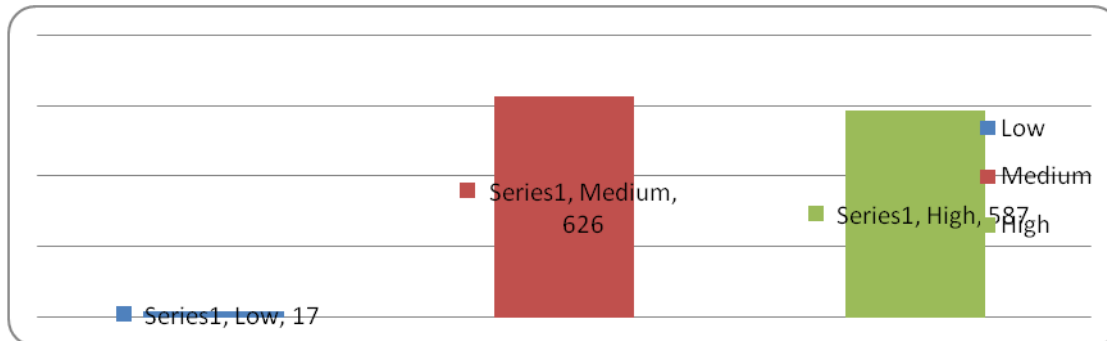
Figure 4.1 Levels of Motivation of respondents in Mathematics Classroom

4.2.1.   Level of Intrinsic Motivation

Table 4.3

Levels of Intrinsic Motivation of the Secondary School Students while learning Mathematics

Variable	Score	Levels of Intrinsic Motivation	N	Percentage
	14 – 32	Low	74	5%
Intrinsic Motivation	33 – 51	Medium	728	54%
	52 – 70	High	548	41%

The level of Intrinsic Motivation of the participants is reflected in Table 4.3. To proceed with it, Intrinsic Motivation Score was divide into three levels. The Score within 14 - 32 was attributed as "low", 33 -51 as "medium" and 52 - 70 as "high". The results showed Intrinsic Motivation statistics as the only 5% students had low level, 54 % had medium level and 41% had high level of Intrinsic

Motivation. It led to the conclusion that majority of the students had "medium" level of Intrinsic Motivation.

4.2.2. Level of Extrinsic Motivation

Table 4.4

Levels of Extrinsic Motivation of the Secondary School Students while learning Mathematics

Variable	Score	Levels of Extrinsic Motivation	n	Percentage
Extrinsic Motivation	12 - 27	Low	48	3.6%
	28 - 43	Medium	450	33.3%
	44 - 60	High	852	63.1%

The Table No. 4.4 displayed the levels of Extrinsic Motivation of the secondary school students for learning mathematics. To assess the levels of extrinsic motivation Score was divided into three levels ranging from 12 - 27 for low, 28 - 43 for medium and 44-60 for high level of Extrinsic Motivation. The above table indicated that the only 3.6 % students had low level of Extrinsic Motivation, 36 % had medium level of Extrinsic Motivation and 63.1% had high level of Extrinsic Motivation. Thus it is evident from the above table that majority of the student had high level of Extrinsic Motivation.

4.2.3. Level of Amotivation

Table 4.5

Levels of Amotivation of the Secondary School Students while learning Mathematics

Variable	Score	Levels of Amotivation	n	Percentage
	05 - 11	Low	635	47%
Amotivation	12 - 18	Medium	584	43.2 %
	19 – 25	High	131	9.7 %

The levels of Amotivation of the participants (i.e. secondary school students) while learning mathematics expressed in Table 4.5 expressed was further divided mentioning levels of Amotivation based on score. The score within 5 - 11 was termed as "low", 12-18 as "medium" and finally 19 - 25 as "high". The table 4.19 exhibited that 47 % of students had "low", 43.2 % had "medium" whereas 9.7 % had "high" level of Amotivation. Thus it is evident that majority of the students had high level of Amotivation in mathematics classrooms.

Section III

4.3. Assessment of the Effects of the Interactive learning environment on the Motivation of the Secondary School Students

Objective No 3:

The main objective is to determine, the effects of "Interactive Learning Environment" students" motivation. The students included were learning mathematics at secondary school level.

Table 4.6

Effects of Interactive Learning Environment on students' motivation at secondary school level. (N=1350)

Independent Variable	Dependent Variable	R^2	β (Coefficient)	t	Sig
Interactive Classroom Learning Environment	Motivation	.53	.254	14.24	.000

The probability value *P<0.05

The value of R^2 (i.e. 0.53) mentioned in the Table 4.6 represents that "Interactive classroom learning environment" (Independent Var) described 53% variation in students "motivation" level is due to Interactive Learning environment and the remaining variations were because of other factors. The coefficient (β= 0.254) led to the findings independent variable concerned positively affect students'

motivation significantly. The probability value p<0.05 showed the level of significance. So, the hypothesis developed at the outset of study, 'there is statistically no significant effects of Interactive classroom learning environment on student motivation' is failed to be accepted. Therefore, the interactive learning environment has a significant effects on students' motivation.

4.3.1. Objective No. 3 (i):

To determine the effects of Students' involvement on students' motivation at secondary school level in mathematics learning.

Table 4.7

Effects of Students' involvement on students' motivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	t	Sig.
Students' involvement	Motivation	. 56	.327	14.9	.010

*The significant level *P <0.05*

R^2 Value appeared as 0.56 in the Table 4.7. Students' involvement (i.e. Independent Variable) described 56 % variation regarding students' motivation (i.e. Dependent Variable) and the rest of % age variation could be attributed to other features. Moreover, the coefficient (β= .327) reflected that such effects was statistically significant at 0.05 level. Such findings led to the deduction that the hypothesis developed i.e. 'there is no statistically significant effects of Students' involvement related to interactive learning environment in classrooms on motivation of the secondary school students' is failed to be accepted. Therefore, it is determined that the Students' involvement related to interactive learning environment in classroom significantly affected students' motivation studying at secondary school level and learning mathematics.

Table 4.8

Effects of Students' involvement on students' intrinsic motivation at secondary school level (N=1350)

Independent Variable	Dependent Variable	R ^{2}	β(Coefficient)	t	Sig.
Students' involvement	Students' Intrinsic Motivation	.63	.623	16.346	.000

*P<0.05

The calculated value of R^2 appeared as 0.63. (see Table 4.8) and represents that 63% variation in students' intrinsic motivation is due to Students' involvement whereas the rest of it may be attributed to factors other than this. Therefore the coefficient (β = .623) indicated that the effects was significant statistically (At 0.05 level of significance). Therefore the hypothesis "there is no statistically significant effects of students' involvement related to interactive classroom learning environment on intrinsic motivation of at the secondary school learners" while learning mathematics is failed to be accepted. Therefore it is determined that the Students' involvement related to interactive learning environment in classroom has a significant effects on students' intrinsic motivation at secondary school level while learning mathematics.

Table 4.9

Effects of Students' involvement on students' extrinsic motivation at secondary school level.

(N=1350)

Independent Variable	Dependent Variable	R ^{2}	β(Coefficient)	t	Sig.
Students' involvement	Extrinsic motivation	.51	.374	12.460	.01

* P <0.05

The R^2 Value (i.e. 0.51) mentioned in the Table 4.9 represents that Students' Involvement (Independent variable) caused 51% variation in students' extrinsic motivation (Dependent Variable) whereas the rest of variation was caused by other factors. While the coefficient (β= 0.374 shows significance of the effects revealed at 0.05 level of significance. The results led to description that hypothesis 'there is no statistically significant effects of Students' involvement related to interactive learning classroom environment on extrinsic motivation of the secondary school students' developed so far is failed to be accepted. Therefore, the Students' involvement relating to interactive environment in class room has a significant effects on students' extrinsic motivation measured at secondary school level while learning mathematics.

Table 4.10

Effects of Students' involvement on students' Amotivation at secondary school level. (N=1350)

Independent Variable	Dependent Variable	R ^{2}	β(Coefficient)	t	Sig.
Students' involvement	Amotivation	.171	.134	1.56	.060

* Significance P >0.05

R^2 Value (i.e. 0.171) shown in Table 4.10 represents 17% variation caused by an independent variable (i.e. Students' Involvement) regarding students Amotivation, however, the rest was due to other factors. The coefficient (β= .134) also validates that this effects was statistically significant at 0.05 level of significance. Keeping in view the results described in the table led to determining the hypothesis 'there is no statistically significant effects of Students' involvement related to interactive learning classroom environment on amotivation of the secondary school students' is accepted. Therefore, the Students' involvement relating interactive learning environment in classroom has not a significant effects on students' amotivation at secondary school level while learning mathematics.

4.3.2. Objective No. 3 (ii):

To determine the effects of Students' Cohesiveness on students' motivation at secondary school level while learning mathematics.

Table 4.11

Effects of Students' Cohesiveness on students' motivation at secondary school level (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	t	Sig.
Students' Cohesiveness	Students' motivation	.76	.47	11.41	.020

$P < 0.05$

As mentioned in Table 4.11, the R^2 Value was 0.76, so it represents that the independent variable (Students' Cohesiveness) described 76 % variation in students' motivation whereas the rest was caused by other factors. The coefficient (β= .47) shows that this effects was statistically significant at 0.05 level of significance.

Thus the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to Students' Cohesiveness on students' motivation of the secondary school students' is failed to be accepted. Therefore, it is determined that the Students' cohesiveness related to interactive learning environment in classroom has a significant effects on students' motivation at secondary school level while learning mathematics.

Table 4.12

Effects of Students' Cohesiveness on students' intrinsic motivation at secondary school level (N=1350)

Independent Variable	Dependent Variable	R²	β(Coefficient)	t	Sig.
Students' Cohesiveness	Students' intrinsic motivation	.61	.29	12.41	.021

P < 0.05

R^2 Value mentioned as 0.61 in the Table 4.12 reflects that the independent variable (Students' Cohesiveness) described 61 % variation in students' intrinsic motivation whereas the rest was due to other factors. The coefficient (β= .29) expresses that this effects was statistically significant at 0.05 level of significance. It leads to a conclusion that a hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to Students' Cohesiveness on students' intrinsic motivation of the secondary school students' is failed to be accepted. So, it is determined that the Students' cohesiveness related to interactive learning environment in classroom has a significant effects on students' intrinsic motivation at secondary school level while learning mathematics.

Table 4.13

Effects of Students' Cohesiveness on students' extrinsic motivation at secondary school level

(N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	t	Sig.
Students' Cohesiveness	Students' extrinsic motivation	.691	.239	10.141	.031

*P<0.05

The value of R^2 was 0.69, so it represented that the independent variable (Which is Students' Cohesiveness) explained 69 % change in students' motivation whereas rest of the change was owed to some other factors. While the coefficient, (β = .239) also shows that the impact/ effects measured was significant statistically at 0.05 level of significance.

Thus the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to Students' Cohesiveness on students' extrinsic motivation of the secondary school students' is failed to be accepted. Therefore, it is determined that the Students' cohesiveness related to interactive learning environment in classroom has a significant effects on students' extrinsic motivation at secondary school level while learning mathematics.

Table 4.14

Effects of Students' Cohesiveness on students' amotivation at secondary school level (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	t	Sig.
Students' Cohesiveness	Students' amotivation	.176	-1.27	1.41	.063

*P > 0.05

As stated in Table 4.14, the calculated R^2 value was 0.17 which represents that the independent variable (Students' Cohesiveness) described 17 % variation in students' amotivation and the rest was due to other factors. Moreover, the coefficient (β= -1.27) shows that this effects was statistically significant at 0.05 level of significance. Thus the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to Students' Cohesiveness on students' amotivation of the secondary school students' is to be accepted. Therefore, the Students' cohesiveness related to interactive learning environment in classroom has not significant effects on students' amotivation at secondary school level while learning mathematics.

4.3.3. Objective No. 3 (iii):

To determine the effects of task orientation on students' motivation at secondary school level.

Table 4.15

Effects of task orientation on students' motivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	t	*Sig.*
Task orientation	Motivation	.64	.254	12.71	.010

*P < 0.05

The R^2 value was 0.64 as mentioned in Table 4.15. It represents that the independent variable (Task orientation) described 64 % variation in students' motivation and the rest was due to other factors causing such effects. The coefficient (β= .254) shows that this effects was statistically significant at 0.05 level of significance. So regarding the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to task orientation on Motivation of the secondary school students' it is concluded that it is failed to be accepted. Therefore, it is determined that the Students' habit of task orientation related to interactive learning environment in classroom has a significant effects on students' motivation at secondary school level while learning mathematics.

Table 4.16

Effects of task orientation on students' motivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	t	Sig.
Task orientation	Students' intrinsic motivation	.61	.354	13.51	.020

P <0.05

As mentioned above (see Table 4.16), the R^2 value was 0.61. It reflects that the independent variable (Task orientation) described 61 % variation in students' intrinsic motivation and the rest was caused by other factors. While the coefficient (β= .354 explains that this effects was statistically significant at 0.05 level of significance. Consequently, the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to task orientation on intrinsic motivation of the secondary school students' is failed to be accepted. Hence, it is determined that the Students'

habit of task orientation related to interactive learning environment in classroom has a significant effects on students' intrinsic motivation at secondary school level while learning mathematics.

Table 4.17

Effects of task orientation on students' extrinsic motivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	t	Sig.
Task orientation	Students' extrinsic motivation	0.49	.254	14.71	.019

* P < 0.05

R^2 value calculated was 0.49 (See Table 4.17) and it represents that the independent variable (Task orientation) described 49 % variation in students' extrinsic motivation and the rest was caused by some other factors. While the coefficient (β= .254 also explained that this effects was statistically significant at 0.05 level of significance. Thus the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to task orientation on extrinsic Motivation of the secondary school students' is failed to be accepted.

Therefore, it is determined that the Students' habit of task orientation related to interactive learning environment in classroom has a significant effects on students' extrinsic motivation at secondary school level while learning mathematics.

Table 4.18

Effects of task orientation on students' amotivation ((N=1350)) at secondary school level while learning mathematics

Independent Variable	Dependent Variable	R ^{2}	β(Coefficient)	*t*	Sig.
Task orientation	Amotivation	.31	.354	1.71	.0560

* P >0.05

As mentioned in table 4.18, R^2 value was 0.31. It shows that the independent variable (Task orientation) described 31 % variation in students' motivation whereas rest one was due some other factors. The coefficient (β= .354) expresses that this effects was statistically insignificant at 0.05 level of significance. S, the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to task orientation on Motivation of the secondary school students' is accepted. Hence, it is determined that the Students' habit of task orientation   related to interactive learning environment in classroom do not has a significant effects on students' amotivation at secondary school level while learning mathematics.

4.3.4. Objective No. 3 (iv):

To determine the effects of Investigation on students' motivation at secondary school level while learning mathematics.

Table 4.19
Effects of Investigation on students' motivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R ^{2}	β(Coefficient)	*t*	Sig.
Investigation	Motivation	.491	.332	11.47	.031

*P<0.05

R^2 value was .491 as mentioned in Table 4.19. That represents that the independent variable (Investigation) described 49 % variation in students' motivation whereas the rest was due some other factors. The coefficient (β= .332) shows that this effects was statistically significant at 0.05 level of significance. Therefore, the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to investigation on motivation of the secondary school students' is failed to be accepted. Thus it is determined that the Students' habit of investigation related to interactive learning environment in classroom has a significant effects on students' motivation at secondary school level while learning mathematics.

Table 4.20

Effects of Investigation on students' intrinsic motivation at secondary school level While Learning Mathematics (N=1350)

Independent Variable	Dependent Variable	R ^{2}	β(Coefficient)	*t*	Sig.
Investigation	Students' Intrinsic Motivation	0.61	0.432	13.47	.013

* P<0.05

As shown in Table 4.20, the R^2 Value was 0.61. It represents that the independent variable (Investigation) described 61 % variation in students' intrinsic motivation and the rest was due some other factors. The coefficient (β= .432) describes that this effects was statistically significant at 0.05 level of significance. Thus the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to investigation on motivation of the secondary school students' is failed to be accepted. Therefore, it is determined that the Students' habit of investigation related to interactive learning environment in classroom has a significant effects on students' intrinsic motivation at secondary school level while learning mathematics.

Table 4.21

Effects of Investigation on students' extrinsic motivation at secondary school level while learning

Mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	t	Sig.
Investigation	Students' extrinsic motivation	0.541	.43	13.24	.010

* P<0.05

The R^2 value mentioned as 0.541 in table 4.21 has show that the independent variable (Investigation) described 54 % variation in students' motivation and the rest was due to some other factor. While the coefficient (β= .43) shows that this effects was statistically significant at 0.05 level of significance. Thus the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to investigation on extrinsic motivation of the secondary school students' is failed to be accepted. Hence it is determined that the Students' habit of investigation related to interactive learning environment in classroom has a significant effects on students' extrinsic motivation at secondary school level while learning mathematics.

Table 4.22

Effects of Investigation on students' amotivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	t	Sig.
Investigation	Motivation	.11	.132	1.47	.000

*P<0.05

R^2 value was 0.11 as showed in Table 4.22. It reflects that the independent variable (investigation) described 11 % variation in students' motivation whereas the rest was due some other factors considered. The coefficient (β= .132) shows that this effects was statistically insignificant at 0.05 level of significance. Thus the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to investigation on motivation of the secondary school students' is accepted. Hence it is determined that the Students' habit of investigation related to interactive learning environment in classroom do not has a significant effects on students' amotivation at secondary school level while learning mathematics.

4.3.5. Objective No. 3 (v):

To determine the effects of equity on students' motivation at secondary school level while learning mathematics

Table 4.23

Effects of equity on students' motivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	*t*	Sig.
Equity	Students' motivation	.76	.47	11.41	.023

P < 0.05

Regarding estimation of relationship between variables i.e. Independent Variable (IV), Dependent Variable (DV), the R^2 value as shown in a Table 4.23 was .076. It represents that the independent variable (equity) described 76 % variation in students' motivation whereas the rest may be attributed to some other factors. While the coefficient (β = .47) shows that this effects was statistically significant at 0.05 level of significance. Thus the hypothesis 'there is no statistically significant

effects of interactive classroom learning environment related to equity on students' motivation of the secondary school students' is failed to be accepted. Therefore, it is determined that the equity among students related to interactive learning environment in classroom has a significant effects on students' motivation at secondary school level while learning mathematics.

Table 4.24

Effects of equity on students' intrinsic motivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	t	Sig.
Equity	Students' intrinsic motivation	0.75	0.39	12.14	.000

* P < 0.05

R^2 value was 0.75 as stated in table 4.24. It denotes that the independent variable (equity) described 075 % variation in students' motivation and the rest was due some other factors. While the coefficient (β = .39) reflects that this effects was statistically significant at 0.05 level of significance. Hence the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to equity on students' intrinsic motivation of the secondary school students' is failed to be accepted. Therefore it is determined that the equity among students related to interactive learning environment in classroom has a significant effects on students' intrinsic motivation at secondary school level while learning mathematics.

Table 4.25

Effects of equity on students' extrinsic motivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	*t*	Sig.
Equity	Students' extrinsic motivation	.56	.37	10.41	.000

* P< 0.05

Regarding estimation of variable considered in Table 4.25, the R^2 value was 0.56. It represents that the independent variable (equity) described 56 % variation in students' extrinsic motivation whereas the rest was due to some other factors. Moreover, the coefficient (β= 0.37) expresses that this effects was statistically significant at 0.05 level of significance. So, the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to equity on students' extrinsic motivation of the secondary school is failed to be accepted. Accordingly it is determined that the equity among students related to interactive learning environment in classroom has a significant effects on students' extrinsic motivation at secondary school level while learning mathematics.

Table 4.26

Effects of equity on students' amotivation at secondary school level while learning mathematics (N=1320)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	*t*	Sig.
Equity	Students' amotivation	.076	.17	1.41	.012

* P < 0.05

Table No.4.26 displayed that R^2 value was .076. It represents that the independent variable (equity) described 07 % variation in students' amotivation and the rest was due some other factor. While the coefficient (β= .17 shows that this effects was statistically significant at 0.05 level of significance. Thus the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to equity on students' amotivation of the secondary school students' is accepted. Therefore it is determined that the equity among students related to interactive learning environment in classroom do not has a significant effects on students' amotivation at secondary school level while learning mathematics.

4.3.6.   Objective No. 3 (vi):

To determine the effects of Teacher Support on students' motivation at secondary school level while learning mathematics

Table 4.27

Effects of teacher support on students' motivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	*t*	Sig.
Teacher support	Students' motivation	0.86	.397	13.41	.000

*P< 0.05

R^2 value was .86 as displayed in table No.4.27. It represents that the independent variable (teacher support) described 86 % variation in students' motivation and the rest was due some other factors. The coefficient (β= .397) shows that this effects was statistically significant at 0.05 level of significance. Thus the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to teacher support on students' motivation of the secondary school

students' is failed to be accepted. Accordingly it is determined that the teacher support provided from teachers to students related to interactive learning environment in classroom has a significant effects on students' motivation at secondary school level while learning mathematics.

Table 4.28

Effects of teacher support on students' intrinsic motivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	*t*	Sig.
Teacher support	Intrinsic students' motivation	0.70	.46	13.41	.000

*P <0.05

Table No.4.28 showed that R^2 value was 0.70. It represents that the independent variable (teacher support) described 70 % variation in students' motivation and the rest was due some other factors. The coefficient (β= .46) explains that this effects was statistically significant at 0.05 level of significance. Therefore, the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to teacher support on students' intrinsic motivation of the secondary school students' is failed to be accepted. Accordingly it is determined that the teacher support provided from teachers to students related to interactive learning environment in classroom has a significant effects on students' intrinsic motivation at secondary school level while learning mathematics. Therefore, it is determined that the teacher support provided from teachers to students related to interactive learning environment in classroom has a significant effects on students' intrinsic motivation at secondary school level while learning mathematics.

Table 4.29

Effects of teacher support on students' extrinsic motivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	t	Sig.
Teacher support	Students' extrinsic motivation	.79	.17	11.41	.000

P < 0.05

R^2 value was .79 as shown in Table 4.29 It denotes that the independent variable (teacher support) described 79 % variation in students' extrinsic motivation and the rest was due to some other factors. The coefficient (β= .17) expresses that this effects was statistically significant at 0.05 level of significance. Thus the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to teacher support on students' motivation of the secondary school students' is failed to be accepted. So, it is determined that the teacher support provided from teachers to students related to interactive learning environment in classroom has a significant effects on students' extrinsic motivation at secondary school level while learning mathematics.

Table 4.30

Effects of teacher support on students' amotivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	t	Sig.
Teacher support	Students' amotivation	.21	.47	1.91	.061

P < 0.05

R^2 value was .21 as displayed in Table 4.30. It represents that the independent variable (teacher support) described 21 % variation in students' amotivation whereas the rest was due some other factor. The coefficient (β = 0.47) shows that this effects was statistically insignificant at 0.05 level of significance. Thus the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to teacher support on students' amotivation of the secondary school students' is to be accepted. Accordingly it is determined that the teacher support provided from teachers to students related to interactive learning environment in classroom has a significant effects on students' amotivation at secondary school level while learning mathematics.

4.3.7. Objective No. 3 (vii)

Table 4.31

Effects of cooperation among students on students' motivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	t	Sig.
cooperation among students	Students' motivation	.57	.31	11.41	.000

P <0.05

Table No. 4.31 displayed that R^2 value was 0.57. It represents that the independent variable (cooperation among students) described 57 % variation in students' motivation and the rest was due some other factor. Moreover, the coefficient (β = .31) reflects that this effects was statistically significant at 0.05 level of significance. Thus the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to cooperation among students on students' motivation of the secondary school students' is failed to be accepted. Hence it is determined

that the Cooperation among students related to interactive learning environment in classroom has a significant effects on students' motivation at secondary school level while learning mathematics.

Table 4.32

Effects of cooperation among students on students' intrinsic motivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	*t*	Sig.
Cooperation among students	Students' intrinsic motivation	0.61	.44	12.41	.010

P<0.05

The Table 4.32 showed that R^2 Value was 0.61. It means that the independent variable (cooperation among students) described 61 % variation in students' intrinsic motivation whereas the rest was due some other factors. The coefficient (β= .44) explains that this effects was statistically significant at 0.05 level of significance. Thus the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to cooperation among students on students' intrinsic motivation of the secondary school students' is failed to be accepted. Hence it is determined that the cooperation among students related to interactive learning environment in classroom has a significant effects on students' intrinsic motivation at secondary school level while learning mathematics.

Table 4.33

Effects of cooperation among students on students' extrinsic motivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	*t*	Sig.
Cooperation among students	Students' extrinsic motivation	0.56	.29	13.41	.020

P <0.05

R^2 value was 0.56 as shown in Table 4.33. It represents that the independent variable (cooperation among students) described 56 % variation in students' motivation and the rest was due to some other factor. The coefficient (β= .47) describes that this effects was statistically significant at 0.05 level of significance. So, the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to cooperation among students on students' extrinsic motivation of the secondary school students' is failed to be accepted. Accordingly it is determined that the Cooperation among students related to interactive learning environment in classroom has a significant effects on students' extrinsic motivation at secondary school level while learning mathematics.

Table 4.34

Effects of cooperation among students on students' amotivation at secondary school level while learning mathematics (N=1350)

Independent Variable	Dependent Variable	R^2	β(Coefficient)	*t*	Sig.
Cooperation among students	Students' amotivation	.11	.23	1.41	.040

*P< 0.05

R^2 Value was 0.11 as shown in table 4.34. It represents that the independent variable (cooperation among students) described 11 % variation in student students' amotivation and the rest was due some other factors. The coefficient (β= .23) expresses that this effects was statistically significant at 0.05 level of significance. Thus the hypothesis 'there is no statistically significant effects of interactive classroom learning environment related to cooperation among students on students' amotivation of the secondary school students' is to be accepted. Therefore, it is determined that the Cooperation among students related to interactive learning environment in class room has not a significant effects on students' amotivation at secondary school level while learning mathematics.

CHAPTER 5

SUMMARY, FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

The research was basically designed to assess the effects of interactive learning environment on students' motivation of the secondary school students in mathematics. The study focuses on the exploring the prevailing practices of interactive learning environment at secondary school level while learning mathematics and its effects on students motivation. Firstly the prevailing practices related to interactive learning environment and motivation level of the learners were explored and then the effects of interactive learning environment on students motivation was determined. Objectives of the study were: explore the practices related to interactive learning environment prevailing at secondary school level, to investigate the level of students' motivation at secondary school level and to determine the effects of Interactive Learning Environment on students' motivation at secondary school level.

It was a quantitative research and Ex Post Facto research design was utilized to accomplish it. Two questionnaires were used to collect data. First one the WIHIC (What Is Happening in This Class) was being used by Myint (2001) & developed by Fraser, Fisher, and McRobbie (1996) and the second one was developed by Vallerand et al. (1992, 1993) named as the AMS (academic motivation scale). Both were adapted by the researcher. After adapting the tools, it were administered for the sake of pilot testing. Reliability of tools were determined by using Chronback Alpha while the tools were validated by the experts of the fields. After determining the item correlation those items whose correlation was found less than 0.30 were rephrased. And then again item correlation and reliability was determined which 0.93 (WIHIC) and 0.91 (AMS). The stratified random sampling technique was used. Researcher herself visited the sampled schools and administered the questionnaire. Researcher

asked the students to fill the questionnaires within a week and return to their maths teacher. Researcher distributed and explained the questionnaires in class of mathematics and assigned the duty to maths teacher to spare some time for guiding and filling the questionnaire. After five days researcher again visited the schools removed students difficulties and ambiguities and helped them. After collecting the data it was analyzed by using mean scores, students' scores and regression analysis. Schools are learning institutions and are established everywhere in every town, community and society. Coming generations are fostering in the schools with the provision of the appropriate environment that is conducive to the learning. The effectiveness is learning is dependent on how students are being treated by the teachers. The behavior of the teachers is an aspect which is also included in the classroom environment. And the class room is considered as most important component of the school because teaching learning process takes place in classrooms. In other words we can say that the classrooms are actual place where learning takes place. Classroom environment is regarded as a core component of powerful and fruitful learning process and best source of motivating and inspiring the learners for learning. Motivation of learners start from effective classroom learning environment. Therefore, schools and especially classroom learning environment may be lively, interactive and healthy that in which students not only show good academic performance but also develops a sense of positive motivation for increasing their performance. Therefore this research would prove helpful for the policy makers, educational administrators, school heads and teachers in the adoption of interactive classroom learning environment which in turns would be helpful in developing and enhancing learner's motivation for learning and showing best performance in mathematics. This research would give school heads a cognizance of their schools about classroom learning environment and how the effects of the classroom learning environment on students' motivation in learning mathematics and to make them well attuned member of the society. If the teachers, school heads, educational administrators and policy makers got the cognizance of effectiveness of interactive classroom learning environment then they would try to establish positive

and supportive interactive classroom learning environment within their classroom and in this way learners will also try to help to generate interactive learning environment within the classroom. Policy makers and curriculum developers may also get guidance from this study as it would provide guideline to add such interactive activities in the curriculum which are helpful in enhancing the interactivity of classrooms to motivate the learners. Students would be the main recipients of the study as students were the main focus of the study they would get positive motivation both intrinsic and extrinsic in classroom while learning which would help them to create concrete concepts which are especially required for learning mathematics in an effective manner. Children are the future asset for their parents and as well as our nation. Their education is as important as the progress of the country. This study would give long lasting benefits to the students, parents as their children would groom in such classrooms where they would have effective learning.

5.2. Findings

5.2.1. Objective No.1: "To explore the practices related to interactive learning

Prevailing Practices Related to Classroom Learning Environment at secondary schools

1. Table No. 4.1   indicated the major prevailing Practices Related to Interactive Classroom Learning Environment. Mean of Interactive Classroom Learning Environment related to Students' Cohesiveness was 36.66 whereas mean of mean was 4.58 which declared Students' Cohesiveness as the most prevailing practice related to Interactive Classroom Learning Environment. Students' Involvement scored mean of 27.64 and 3.45 was determined as mean of mean. Whereas Teacher Support score 27.64 as mean and 3.45 as mean of mean score. Interactive classroom learning environment related to Investigation scored mean of 23.27 and mean of mean score was 2.81 which declared Investigation as the least prevailing Interactive Classroom Learning Environment. Interactive classroom learning environment related to Cooperation scored mean of 28.89 and mean of mean score was 3.61. Interactive

classroom learning environment related to Equity scored mean of 29.08 and mean of mean score was 3.63. Interactive classroom learning environment related to Task Orientation scored mean of 29.08 and mean of mean score was 3.64. From above table it is clear that students' cohesiveness was most prevailing classroom practice while students' investigation was least prevailing classroom practice whereas all other variables like equity, teacher support, task orientation, cooperation among students and students' involvement related to Interactive classroom learning environment was found at medium level.

5.2.2. Objective No.2: "To explore the level of motivation of the Secondary school students while learning mathematics."

2. Data analysis revealed that only 2.7% students had low level of motivation, 51.6% had medium level of motivation and 45.64% had high level of motivation while learning mathematics. Thus it is evident from the above table that majority of the student had medium level of motivation while learning mathematics.

3. The results declared that only 5% students had low level of intrinsic motivation, 54% had medium level of intrinsic motivation and 41% had high level of intrinsic motivation while learning mathematics. Thus it was declared from the table 4.3 that majority of the students had medium level of intrinsic motivation while learning mathematics.

4. It was found that only 3.6% students had low level of extrinsic motivation, 36 % had medium level of extrinsic motivation and 63.1 had high level of extrinsic motivation while learning mathematics. Thus it was determined that majority of the student had high level of extrinsic motivation while learning mathematics (Table 4.4).

5. It was determined that 47 % students had low level of amotivation, 43.2 % had medium level of amotivation and 9.7% had high level of amotivation while learning

mathematics. Majority of the student had low level of amotivation while learning mathematics. (Table 4.5)

5.2.3. Objective No. 3: To determine the effects of Interactive Learning Environment on students' motivation at secondary school level.

6. From Table No. 4.6 it is clear that R^2 Value of Interactive Learning Environment was 0.53. This represents that the independent variable (Interactive Learning Environment) described 53% variation in students motivation was due to interactive learning environment and the rest was due to some other factor. While the coefficient (β= .254) shows that this effects was statistically significant at 0.05 level of significance. Thus it is determined that there is statistically significant effects of Interactive Learning Environment on motivation of the secondary school students.

Objective No. 3 (i): To determine the effects of Students' involvement on students' motivation at secondary school level in mathematics learning.

7. Students' involvement R^2 Value was .56. Which represents that the independent variable (Students' involvement) described 56% variation in students' motivation and the rest was due to some other factor. While the coefficient (β= .327) shows that this effects was statistically significant at 0.05 level of significance. Thus it was revealed that there is statistically significant effects of interactive learning environment related to Students' involvement on motivation of the secondary school students (Table 4.7).

8. Students' involvement R^2 Value was .63. This represents that the independent variable (Students' involvement) described 63% variation in students' intrinsic motivation and the rest was due some other factor. While the coefficient (β= .623) shows that this effects was statistically significant at 0.05 level of significance. Thus it is obtained that there is statistically significant effects of

Interactive learning environment related to Students' involvement on intrinsic motivation of the secondary school students. (Table 4.8)

9. Students' involvement R^2 Value was .51. That represents that the independent variable (Students' involvement) described 51 % variation in students' extrinsic motivation and the rest was due to some other factor. While the coefficient (β = .374) shows that this effects was statistically significant at 0.05 level of significance. It was found that there is statistically significant effects of interactive classroom learning environment related to Students' involvement on extrinsic motivation of the secondary school students. (Table 4.9)

10. According to table 4.10 Students' involvement R^2 Value was .171. It represents that the independent variable (Students' Involvement) described 17 % variation in students Amotivation and the rest was due to some other factor. While the coefficient (β= .134 showed that this effects was statistically insignificant at 0.05 level of significance. Thus the hypothesis 'there is no statistically significant effects of Students' involvement related to interactive learning classroom environment on amotivation of the secondary school students' is accepted.

Objective No. 3 (ii): To determine the effects of Students' Cohesiveness on students' motivation at secondary school level while learning mathematics.

11. Students' Cohesiveness R^2 Value was 0.76. It represents that the independent variable (Students' Cohesiveness) described 76 % variation in students' motivation and the rest was due to some other factor. While the coefficient (β= .47) shows that this effects was statistically significant at 0.05 level of significance. Thus it is evident that there is statistically significant effects of

interactive learning environment related to Students' Cohesiveness on motivation of the secondary school students (Table 4.11)

12. According to table 4.12. Students' Cohesiveness R^2 value was 0.61. It represented that the independent variable (Students' Cohesiveness) described 61 % variation in students' intrinsic motivation and the rest was due to some other factor. While the coefficient (β= .29) shows that this effects was statistically significant at 0.05 level of significance. Thus it was evident that there is statistically significant effects of interactive learning environment related to Students' Cohesiveness on intrinsic motivation of the secondary school students.

13. According to table 4.13 Students' Cohesiveness R^2 value was 0.69. It represented that the independent variable (Students' Cohesiveness) described 69 % variation in students' extrinsic motivation and the rest was due to some other factor. While the coefficient (β= .29) shows that this effects was statistically significant at 0.05 level of significance. Thus it was determined that there is statistically significant effects of interactive learning environment related to Students' Cohesiveness on extrinsic motivation of the secondary school students.

14. According to table 4.14 displayed that R^2 Value was 0.17. It represented that the independent variable (Students' Cohesiveness) described 17 % variation in students' amotivation and the rest was due to some other factor. While the coefficient (β= -1.27) shows that this effects was statistically insignificant at 0.05 level of significance. Thus it was determined that there is statistically no significant effects of interactive learning environment related to Students' Cohesiveness on amotivation of the secondary school students.

***Objective No. 3 (iii): To determine the effects of task orientation on students'
motivation at secondary school level while learning mathematics.***

15. Task orientation value of R^2 was .64. Which represents that the independent
    variable (Task orientation) described 64 % variation in students' motivation
    and the rest was due some other factor. While the coefficient (β= .254 shows
    that this effects was statistically significant at 0.05 level of significance. Thus
    it is evident that there is statistically significant effects of interactive learning
    environment related to Students' task orientation on motivation of the
    secondary school students (Table 4.15).

16. Task orientation value of R^2 was .61. Which represented that the independent
    variable (Task orientation) described 61 % variation in students' intrinsic
    motivation and the rest was due some other factor. While the coefficient (β=
    .354 shows that this effects was statistically significant at 0.05 level of
    significance. Thus it is evident that there is statistically significant effects of
    interactive learning environment related to Students' task orientation on
    intrinsic motivation of the secondary school students (Table 4.16).

17. Table 4.17 displayed that R^2 Value was .49. Which represented that the
    independent variable (Task orientation) described 49 % variation in students'
    extrinsic motivation and the rest was due some other factor. While the
    coefficient (β= .254 shows that this effects was statistically significant at 0.05
    level of significance. Thus it is evident that there is statistically significant
    effects of interactive learning environment related to Students' task orientation
    on extrinsic motivation of the secondary school students.

18. R^2 Value was .31. Which represented that the independent variable (Task
    orientation) described 31 % variation in students' amotivation and the rest was

due to some other factor. While the coefficient (β= .354 shows that this effects was statistically insignificant at 0.05 level of significance.

19. Thus it is evident that interactive learning environment related to Students' task orientation on amotivation of the secondary school students has statistically no significant effects on students' amotivation.

Objective No. 3 (iv): To determine the effects of Investigation on students' motivation at secondary school level while learning mathematics.

20. Table 4.17 displayed that R^2 Value was .491. That represented that the independent variable (Investigation) described 49 % variation in students' motivation and the rest was due to some other factor. While the coefficient (β= .332) shows that this effects was statistically significant at 0.05 level of significance. Thus it is evident that there is statistically significant effects of interactive learning environment related to Students' sense of investigation on motivation of the secondary school students.

21. Table 4.20 displayed that R^2 value was 0.54. Which represents that the independent variable (Investigation) described 54 % variation in students' intrinsic motivation and the rest was due some other factor. While the coefficient (β= .432) shows that this effects was statistically significant at 0.05 level of significance. Thus it was evident that there is statistically significant effects of interactive learning environment related to Students' sense of investigation on intrinsic motivation of the secondary school students.

22. Table 4.21 displayed that R^2 Value was 0.541. It represented that the independent variable (Investigation) described 54 % variation in students' extrinsic motivation and the rest was due some other factor. While the coefficient (β= .43) shows that this effects was statistically significant at 0.05

level of significance. Thus it is evident that there is statistically significant effects of interactive learning environment related to Students' investigation on extrinsic motivation of the secondary school students.

23. Table 4.22 displayed that R^2 Value was 0.11. It represented that the independent variable (Investigation) described 11 % variation in students' amotivation and the rest was due some other factor. While the coefficient (β= .33) showed that this effects was statistically insignificant at 0.05 level of significance. Thus it is evident that there is statistically no significant effects of interactive learning environment related to Students' investigation on amotivation of the secondary school students.

Objective No. 3 (v): To determine the effects of equity on students' motivation at secondary school level while learning mathematics.

24. Table 4.23 displayed that R^2 Value was .76. It represented that the independent variable (equity) described 76 % variation in students' motivation and the rest was due some other factor. While the coefficient (β= .47) showed that this effects was statistically significant at 0.05 level of significance. Thus it is evident that there is statistically significant effects of interactive learning environment related to Students' equity on motivation of the secondary school students.

25. Table 4.24 displayed that R^2 Value was .75. It represented that the independent variable (equity) described 75 % variation in students' intrinsic motivation and the rest was due some other factor. While the coefficient (β= .39) showed that this effects was statistically significant at 0.05 level of significance. Thus it is evident that there is statistically significant effects of interactive learning

environment related to Students' equity on motivation of the secondary school students.

26. Table 4.25 displayed that R^2 Value was .56. It represented that the independent variable (equity) described 56 % variation in students' students' extrinsic motivation and the rest was due some other factor. While the coefficient (β= .37) shows that this effects was statistically significant at 0.05 level of significance. Thus it is evident that there is statistically significant effects of interactive learning environment related to Students' equity on extrinsic motivation of the secondary school students.

27. Table 4.26 displayed that R^2 value was .076. It represented that the independent variable (equity) described 7.6 % variation in students' amotivation and the rest was due some other factor. While the coefficient (β= .17) shows that this effects was statistically insignificant at 0.05 level of significance. Thus it is evident that there is statistically no significant effects of interactive learning environment related to Students' equity on amotivation of the secondary school students.

Objective No. 3 (vi): To determine the effects of teacher support on students' motivation at secondary school level while learning mathematics.

28. Table 4.27 displayed that R^2 Value was .86. It represented that the independent variable (teacher support) described 86 % variation in students' motivation and the rest was due some other factor. While the coefficient (β= .39) showed that this effects was statistically significant at 0.05 level of significance. Thus it is evident that there is statistically significant effect of interactive learning environment related to teacher support on motivation of the secondary school students.

29. Table 4.28 displayed that R^2 Value was .70. It represented that the independent variable (teacher support) described 70 % variation in students' intrinsic motivation and the rest was due some other factor. While the coefficient (β= .46) showed that this effects was statistically significant at 0.05 level of significance. Thus it is evident that there is statistically significant effects of interactive learning environment related to teacher support on intrinsic motivation of the secondary school students.

30. Table 4.29 displayed that R^2 Value was .79. It represented that the independent variable (teacher support) described 79 % variation in students' extrinsic motivation and the rest was due some other factor. While the coefficient (β= .17) showed that this effects was statistically significant at 0.05 level of significance. Thus it is evident that there is statistically significant effects of interactive learning environment related to teacher support on extrinsic motivation of the secondary school students.

31. Table 4.30 displayed that R^2 Value was .21. It represented that the independent variable (teacher support) described 21 % variation in students' amotivation and the rest was due some other factor. While the coefficient (β= .47) showed that this effects was statistically insignificant at 0.05 level of significance. Thus it is evident that there is statistically no significant effects of interactive learning environment related to teacher support on amotivation of the secondary school students.

Objective No. 3 (vii): To determine the effects of cooperation among students on students' motivation at secondary school level while learning mathematics.

32. Table 4.31 displayed that R^2 Value was .57. It represented that the independent variable (cooperation) described 57 % variation in students' motivation and

the rest was due some other factor. While the coefficient (β= .31) showed that this effects was statistically significant at 0.05 level of significance. Thus it is evident that there is statistically significant effects of interactive learning environment related to cooperation on motivation of the secondary school students.

33. Table 4.32 displayed that R^2 Value was .61. It represented that the independent variable (cooperation among students) described 61 % variation in students' intrinsic motivation and the rest was due to some other factor. While the coefficient (β= .44) shows that this effects was statistically significant at 0.05 level of significance. Thus it is evident that there is statistically significant effects of interactive learning environment related to cooperation on intrinsic motivation of the secondary school students.

34. Table 4.33 displayed that R^2 Value was .56. It represented that the independent variable (cooperation) described 56 % variation in students' extrinsic motivation and the rest was due to some other factor. While the coefficient (β= .29) shows that this effects was statistically significant at 0.05 level of significance. Thus it is evident that there is statistically significant effects of interactive learning environment related to cooperation among students on extrinsic motivation of the secondary school students.

35. Table 4.48 displayed that R^2 Value was .56. It represented that the independent variable (cooperation) described 56 % variation in students' amotivation and the rest was due some other factor. While the coefficient (β= .29) shows that this effects was statistically insignificant at 0.05 level of significance. Thus it is evident that there is statistically no significant effects of interactive learning

environment related to cooperation on amotivation of the secondary school students.

5.3. Discussion

The focus of the research in hand was to determine the effects of interactive learning classroom environment of the secondary schools on secondary school students' motivation level while learning mathematics. In this study the researcher explored the practices related to interactive learning classroom environment and levels of motivation of the secondary school students. The main aim of the research was to determine the effects of interactive learning classroom environment on the motivation of secondary school students studying in the secondary school of Federal Directorate of Education (FDE) Islamabad. The research was based on three major objectives.

Various researches had presented different models of related to interactive learning environment. So many models of interactive learning environment were studied by the researcher. Every model has its own benefits as well as limitations. Cavanagh & Waugh (2004), an 85-item survey was developed which builds on learning environment and the previously determinant scale for learning Kennish & Cavanagh (2011). However, 2 subscales were made in proceeding. 12 items were on learning capabilities and similarly, there were 15 items on expectations of the learning. Hence, the 8 subscales were made for the determinant of the perceptions of the students in the learning environment. 5 items were on education, 9 items on learning outcomes, 3 items on classroom planning, 9 items from support & expectations, and five items are about the involvement of the parents. However, in the appendix the survey is available.

According to Wubbels, Brekelmans, Denbrok & Tartwijik (2006) in complex environment classroom teaching is a complicated task and teachers have to perform concurrent functions like motivating, instructing, organizing and encouraging helping the learners to achieve their goals. In this reverence Kim (2000) explained the multidimensional role of teachers. To discuss the major prevailing practices related to interactive classroom learning environment of the secondary school model

presented by Myint (2001) was thoroughly studied. This model also served basis for conceptual framework for the study in hand. According to model there were 7 major sub scales of interactive classroom learning environment. SPSS was used to calculate standard (SD) deviation and mean (M). However, in this research Task orientation was the major prevailing practice related to classroom learning environment at secondary schools while learning mathematics. Rabby (2001) declares that the motivational ingredients dominate the thoughts. The performance of an individual is associated with the person's level of motivation. Similarly, the organizations perform and enhance their functioning by increasing the level of motivation to be more productive. The man force is in best use if the organization arranges seminars and interactive session for the employees. Same is here in educational context, the employees are trained to motivate the students to gain the outcomes. The contribution of all the individual is same. The learner's motivation is affected in the institutions where there is least motivation for them (Panagio, 2013). It is among the responsibilities of the employers and the management to be careful about the motivations of the employees to increase the level of accomplishments for them. However, the strong predicators of the intrinsic motivation are the relationships, associations, intentions and the set goals which are very significant in many cases (Dysivik & Kuvaas, 2010). Organizations can enhance the level of motivation of the workers by providing the resource and forum for the practice.

For responding to the external change, an organization requires a combination of the motivation and the strength of the employees and show of organizational values (Kuo, 2013). The flow is made from the younger to adult employees and variety of the techniques were used in current literature. The motivational flow requires the understanding and attention of the management which is helpful in creating the cultural impact on employees to perform well. The job place, time flexibility, and the residential area are the major areas which ensure the existence of the motivation. The culture of the organizations is major area which is thriving. In views of Gignac and Palmer (2011), the passionate people are collaborating with each other and work hard which ultimately

produces good results. Base on the theory of motivation, there is a variety of the frameworks which are utilized in the body of the literature with limited dimension of the motivation. According to Denhardt et al. (2008,) there is a difference in satisfaction and the motivation. Motivation is orienting on future, however, the satisfaction is something which is past oriented. The results of the objectives revealed that majority of the students are at medium level of motivation and very few were on low level of motivation. Data analysis revealed that students enjoy medium level of motivation intrinsically but have high level of motivation extrinsically and majority of the learners have low level of amotivation while learning mathematics.

The environmental impact is given much importance by many researchers. It is something which requires to be well organized and established. The motivation of the students is obviously achieved if the students are provided with required experience and work independently or if the ownership is achieved (Evertson, Worsham and Emmer, 2003).

Kyriakides (2007) specified in this regard the part of learning environment. Educating, instructors perform in common, while enhancement and acquiring situations, and the viability of intercessions were considered for numerous a long time from diverse viewpoints. According to Wubbles, Brekelmans, cave Brok & Tartwijk (2006), get a handle on the involves of teaching space instruction and which occurs within the schoolroom, a few analysts have recognized between diverse sorts of educating actions for directions of behaviors and methods & classroom organization, Classroom learning and teaching could be a multifaceted errand in a multipart situation, besides instructors are supposed be fulfill numerous concurrent capacities similar direction, propelling, plus organizing to gain the objectives.

The multifaceted part of instructors are considerable (Kyriakides, 2007). Instructing learners perform in common, and the acquision situations, and adequacy of mediations, were examined by numerous educationists since long time from diverse viewpoints. To handle on the intricacy of academically instructing which happens in the classroom, a few analysts have recognized between diverse sorts of

instructing acts such as directions behaviors and strategies and classroom administration whereas others have inspected educating from diverse viewpoints, e.g., interpersonal, course administration, and learning activities, recognizing that there's a few cover between these points of view (Wubbels, et. al., 2006)., whereas others have inspected educating from diverse points of view, e.g., interpersonal, managing classes and exercises, recognizing that there's a few cover between these points of view (Wubbels, et. al., 2006).Students' inclusion in classroom, is these days regularly abstracted in various ways which apprehend the quality of the students' support classroom enhancement and exercises or their association in scholarly exercises (within the classroom) and their engagement with learning openings within the learning environment. Kindermann & Furrer, (2009) stated that numerous inspiration analysts, assignation intellectualized this way appearance of a students' inspiration (Skinner, 2009). In expansion, ponders motivated by learning environment inquire about contextualized adequacy, connecting instructing conduct and educating environment individualities or situations with understudy results. For the expansion to the above-stated subjects, the development slant thought about instructing & educator viability to center the accessibility to steady circumstances for education. In views of Prenzel, Kramer, and Drechsel (2002) it is stated that the said 6 strong situations in pupils' learning situations, specifically the pertinence of substance, excellence of teaching, educator's intrigued, communal affiliation, bolster of capability, with back of independence. These conditions are signified in virtue of the inbuilt inspirational understudies (Krapp & Lewalter, 2001). This is also highlighted that the conditions are associated with environments (Prenzel et al., 2002). Education is considered as a set of conditions which boosts and encourages learning (Scheerns, 2007). The moral binding of the instructors in boosting learning is prominent thing. Artelt, et. al. (2003) and Boekaerts& Corno (2005) consider the role played by the teachers in this regard is imperative which is assisting in control technique and adopts the self-regulation and motivation methods by recompensing the need of understudy learning's control by effectively requesting and regulation of the learning condition. However, instructors act as an additional for

learners control strategy. Previously, understudy inspirations were frequently considered as an absolutely learner's individual property. Anderson, Hamilton, & Hattie (2004) state that it is recognized presently that inspiration is impacted by outside impacts as well particularly by learning environment. Subsequently, inspiration and persuaded behavior were these days more regularly considered inside an biological point of view, seeing the understudy in collaboration with the setting where they learn. Furthermore, in views of Nye, Konstantopoulos, & Supports (2004) the instructor is broadly recognized as an critical factor of the culture and environment where they learn within the situation, investigate on instructor viability and classroom environment inquire about formative brain research and environmental viewpoints appeared the significance of instructors by educating to learners scholastic results. According to Alton-Lee, (2003) and Opdenakker & Van Damme (2009), in a specific, educators' bolster of understudies i.e. academic related, passionate/ motivations, educator association, and teaching space administration & organization are regularly specified in instructor viability and classroom environment investigated as vital pointers of the quality of the learning environment. However, in a survey article it was illustrated that the significance of tutors' caring, bolster "support" , what is more responsiveness for undergraduate-learning forms, & famous in their audit the significance of helpful, scholarly and social educator understudy intelligent in expansion to classroom administration and organized educating (Alton-Lee, 2003). Besides in view of Opdenakker & Van Damme (2000) it was inquired about and hypotheses on inspiration and self-determination recognized the significance of a strong and included educator with regard to understudy inspiration, (Opdenakker & Maulana, 2010; Maulana, Opdenakker, sanctum Brok, &Bosker, 2011) scholastic inclusion and states of mind in learning situation to the enhancement and determinations of the self (Minnaert et. al., 2007). Within the same mood, it is expressed in a survey based upon speculations and writing by Nichols (2006, p. 152) on objective introductions, self-efficacy, and attributions of victory and disappointment, that "motivation will thrive when the classroom environment is touchy to and viably advances positive student-teacher relationships. In

views of Scheerens (2007), the system of instructive viability inquire about is utilized as the central hypothetical establishing which inquired about to a few degrees, the part of the educator depicted over has a few correspondence with the qualification between organized and more open, discovery-oriented instructing approaches. One of the contrasts between these approaches was the sum of structure and control set up by the educator. There are a few signs within the writing that weaker understudies in essential and auxiliary instruction were more likely to advantage from instructors taking over or giving extra back for understudy control procedures, though way better understudies in auxiliary instruction advantage from instructors acting as a demonstrate and an illustration and giving them adequate breathing space to create their control techniques (Scheerens, 2007). In expansion, D'Agostino (2000) found that a more teacher-centered approach worked superior for more youthful children in essential instruction, though a more student-centered approach was superior fitted to more seasoned children. This implies that the discourse around what learning environment is most successful (a organized one or a more open and revelation arranged) is more complex than was regularly recognized since the adequacy of learning situations appears to be conditional on understudy aptitudes, the progression in school career (age), and maybe too on instructive targets. The over recommended a few elbowroom for the significance of versatile educating and seeing the approaches as complementary. Concurring to Scheerens (2007), in any case, this does not cruel that differentiating the conventions of organized instructing, dominance learning, and coordinate instruction approaches with "constructivist ideas" around instructing and learning isn't profitable. Additionally Scheerens (2007) said that "The abrogating conclusion of the meta-analysis of educating components was that effective teaching could be a matter of clear organizing and challenging introduction and a strong climate and meta-cognitive preparing. They indicated that these primary orientations to educating are all critical, which compelling instructing wasn't subordinate on a particular procedure or approach. "Be that as it may, it remains or maybe vague how these fundamental introductions relate to inspiration and propelled behavior like scholastic engagement

since of the need of investigate connecting these instructing approaches to inspiration. Self-determination hypothesis (Ryan & Deci, 2000) recommended an approach in which the independence of understudies is backed, and students' involvement, at the cruel time, structure is advantageous to inspiration (e.g., Jang, Reeve &Deci, 2010). In line with the qualification between organized and more open teaching/constructivist approaches, a few analysts allude to a teacher-centered approach as contradicted to a learner-centered approach (Alfassi, 2004; Opdenakker& Van Damme, 2006). Advocates of learner-centered approaches pushed the significance of giving the foremost strong learning setting for different understudies (Osterman, 2001). Emilia along with constructivist approaches proposes that enabled, steady classroom situations where student-teacher relations were energized and fed emphatically influence students' inspiration, engagement for school, learning, and advancement (Nichols, 2006). Investigate on student-teacher interpersonal connections and school climate affirmed the significance of great student-teacher relations and the viability of a definitive fashion (compared to a dictator fashion) to propelled behavior (exertion) and states of mind toward scholarly subjects (Gregoire & Algina, 2000; Anderson, et al., 2004; cave Brok, van Tartwijk, Wubbels, &Veldman, 2010). In expansion, investigate of Opdenakker and Van Damme (2006) has appeared that the more instructors embraced a learner-centered instructing fashion, the more they donate their classes directions back and openings to memorize (independent of the common capacity level of the lesson) and the way better were their connections with their classes and the accomplishment and scholarly engagement of understudies (Opdenakker& Van Damme, 2009)

Besides, Alfassi (2004) proposed understudies at hazard or whose needs are less routine will most advantage from a learner-centered environment in terms of inspiration and accomplishment since such an environment is based on an improvement show of educating and learning (tending to students' interface and qualities) compared to conventional learning situations (tending to students' shortfalls). Alfassi (2004) detailed that an organized program in a learner-centered setting yielded altogether way better comes about than conventional teacher-centered instruction with respect to

scholastically locks in understudies who had experienced scholastic disappointment within the past. Hamre and Pianta (2005) found prove for positive impacts of guidelines and enthusiastic back on children at hazard of school disappointment. In spite of the fact that within the past teacher-centered and organized instructing approaches were regularly set against more learner-centered and constructivist approaches, a few researchers these days make a supplication for putting them on one continuum and for connecting the choice for a position on that continuum to learning targets and the capacity of understudies (Creemers, 2005; Scheerens, 2007). Others (e.g., Kyriakides, Creemers, & Antoniou, 2009) moreover allude to such a continuum, but infer a progression within the characteristics of these approaches, showing that characteristics of teacher-centered and, in specific, organized educating approaches require essential instructing aptitudes, whereas the creation of a more learner-centered and constructivist learning environment in which consideration is paid to person contrasts. An impartial instruction framework makes a difference all understudies create the knowledge and skills they have to be be locked in and gotten to be profitable individuals of society. More imperatively, giving all children an evenhanded begin would lead to superior financial and social outcomes for people, for locales, and for our country. Issue of value could be a significant theme for the think about of instruction frameworks.

Meuret (2006) stateed that It can subsequently be said that, for the quality of instruction approaches, but too for the quality of the political wrangle about on instruction, it is Common conclusion, in both Europe and within the Joined together States, has moved toward centering more on the assignment and obligation of the school in choosing long-term of the community, and, in line with a common alter within the viewpoint for the condition of children, there's a more grounded conviction that the concept of equity must be applied to all citizens independent their age. In connection to this, in a 2004 think about, Meuret cited a number of studies and investigated ventures conducted within the to begin with few a long time of unused millennium, including those by Fauconnier and Deloy (2000) and Hutmacher, Cochrane and Bottani (2001). This paper is portion of a more broad investigate

extend, enduring for four a long time, with the ultimate point of distributing a report on the state of the markers in open school in Ticino (see Berger, 2005 and Cattaneo, 2010).). In this investigate extend, value was one of the themes that had been recognized in arrange to think about the markers of the educational framework, and, among other angles, incorporated the issues of incorporation, selectivity, ensures of the correct to consider and rise to openings. The level of understudy certainty whether he/ she can finish the errand well or not decide understudy victory (Ryan & Deci, 2000). Participation among understudies whereas learning improve conceivable outcomes for understudies to adjust and to acknowledge distinctive capacity and foundation of other understudies (Wyk, 2012). In expansion, peer connections are exceptionally critical and cannot be underestimated. The peer support to realize way better scholarly accomplishment not as it were cultivate well understudy inspiration but moreover make understudies prepared to work, and be mindful amid learning and upgrade the considering capacity (Hamid, Zakaria, & Islam, 2012). The findings suggested that interactive learning environments, when carefully designed and implemented, have a substantial positive impact on students' motivation in mathematics education. Fostering students' involvement, cohesiveness, task orientation, investigation, equity, teacher support, and cooperation can significantly enhance both intrinsic and extrinsic motivation levels. These results underscore the importance of promoting active engagement, collaborative learning, and a sense of belonging in mathematics classrooms to inspire students and improve their overall learning experiences. Future educational strategies and curriculum development should consider these findings to create more effective and motivating learning environments for mathematics education. Creating an interactive learning environment that motivates the learners and enhances their academic achievement is a complex and multifaceted endeavor. Various elements contribute to the success of such an environment, including the physical space, teaching methods, teacher-student relationships, and the overall atmosphere of the educational institution. One of the fundamental aspects of a motivating learning environment is the quality of teacher-student relationships. This factor is highlighted in

numerous studies as a critical determinant of student motivation and academic achievement. Pianta (1999) emphasized the significance of positive teacher-student relationships. When students feel valued, respected, and supported by their teachers, they were more likely to engage in the learning process and strive for academic excellence. Such relationships foster trust and create a safe space for students to take intellectual risks, ask questions, and seek guidance. The learning materials and resources available to students also played a pivotal role in motivating them. McGinnis (2002) stressed the importance of engaging and relevant learning materials. Interactive and multimedia resources can make learning more enjoyable and captivating, thereby increasing students' motivation to participate actively in their education. Access to up-to-date textbooks, digital resources, and various media can provide students with a diverse range of tools to support their learning. The overall classroom climate is another critical factor in shaping the learning environment. Wang and Holcombe (2010) explored the impact of classroom climate on academic achievement. They found that a supportive and inclusive classroom climate, where students feel safe to express their opinions, collaborate with their peers, and actively participate in class discussions, can have a significant positive effect on academic success. A positive classroom climate encourages students to engage more fully with the material, leading to increased motivation and achievement. The concept of autonomy and choice in the learning process is closely tied to student motivation. Deci and Ryan's Self-Determination Theory (1985) suggested that when students have some level of autonomy and feel that they have control over their learning, they are more likely to be motivated and perform better academically. Allowing students to make decisions about their projects, study methods, or even some aspects of the curriculum can boost their motivation and sense of ownership over their education. Peer interaction and collaborative learning environments are powerful motivators. Johnson and Johnson (1999) highlighted the benefits of students working together in their learning journey. Interacting with peers, discussing ideas, and solving problems collaboratively can create a sense of belonging and motivation to learn. Students often find it motivating to share their knowledge, learn

from their peers, and contribute to a positive group dynamic. Incorporating these elements into the learning environment can lead to improved motivation and academic achievement among students. However, it's essential to recognize that these factors are interconnected and interdependent. A positive teacher-student relationship can influence the classroom climate, which, in turn, affects the level of autonomy and choice students are granted. Additionally, engaging learning materials and peer interaction can contribute to the overall positive atmosphere of the learning environment. When educators and institutions focus on creating a holistic learning environment that addresses these aspects, they are more likely to motivate learners and increase their academic achievement. It is not just one factor but the synergy of these elements that creates a thriving educational setting. In summary, the learning environment is a pivotal factor in motivating learners and enhancing their academic achievement. Positive teacher-student relationships, engaging learning materials, a supportive classroom climate, autonomy and choice, and peer interaction all contribute to creating a conducive environment for learning. When educators and institutions prioritize these elements, students are more likely to be motivated, engaged, and successful in their academic pursuits.

5.4. Conclusions

Following conclusions were made by the findings of the research study in hand.

> **Objective No. 1:** To explore the practices related to interactive learning environment prevailing at secondary school level."

It is concluded from the findings of the data analysis of Objective No. 1 that task orientation was the most prevailing practice in classroom learning environment of mathematics. In the pursuit of task orientation students who fully concentrate on their lesson during class were found more successful as compared to other students. Students' involvement was found the least prevailing practice during mathematics class.

Objective No.2: "To explore the level of Motivation of the Secondary school students while learning Mathematics."

It was concluded from data that majority of the students were at medium level of motivation. 2nd best majority was of those students who were at high level of motivation and very little number of students i.e. only 2.7 % had low level of motivation. It was also concluded that most of the majority of the students was motivated to learn mathematics extrinsically while minority was amotivated to learn mathematics. In respect of intrinsic motivation of it was concluded that little number of students were at low level of intrinsic motivation. Whereas majority of the students were enjoying medium level of intrinsic motivation and 2nd best majority was of the students who were at high level of intrinsic motivation. On the analysis of data it was concluded that majority of the students had high level of extrinsic motivation and very little number of students were at low level of extrinsic motivation rest were at medium level of extrinsic motivation. In amotivation majority of the students laid in low level of , 2nd best majority was of the students who laid in the middle level of amotivation and very few were at high level of amotivation.

Objective No. 3 To explore the effects of   Interactive Learning Environment on learners' motivation at secondary school level.

 Interactive classroom Learning Environment affected the motivation of the secondary school students while learning mathematics at 73%. It was concluded from the results that interactive classroom learning environment had influenced the motivation of the students. Classroom learning environment can be an important factor for upbringing the motivation of the students. Interactive classroom learning environment related to involvement significantly affected motivation of the secondary school students. Involvement affected the motivation of the secondary school students while learning mathematics at 56%. This showed interactive classroom learning environment related to involvement is important factors in the nourishment of motivation of the students.

Involvement affected the intrinsic motivation of the secondary school students while learning mathematics at 51%. Students' involvement played a visibly important role in determining the extrinsic motivation of the students. It was concluded that interactive classroom learning environment

related to involvement significantly affected the extrinsic motivation of the secondary school students. Interactive classroom learning environment related to Students' cohesiveness affected motivation of the secondary school students. Students' cohesiveness affected the motivation of the secondary school students while learning mathematics at 76%. This showed interactive classroom learning environment related to students' cohesiveness is important factors in the nourishment of motivation of the students.

Interactive classroom learning environment related to Students' Investigation affected intrinsic motivation of the secondary school students. Students' Investigation affected the intrinsic motivation of the secondary school students while learning mathematics at 54%. This showed interactive classroom learning environment related to Investigation is important factors in the nourishment of intrinsic motivation of the students. Interactive classroom learning environment related to Students' Investigation affected intrinsic motivation of the secondary school students. Students' Investigation affected the extrinsic motivation of the secondary school students while learning mathematics at 74%. This showed interactive classroom learning environment related to Investigation is important factors in the nourishment of extrinsic motivation of the students.

Overall conclusion of the study is that Interactive learning environment motivate the learners to learn mathematics.

5.5. Recommendations

Keeping in view the conclusions, few recommendations had been made by the researcher. These recommendations can be significant for the government, policy makers, and directorate of school education, school administrators and teachers. Following recommendations has been suggested:

1. Students' cohesiveness was found often prevailing practice and has significant effect on students motivation therefore school administrators may help teachers to foster a sense of cohesiveness among students as a mean to inspire learners to enhance academic motivation. This can be achieved by:

    i.   Encouraging students to participate in group discussions and debates to foster critical thinking, communication skills, and a deeper understanding of complex topics.

    ii.   Encouraging teamwork by having students work together on assignments, presentations, or research projects, promoting peer learning and communication.

    iii.   Using softwares and online tools that facilitate collaboration, such as shared documents, project management platforms, and video conferencing.

    iv.   Creating physical or virtual collaborative workspaces where individuals can work on shared projects and provide feedback in real-time.

2. As Students' involvement was found most prevailing practice in the study and has a significant effect on students' motivation therefore educators may aim to increase student involvement which can motivate the learners both intrinsically and extrinsically.

    i.   Students involvement can be enhanced by using interactive teaching methods, discussions, hands-on activities, and involving students in decision-making regarding their learning.

    ii.   Utilizing digital or physical simulations to let students interact with complex processes or systems, enabling them to visualize and experiment with various variables.

    iii.   Employing the Socratic method, where teachers ask open-ended questions to encourage students to explore, stimulate involvement and find reason through problems independently.

3. The results of the study showed that teacher support is one of the most prevailing practice in classroom learning environment and is also highly influencing factor for students academic motivation. Teacher support may enhance students' motivation so teachers may continue to provide guidance, encouragement, and mentorship to their students. Teacher support may be enhanced by:

    i.   Fostering positive teacher-student relationships built on trust, respect, and empathy.

    ii.   Recognizing and addressing the unique needs and abilities of each student.

iii.   Offering remedial assistance, such as tutoring, study groups, or access to educational resources, for students who may be struggling academically or need extra support.

4. Task orientation was also found most prevailing practice in classroom learning environment and has significant effect on students' motivation. To enhance task orientation:

  i. Educators may design lessons that clearly outline objectives and learning goals. This assists students in comprehending the objectives behind their assignments and maintains their motivation to accomplish them.

  ii. By offering incentives or rewards for completing tasks, such as recognition, small prizes, or extra privileges.

  iii. By using multimedia resources like educational videos, interactive software, or online platforms to engage students and provide visual and auditory aids.

  iv. By tailoring tasks and assignments according to the students' interests and learning styles, making them more engaging and motivating.

5. Since cooperation among students was found most prevailing practice in maths classrooms and has significant effect on students' extrinsic and intrinsic motivation. To enhance cooperation among students:

  i. School administration and teachers may promote collaborative learning activities.

  ii. School administration may help and train the teachers to create an inclusive classroom culture where students are encouraged to work together, share ideas, and support one another.

  iii. Introducing challenging maths puzzles or problems that require critical thinking and problem-solving skills.

  iv. Offering rewards or recognition for solving these challenges.

6. Equity was another most prevailing factor in classroom learning environment and significantly effect the intrinsic and extrinsic motivation of the students.

i. School administration may ensure equity in classrooms with the help of teachers who can manage the equitable distribution of resources and opportunities among all students, regardless of their background or abilities.

ii. Address disparities in access to educational resources and provisions.

iii. To promote equity teachers may create a classroom environment that is safe, welcoming, and inclusive. Address issues of biasness, discrimination and bullying promptly.

7. Investigation was found the least prevailing practice in mathematics classrooms and significantly effect the intrinsic motivation of the learners. Teachers may encourage students to explore, inquire, and investigate mathematical concepts. Use real-world problems and scenarios to make learning more relevant and engaging.

i. Provide students with math problems according to the level of learners like low level questions for struggling students, intermediate level questions for mediocre students and challenging questions. It will encourage the learners to investigate.

ii. Assign math projects to inspire them for investigation.

iii. Present students with real-world problems that require mathematical solutions. Encourage them to investigate and apply maths to address these issues.

8. It was found that students have varying levels of intrinsic and extrinsic motivation. There is a need of tailoring teaching approaches to cater both types of motivation.

i. For intrinsically motivated students, teachers may emphasize to enhance the inherent value and interest in mathematics.

ii. Encourage creative projects and self-expression through various media, allowing students to tap into their interests and passions.

iii. Teach the concept of a growth mindset, where students understand that abilities can be developed through effort and perseverance. This mindset may lead to a stronger intrinsic motivation to learn and grow.

iv. For extrinsically motivated students, administration and teachers may provide rewards or recognition for their efforts.

v. Offer positive and specific feedback to recognize students' efforts and accomplishments.

vi. Organize math-a-thons, where students solve a certain number of math problems within a set time frame. Recognize and reward students for their participation and performance.

vii. Recognize students who excel in math by offering opportunities to become math tutors or peer helpers, which can be seen as prestigious positions.

9. For the small percentage of students who showed high levels of amotivation, teachers may consider personalized interventions. They may identify the root causes of their amotivation and work with them to find strategies to increase their motivation like:

i. Regularly monitoring progress and provide feedback to keep students to investigate, explore and solve problems can motivate the learners and decrease amotivatio.

ii. Celebrating small victories along the way can also boost motivation.

iii. Offering students choices in their learning may motivate the learners. Allow them to have some control over how they learn because at this level they may not allowed to decide what they want to learn. This autonomy can increase their sense of ownership and motivation. For example, let them choose from a selection of assignments or projects related to a specific learning objective etc.

iv. Connecting the subject matter to real-life situations and show the relevance of what students are learning. When students see how the knowledge or skills they're acquiring can be applied to their lives or future careers, they are more likely to be motivated.

10. Government, school administration and teachers may use the techniques which may foster a school culture that values and promotes interactive learning and motivation. Encourage collaboration among teachers, students, and parents to create a conducive learning environment. It may be done by:

i. Organizing workshops and training sessions for teachers to introduce them to interactive teaching methods and strategies that promote motivation among students. This might include techniques like flipped classrooms, project-based learning, and active learning.

ii. Encouraging teachers to collaborate on lesson planning. This not only allows for the sharing of effective teaching methods but also promotes a sense of community and teamwork among educators.

iii. Regularly hold parent-teacher meetings to involve parents in their children's education. Discuss student progress, address concerns, and seek parental input on school activities.

iv. Investing interactive classroom technologies, such as smartboards, tablets, and educational software, to make learning more engaging and interactive.

v. Establishing peer tutoring programs where older students help younger ones with their studies. This not only aids in academic learning but also builds a sense of responsibility and collaboration.

vi. Promoting the formation of student clubs and organize extracurricular activities that cater to various interests. This encourages students to actively participate in school life.

vii. Implementing inclusive education practices to create a diverse and welcoming environment for students of all abilities.

viii. Developing and share a library of interactive learning resources, including online educational games, videos, and simulations, to supplement traditional teaching methods.

5.5.1. Specific recommendations for future researchers

By addressing these specific areas of research, future researchers can build upon the findings and contribute valuable insights to the field of interactive learning environments, mathematics education, and student motivation. These recommendations can help to create a more comprehensive understanding of the factors that influence students' motivation and learning outcomes in mathematics.

11. An experimental study may be conducted to find the correlation between students' motivation and interactive learning environment. Conducting an experimental study on both variables, students' motivation and interactive learning environment, is imperative for future researchers due to its potential to yield valuable insights into the complex interplay between these factors. Such a study would allow researchers to employ controlled conditions, manipulating variables to observe their direct impact on students' motivation within interactive learning settings. By systematically varying elements of the learning environment, researchers can discern which aspects contribute most significantly to heightened motivation among students. Furthermore, an experimental design enables the establishment of causal relationships, providing a more robust foundation for educational interventions.

12. Researchers may conduct longitudinal studies to explore the long-term effects of an interactive learning environment on students' motivation in mathematics. Follow a cohort of students over an extended period to understand how interactive practices impact motivation and academic performance over time.

13. Comparative studies may be conducted to analyze the impact of different types of interactive learning environments on students' motivation in mathematics. Compare traditional classroom settings with technology-enhanced, project-based, or flipped learning approaches to identify the most effective methods.

14. Researches may be conducted to explore the effects of interactive learning environments on students' motivation in mathematics across different grade levels to analyze how these practices may vary in impact between early secondary school, mid-secondary school, and high school levels.

15. Researches may be conducted to examine the influence of teachers' training and professional development on the implementation of interactive learning environments. Investigate how

well-prepared teachers can effectively integrate interactive practices and promote students' motivation in mathematics.

16. The effects of an interactive learning environment on students' motivation may be explored, particularly those with diverse learning needs and backgrounds. Investigate how interactive practices can be adapted to support inclusive education in mathematics classrooms.

17. Qualitative research methods may be incorporated such as interviews or focus groups, to gather students' perspectives on the impact of interactive learning environments on their motivation in mathematics. Understand students' experiences, perceptions, and preferences regarding interactive practices.

18. The role of parental involvement in supporting and reinforcing investigation, cooperation, task orientation and motivating the students for learning maths may be explored.

19. Cross-cultural studies may be conducted to examine the effectiveness of interactive learning environments in diverse cultural and educational settings. Explore how cultural factors may influence students' motivation in mathematics.

20. Comparative analysis may be conducted to determine the effects of interactive learning environment on students' motivation in mathematics with other subjects like science, language, or social studies. It may be analyzed if certain interactive practices are more effective in specific subject areas.

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Topic Approval Letter

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

ML.1-4/2019/Edu

Dated: 26-02-2019

To: **Saima Afzal,**
701-PhD/Edu/F17

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

1. Reference to Letter No. ML.1-2/2019-Edu dated 11-02-2019, the Higher Authority has approved your topic and supervisor on the recommendation of Faculty Board of Studies vide its meeting held on 5th Dec 2018.

    i. **Supervisor's Name & Designation**
       Dr. Quratul Ain Hina,
       Assistant Professor, Department of Education
       NUML, Islamabad.

    ii. **Topic of Thesis**

Effects of Interactive Learning Environment on Students' Motivation 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 & Published Research Article should be submitted within prescribed period by Sept 2022 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 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. Quratul Ain Hina (Supervisor)
    Individual Concerned.

List of Experts Committee for Tool Validation

Sr No	Expert	Association
1.	Dr. Qudsia Riffat	Associate Prof. Ex Chairperson of Science Education Department, Allama Iqbal Open University, Islamabad
2.	Dr. M. Ajmal Chaudary	Chairperson of Distance Non Formal & Continuing Education department, Faculty of Education, Allama Iqbal Open University, Islamabad
3.	Dr. Muhammad Tanveer Afzal	Assistant. Professor, Secondary Teacher Education. Department, Allama Iqbal Open University, Islamabad
4.	Dr. Azher Mumtaz Saadi	Assistant. Professor, Educational Planning, Policy Studies and Leadership Department, Allama Iqbal Open University, Islamabad
5.	Mr. Imran Bukhari	Lecturer, National Institute of Psychology Quaid e Azam University Islamabad

Research Instrument Validity Certificates

Certificate for Test Validation
(Interactive Learning Environment)

Effects of Interactive Learning Environment on Students' Motivation in Mathematics at Secondary School Level

By Ms Saima Afzal

.

PhD Scholar, Department of Education, Faculty of Social Sciences, National University of Modern Languages, Islamabad, Pakistan.

This is to certify that the questionnaire developed by the scholar towards her thesis has been assessed and undersigned found that it has been designed adequately to explore the practices related to Interactive Learning Environment prevailing at secondary schools. Responses thus collected will aid treatment of the subject in a scientific manner. It is considered that the research instrument, developed for the research titled above, is according to the objectives of the research, assures adequate construct and content validity according to the purpose of research, and can be used for data collection by the researcher with amount of confidence.

Name _Dr Qudsia Riffat_

Designation _Associate Prof._

Institute _AIOU_ 22-07-2019

Signature _____

Certificate for Test Validation
(Motivation Assessment Scale)

Effects of Interactive Learning Environment on Students' Motivation in Mathematics at Secondary School Level

By Ms Saima Afzal

PhD Scholar, Department of Education, Faculty of Social Sciences, National University of Modern Languages, Islamabad, Pakistan.

This is to certify that the questionnaire developed by the scholar towards her thesis has been assessed and undersigned found that it has been designed adequately to assess the "Motivation Level" of secondary school students. Responses thus collected will aid treatment of the subject in a scientific manner. It is considered that the research instrument, developed for the research titled above, is according to the objectives of the research, assures adequate construct and content validity according to the purpose of research, and can be used for data collection by the researcher with amount of confidence.

Name _Dr Qudsia Riffat_

Designation _Associate Prof_

Institute _Allama Iqbal Open Uni_

Signature _____

20-07-2019

List of Schools Included in Population

Province	District	Level	Name
ICT	ISLAMABAD	HIGH	IMSB (VI-X), I-9/4, (NO 2)
ICT	ISLAMABAD	HIGH	IMSB (I-X), SAID PUR
ICT	ISLAMABAD	HIGH	IMSB (I-X) TALHAR
ICT	ISLAMABAD	HIGH	IMSB (VI-X) RAWAL DAM
ICT	ISLAMABAD	HIGH	IMSB (I-X) SHAHDARA
ICT	ISLAMABAD	HIGH	IMSB (I-X) KUREE
ICT	ISLAMABAD	HIGH	IMSB (I-X) CHATTAR
ICT	ISLAMABAD	HIGH	IMSB (I-X) BHARA KAU
ICT	ISLAMABAD	HIGH	IMSB (I-X), G-8/4
ICT	ISLAMABAD	HIGH	IMSB (I-X), G-5, PMS COLONY
ICT	ISLAMABAD	HIGH	IMSB (VI-X), I-10/2
ICT	ISLAMABAD	HIGH	IMSB (VI-X), SIHALA
ICT	ISLAMABAD	HIGH	IMSB (VI-X), I-9/4, (NO 1)
ICT	ISLAMABAD	HIGH	IMSB (VI-X) F-6/2, NO 8
ICT	ISLAMABAD	HIGH	IMSB (VI-X), G-6/4
ICT	ISLAMABAD	HIGH	IMSB (VI-X) G-7/3-1
ICT	ISLAMABAD	HIGH	IMSB (VI-X), G-11/2
ICT	ISLAMABAD	HIGH	IMSB (VI-X), F-8/3
ICT	ISLAMABAD	HIGH	IMSB (VI-X), G-9/1
ICT	ISLAMABAD	HIGH	IMSB (VI-X), G-10/3,
ICT	ISLAMABAD	HIGH	IMSB (VI-X), G-8/1,
ICT	ISLAMABAD	HIGH	IMSB (VI-X), I/8-4,
ICT	ISLAMABAD	HIGH	IMSB (VI-X) SHAH ALLAH DITTA
ICT	ISLAMABAD	HIGH	IMSB (I-X), KHANNA NAI ABADI
ICT	ISLAMABAD	HIGH	IMSB (I-X) KIRPA
ICT	ISLAMABAD	HIGH	IMSB (I-X) KHANNA DAK
ICT	ISLAMABAD	HIGH	IMSB (VI-X) TARLAI
ICT	ISLAMABAD	HIGH	IMSB (VI-X) JHANG SYEDAN
ICT	ISLAMABAD	HIGH	IMSB (I-X) JAGIOT
ICT	ISLAMABAD	HIGH	IMSB (I-X) TUMAIR
ICT	ISLAMABAD	HIGH	IMSB (VI-X) CHIRAH
ICT	ISLAMABAD	HIGH	IMSB (I-X), MAIRA BERI ,
ICT	ISLAMABAD	HIGH	IMSB (I-X), MAIRA BEGWAL
ICT	ISLAMABAD	HIGH	IMSB (VI-X) GOLRA ,
ICT	ISLAMABAD	HIGH	IMSB (VI-X), NOORPUR SHAHAN
ICT	ISLAMABAD	HIGH	IMSB (I-X) MAIRA AKKU
ICT	ISLAMABAD	HIGH	IMSB (VI-X) NOON ,
ICT	ISLAMABAD	HIGH	IMSB (VI-X) I-14 ,

ICT	ISLAMABAD	HIGH	IMSB (I-X) NAUGAZI ,
ICT	ISLAMABAD	HIGH	IMSB (VI-X) SANGJANI
ICT	ISLAMABAD	HIGH	IMSB (I-X), BANI SARAN
ICT	ISLAMABAD	HIGH	IMSB (I-X), DHALIALA
ICT	ISLAMABAD	HIGH	IMSB (I-X), GHAGRI
ICT	ISLAMABAD	HIGH	IMSB (I-X), HARNO THANDA PANI
ICT	ISLAMABAD	HIGH	IMSB (I-X) BHADANA KALAN ,
ICT	ISLAMABAD	HIGH	IMSG (I-X) NARA SYEDAN
ICT	ISLAMABAD	HIGH	IMSG (I-X), NHC
ICT	ISLAMABAD	HIGH	IMSG (VI-X), F-7/2
ICT	ISLAMABAD	HIGH	IMSG (VI-X), G-7/2
ICT	ISLAMABAD	HIGH	IMSG (VI-X), G-7/1
ICT	ISLAMABAD	HIGH	IMSG (I-X), PRESIDENTIAL ESTATE
ICT	ISLAMABAD	HIGH	IMSG (VI-X), G-6/2,
ICT	ISLAMABAD	HIGH	IMSG (I-X), G-6/1-3
ICT	ISLAMABAD	HIGH	IMSG (I-X) RADIO COLONY RAWAT
ICT	ISLAMABAD	HIGH	IMSG (I-X) UPRAN GOHRA
ICT	ISLAMABAD	HIGH	IMSG (I-X) GAGRI
ICT	ISLAMABAD	HIGH	IMSG (I-X), G-5, PMS COLONY
ICT	ISLAMABAD	HIGH	IMSG (I-X), DHOKE GANGAL
ICT	ISLAMABAD	HIGH	IMSG (VI-X), E-8/3
ICT	ISLAMABAD	HIGH	IMSG (VI-X) SIHALA
ICT	ISLAMABAD	HIGH	IMSG (I-X), MALOT
ICT	ISLAMABAD	HIGH	IMSG (I-X), SAID PUR
ICT	ISLAMABAD	HIGH	IMSG (I-X) SHAHDRA KHURD
ICT	ISLAMABAD	HIGH	IMSG (I-X) NOORPUR SHAHAN
ICT	ISLAMABAD	HIGH	IMSG (I-X) LAKHWAL
ICT	ISLAMABAD	HIGH	IMSG (I-X) TALHAR
ICT	ISLAMABAD	HIGH	IMSG (I-X) RAWAL TOWN
ICT	ISLAMABAD	HIGH	IMSG (I-X) PHULGRAN
ICT	ISLAMABAD	HIGH	IMSG (I-X) KURRI
ICT	ISLAMABAD	HIGH	IMSG (I-X) GOKINA
ICT	ISLAMABAD	HIGH	IMSG (I-X), HUMAK
ICT	ISLAMABAD	HIGH	IMSG (VI-X), I-10/4
ICT	ISLAMABAD	HIGH	IMSG (I-X), JABA TELI
ICT	ISLAMABAD	HIGH	IMSG (I-X), NEW SHAKRIAL
ICT	ISLAMABAD	HIGH	IMSG (VI-X) CHIRAH
ICT	ISLAMABAD	HIGH	IMSG (I-X), MAIRA BERI
ICT	ISLAMABAD	HIGH	IMSG (I-X) BADIA QADIR BUKSH ,
ICT	ISLAMABAD	HIGH	IMSG (I-X) NAUGAZI ,
ICT	ISLAMABAD	HIGH	IMSG (VI-X), I-14/3
ICT	ISLAMABAD	HIGH	IMSG (I-X) TARNOUL ,
ICT	ISLAMABAD	HIGH	IMSG (I-X) BHADANA

			KALAN ,
ICT	ISLAMABAD	HIGH	IMSG (I-X) JHANGI SYEDAN ,
ICT	ISLAMABAD	HIGH	IMSG (VI-X), F-6/1
ICT	ISLAMABAD	HIGH	IMSG (VI-X), I-9/4,
ICT	ISLAMABAD	HIGH	IMSG (I-X), DARKALA
ICT	ISLAMABAD	HIGH	IMSG (VI-X), I-8/1
ICT	ISLAMABAD	HIGH	IMSG (VI-X), G-11/1
ICT	ISLAMABAD	HIGH	IMSG (I-X), F-11/1
ICT	ISLAMABAD	HIGH	IMSG (I-X), G-11/2
ICT	ISLAMABAD	HIGH	IMSG (I-X) G-10/3
ICT	ISLAMABAD	HIGH	IMSG (VI-X), G-10/1
ICT	ISLAMABAD	HIGH	IMSG (I-X), G-9/1
ICT	ISLAMABAD	HIGH	IMSG (VI-X), G-9/4
ICT	ISLAMABAD	HIGH	IMSG (VI-X), G-9/3
ICT	ISLAMABAD	HIGH	IMSG (VI-X), G-8-2
ICT	ISLAMABAD	HIGH	IMSG (I-X),E-9
ICT	ISLAMABAD	HIGH	IMSG (I-X) SUNGJANI ,
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (VI-XII) G-6/1-4
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (VI-XII), KOT HATHIAL, BK
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (I-XII), UNIVERSITY COLONY
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (VI-XII) NCH, CHAK SHAHZAD
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (VI-XII) MALPUR
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (I-XII) MAIRA BEGWAL
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (I-XII) PIND BEGWAL
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (VI-XII), HERDOGHER
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (VI-XII), RAWAT
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (VI-XII) HUMAK
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (I-XII), PIND MALKAN
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (I-XII), MARGALLA TOWN,
ICT	ISLAMABAD	HIGHER SECONDARY	IMSG (I-XII) MOHRA NAGIAL
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (I-XII) KIRPA
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (VI-XII), G-8/4

ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (VI-XII), G-9/2
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (I-XII), I-9/1
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (I-XII), SHAH ALLAH DITTA ,
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (I-XII), GOLRA,
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (VI-XII) NILORE
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (VI-XII), PUNJGRAN
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (VI-XII) TARLAI
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (I-XII) JAGIOT
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (I-XII) PIHOUNT
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (I-XII) THANDA PANI
ICT	ISLAMABAD	HIGHER SECONDARY	IMCG (I-XII) LOHI BHER
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB (VI-XII), RAWAT
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB (VI-XII) G-6/2
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB, (VI-XII), G-7/2
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB (VI-XII), G-7/4
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB (VI-XII), I-10/1
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB (VI-XII), (BSK) BHARA KAU
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB (VI-XII), CHAKSHAHZAD
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB (VI-XII), G-9/4
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB (VI-XII), MUGHAL
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB (I-XII) JABA TALI
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB (I-XII) BHIMBER TRAR
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB (I-XII) HUMAK
ICT	ISLAMABAD	HIGHER	IMCB (I-XII) PAHG PANWAL

		SECONDARY	
ICT	ISLAMABAD	HIGHER SECONDARY	IMSB (I-XII) MOHRA NAGIAL
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB (VI-XII), TARNOL ,
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB (I-XII), NILORE
ICT	ISLAMABAD	HIGHER SECONDARY	IMCB (VI-XII) PIND BEGWAL

Appendix E

Research Instrument

I am a PhD (Education) research scholar and conducting the study entitled "Effect of Interactive Learning Environment at Secondary School Students Motivation in Mathematics". The attached questionnaire has been designed to get information about you and your opinion/ view regarding the learning environment of your mathematics classroom and your level of motivation for learning mathematics. As you are concerned with the study, I request you to please fill the attached questionnaires. I assure you that your views will be used only for the purpose of research and your opinion / views will be kept confidential. Your participation is entirely and you will not be affected in any way by this research. Feel free to inquire any question about this study. Thank you very much for your cooperation and anticipation.

Yours faithfully,

Mrs. Saima Afzal, Ph.D Scholar.

Department of Education,

National University of Modern Languages, Islamabad, Pakistan.

Demographic Information Sheet

Gender	Male 1			Female 2	
Age	14 Years 1	15 Years 2	16 Years 3	17 Years 4	18 Years 5
Score in 9th class mathematics	40% to 49% 1	50% to 59% 2	60% to 79% 3	80% to 89% 4	90% and above 5
Grade	D 1	C 2	B 3	B+ 4 / A 5	A+ 6
Sector	Urban I 1	Urban 2	Bhara Kahu 3	Sihala 4 / Nelore 5	Ternole 6
Province	Sindh 1	KPK 2	Punjab 3	Balochistan 4	Others 5
Religion	Islam 1	Christianity 2	Hindu 3	Others 4	
Father's Profession	Labour 1	Business Man 2	Govt. Servant 3	Private Job 4	Unemployed 5
Mother's Profession	Labour 1	Business Woman 2	Govt. Servant 3	Private Job 4	House Wife 5

Interactive Learning Environment Questionnaire

Directions for Respondents

You are requested to give your opinion ranging from 5 to 1 indicating your preferences of responses (5= always, 4=Mostly, 3=Sometimes, 2=Seldom, 1=Never)

Sr. No.	Code	STUDENT COHESIVENESS means the extent to which students are friendly and supportive of each other	Never	Seldom	Some-times	Mostly	Often
1.	SC1	I know the names of my class fellows.	1	2	3	4	5
2.	SC2	I like to make friends in my class.	1	2	3	4	5
3.	SC3	I am friendly to my all class fellows.	1	2	3	4	5
4.	SC4	I like my class fellows.	1	2	3	4	5
5.	SC5	I work well while working with the group of my class fellows.	1	2	3	4	5
6.	SC6	I like to help my class fellows when they are in trouble..	1	2	3	4	5
7.	SC7	My class fellows also like me.	1	2	3	4	5
8.	SC8	My class fellows also help me when I need.	1	2	3	4	5
TEACHER SUPPORT is the extent to which the teacher helps, befriends and is interested in students learning.							
9.	TS1	My math's teacher provides me individual help in academic matters.	1	2	3	4	5
10.	TS2	My math's teacher help me when I am confused.	1	2	3	4	5
11.	TS3	My maths teacher consider my pace of learning while teaching.	1	2	3	4	5
12.	TS4	The teacher helps me when I have trouble with the work.	1	2	3	4	5
13.	TS5	The teacher talks with me on academic problems while learning maths.	1	2	3	4	5
14.	TS6	The teacher is interested in my problems.	1	2	3	4	5
15.	TS7	The teacher moves about the class to talk with me.	1	2	3	4	5
16.	TS8	The teacher's questions help me to understand maths concepts.	1	2	3	4	5
INVOLVEMENT: Students involvement means the extent to which students have attentive interest.							
17.	SI1	I am encouraged to discuss ideas about mathematics concepts in class.	1	2	3	4	5
18.	SI2	I am encouraged to participate in classroom discussion.	1	2	3	4	5
19.	SI3	The teacher asks me questions.	1	2	3	4	5

20.	SI4	My ideas and suggestions are used during classroom discussions.	1	2	3	4	5
21.	SI5	My teacher of mathematics allows me to ask questions.	1	2	3	4	5
22.	SI6	My maths teacher encourages me to describe different methods of solving same problem.	1	2	3	4	5
23.	SI7	My class fellows discuss with me how to go about solving problems.	1	2	3	4	5
24.	SI8	I feel pleasure to help my fellows to solve maths problem.	1	2	3	4	5

INVESTIGATION is the extent to which there is emphasis on the skill of inquiry and their use in problem solving.

25.	I1	I carry out investigations to test my ideas about mathematics.	1	2	3	4	5
26.	I2	I am asked to think about the evidence for statements.	1	2	3	4	5
27.	I3	I carry out investigations to answer questions coming from discussions.	1	2	3	4	5
28.	I4	My teacher asks me to explain statements, diagrams and graphs.	1	2	3	4	5
29.	I5	My maths teacher requires me to find the answers to the questions which puzzle me.	1	2	3	4	5
30.	I6	I carry out investigations to answer the teacher's questions.	1	2	3	4	5
31.	I7	I find out answers to questions by doing investigations.	1	2	3	4	5
32.	I8	I solve problems by using information obtained from my own investigations.	1	2	3	4	5

TASK ORIENTATION is the extent to which it is important to complete planned activities and stay on the subject matter.

33.	TO1	I fully concentrate on my lesson during class.	1	2	3	4	5
34.	TO2	I meet my targets.	1	2	3	4	5
35.	TO3	I know the goals for mathematics class.	1	2	3	4	5
36.	TO4	I always come to my Maths class on time.	1	2	3	4	5
37.	TO5	I am clear what I should know/learn in my Maths class.	1	2	3	4	5
38.	TO6	I pay attention during mathematics class.	1	2	3	4	5
39.	TO7	I try to understand the work in mathematics class.	1	2	3	4	5
40.	TO8	I know how much work I have to do.	1	2	3	4	5

COOPERATION is the extent to which the students work together to accomplish shared goals.

41.	C1	I cooperate with other students while doing the assignment of mathematics.	1	2	3	4	5
42.	C2	I share my books and resources with other students while doing assignments of mathematics.	1	2	3	4	5
43.	C3	I enjoy teamwork in my mathematics class.	1	2	3	4	5
44.	C4	I work with other students on projects in mathematics class.	1	2	3	4	5
45.	C5	I learn from other students in mathematics class.	1	2	3	4	5
46.	C6	I work with other students in mathematics class.	1	2	3	4	5
47.	C7	I cooperate with other students on class activities.	1	2	3	4	5

48.	C8	My class fellows work with me to achieve class goals.	1	2	3	4	5
EQUITY means fairness and impartiality towards all concerned, based on the principles of even handed dealing.							
49.	E1	The mathematics teacher gives as much attention to my questions as to other students' questions.	1	2	3	4	5
50.	E2	I get the same level of help from the mathematics teacher as do other students.	1	2	3	4	5
51.	E3	Mathematics teacher helps out all students on equal basis.	1	2	3	4	5
52.	E4	I am treated the same as other students in this class.	1	2	3	4	5
53.	E5	I receive the same encouragement from the teacher as other students do.	1	2	3	4	5
54.	E6	I get the same opportunity to contribute to class discussions as other students.	1	2	3	4	5
55.	E7	My work receives as much praise as other students' work.	1	2	3	4	5
56.	E8	I get the same opportunity to answer questions as other students.	1	2	3	4	5

Motivation Assessment Scale (MAS)

Instructions

You are requested to give your response against the option ranging from 5 to 1 indicating your preferences of responses (5=Almost Always, 4=Often, 3=Some times, 2=Seldom & 1=Almost Never)

Sr. No	Code	**Intrinsic Motivation** will be measured in terms of knowledge, stimulation and accomplishment	Almost Never	Seldom	Sometimes	Often	Almost Always
A		**Knowledge** assesses the desire to perform an activity for the pleasure and satisfaction experienced while learning					
1.	IMK1	I feel pleasure while learning new concepts of Mathematics.	1	2	3	4	5
2.	IMK2	I feel pleasure while discovering new things in mathematics.	1	2	3	4	5
3.	IMK3	I feel pleasure while broadening my knowledge of mathematics.	1	2	3	4	5
4.	IMK4	Study of Mathematics demands me to learn new things and get new knowledge.	1	2	3	4	5
5.	IMK5	I enjoy solving difficult problems in mathematics.	1	2	3	4	5
B		**Accomplishment** assesses the desire to perform an activity for the pleasure and satisfaction experienced from accomplishment or creation.					
6.	IMA1	I feel great satisfaction when my performance improves in maths.	1	2	3	4	5
7.	IMA2	I feel pleasure while I am exceeding myself in one of my personal accomplishments.	1	2	3	4	5
8.	IMA3	I feel satisfaction when I am in the process of completing difficult mathematical activities.	1	2	3	4	5
9.	IMA4	Studying mathematics satisfies my quest for excellence in my knowledge.	1	2	3	4	5
10.	IMA5	I feel pleasure when I solve a mathematics problem without help.	1	2	3	4	5
C		**Stimulation** measures the desire to perform an activity in order to experience stimulation.					
11.	IMS1	I keenly wait for my Mathematics class.	1	2	3	4	5
12.	IMS2	I think that learning mathematics is a fun for me.	1	2	3	4	5
13.	IMS3	I feel pleasure while discussing mathematics problems in class.	1	2	3	4	5
14.	IMS4	Knowledge about other branches of mathematics	1	2	3	4	5

		stimulates me to learn maths.					
Extrinsic Motivation: will be determined in terms of identified, introjected regulation and extrinsic regulation						
A		**Identified Regulation** assesses the desire to perform activities in order to gain a sense of importance and personal value.					
15.	EMI1	I think that high-school mathematics will help me betterfor preparing my career in future.	1	2	3	4	5
16.	EMI2	I feel that learning of mathematics will enable me to enter my favorite field in job market.	1	2	3	4	5
17.	EMI3	I think learning of mathematics will give me more carrier choices.	1	2	3	4	5
18.	EMI4	I learn mathematics because I want to show myself that I can study tough subjects.	1	2	3	4	5
B		**Introjected Regulation** assesses the experience of pressure and guilt					
19.	EMIR 1	I learn mathematics to prove myself that I am capable of completing my secondary school degree.	1	2	3	4	5
20.	EMIR 2	Getting better grades in mathematics gives me a feeling of importance.	1	2	3	4	5
21.	EMIR 3	I take interest in learning mathematics to show myself that I am an intelligent person	1	2	3	4	5
22.	EMIR 4	I take interest in learning mathematics because I want to show myself that I can succeed in my studies.	1	2	3	4	5
C		**External Regulation** measures whether students participate in activities to avoid negative consequences or achieve rewards.					
23.	EMER 1	I take interest in learning mathematics because I need at least a high score in mathematics in secondary school degree in order to find a high-paying degree.	1	2	3	4	5
24.	EMER 2	I take interest in mathematics because with a degree in maths I will have better job opportunities.	1	2	3	4	5
25.	EMER 3	I take interest in learning mathematics because I want to have 'the good career' later on	1	2	3	4	5
26.	EMER 4	I take interest in learning mathematics in order to have a better salary in future.	1	2	3	4	5
Amotivation assesses the experience of lack of motivation.						
27.	AI	I really feel that I am wasting my time in mathematics class.	1	2	3	4	5
28.	A2	I don't see any practical use of studying maths.	1	2	3	4	5
29.	A3	I am not clear about purpose of studying maths.	1	2	3	4	5
30.	A4	I don't see any benefit of studying mathematics at secondary level in future.	1	2	3	4	5
31.	A5	Solving maths problems is boring for me.	1	2	3	4	5