RELATIONSHIP OF LEARNING STYLES AND ACADEMIC ACHIEVEMENT OF STUDENTS AT SECONDARY SCHOOL LEVEL

By

Bushra

NATIONAL UNIVERSITY OF MODERN LANGUAGES

ISLAMABAD

DECEMBER, 2021

RELATIONSHIP OF LEARNING STYLES AND ACADEMIC ACHIEVEMENT OF STUDENTS AT SECONDARY SCHOOL LEVEL

By

Bushra

M.A.EDU, International Islamic University Islamabad, 2016

A THESIS SUBMITTED IN THE PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF PHILOSOPHY

In Education

To

DEPARTMENT OF EDUCATION,
FACULTY OF SOCIAL SCIENCES

NATIONAL UNIVERSITY OF MODERN LANGUAGES, ISLAMABAD

NATIONAL UNIVERSITY OF MODERN LANGUAGES FACULTY OF SOCIAL SCIENCES

THESIS AND DEFENSE APPROVAL FORM

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

Thesis Title: Relationship of Learning Styles and Academic Achievement of Students at Secondary School Level

Submitted by: Bushra **Registration #:**1490-MPhil/Edu/S18

Master of Philosophy
Degree Name in Full

Education
Name of Discipline

Dr. Shazia Zamir _____
Name of Supervisor Signature of Research Supervisor

Dr. Farkhanda Tabassum _____
Name of Co-Supervisor Signature of Research Co-Supervisor

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

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

_____
Date

AUTHOR'S DECLARATION

I Bushra

Daughter of Muhammad Khalid Farooq

Registration # 1490 MPhil/Edu/S18

Discipline Education

Candidate of **Master of Philosophy** at National University of Modern Languages do hereby declare that the thesis **"Relationship of Learning Styles and Academic Achievement of Students at Secondary School Level"** submitted by me in partial fulfillment of M. Phil Degree, is my original work, and has not been submitted or published earlier. I also solemnly declare that it should not, in future, be submitted by me for obtaining any other degree from this or any other university or institution.

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

_____
Signature of Candidate

Bushra
Name of Candidate

_____
Date

ABSTRACT

Thesis Title: Relationship of learning styles and academic achievement of students at Secondary School Level.

The current study aimed to identify the relationship of learning styles and academic achievement of science students at Secondary School Level. The theoretical framework was based on the VAK model (visual, auditory, kinesthetic) developed by (Flaming, 2001). The academic achievement was evaluated based on the send-up exam score (grade 9th December results). The Barsch Learning Style Inventory (1996) was adapted for the assessment of science students' learning styles. The sample of the present study consisted of 317 science students of Govt. High Secondary schools in Rawalpindi among them 163 were male students and 154 were female students. The result of this study revealed that there is a significant relationship of Visual Learning Style and academic achievement of science students. The result also showed that there is a significant relationship of Auditory Learning Style and academic achievement of science students. However, there is no significant relationship of Kinesthetic Learning Style and academic achievement of science students. The results also concluded that there is a significant difference in visual, auditory, and kinesthetic learning styles based on gender. Male science students preferred Kinesthetic Learning Style, and female students preferred Visual and Auditory Learning Styles. It was further concluded that science students prefer Visual Learning Style at Secondary School Level. The academic achievement of female science students was found to be significantly better compared to male students. The researcher recommended that science teachers may incorporate these learning styles (Visual, Auditory) in their curriculum activities so the science students are able to succeed in their exams.

TABLE OF CONTENTS

Chapter **Page**

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Abbreviation	Terms
LS	Learning style
Visual, Auditory, Kinesthetic	VAK
V	Visual
A	Auditory
K	Kinesthetic
H_o	Hypothesis
CV	Compute Variable
SPSS	Statistical Package for Social Sciences
COVID-19	Corona Virus Disease
SE	Science Education
BISI	Barsch Learning Style Inventory
Sig.	Significant
BISE	Board of Intermediate and Secondary Education
df	Degree of freedom

LIST OF APPENDICES

ACKNOWLEDGEMENT

All praises to Allah Almighty, the most beneficent, the most merciful, who gave me strength and enabled me to undertake this research. Countless salutations upon the Holy Prophet Hazrat Muhammad (Sawll allho Allaihe Waalahe Wassalam), the City of knowledge for enlightening with the essence of faith in Allah and guiding mankind, the true path of life.

I also greatly thank Prof. Dr. Mustafeez Ahmad Alvi (Dean FSS), Dr. Wajeeha Aurangzeb (HOD), Dr. Saira Nudrat (Coordinator M.Phil. Program), and faculty members of NUML for their cooperation and support.

I feel grateful for taking the opportunity to express my deep sense of gratitude to my Supervisor, Dr. Shazia Zamir, Co-Supervisor, Dr. Farkhanda Tabassum for their guidance and valuable suggestions throughout the study without their guidance and support, it was impossible to complete this thesis.

I want to thank the Science students who accepted to participate in this study. I would love to express my sincere thanks to Nida Shehzad, Laraib Mehdi, Anam Naseem, Fareeha, Sara Siddique, Shazia Batool, Sobia Khalid, Samina, Fari, Yasmeen, Shabana, Nagina, Humaira, Saba, Munaza, Azra, Rashida, Sehar, my friends who have always been a real source of motivation for me. At the same time, my thanks also go to my caring siblings whose advice really worked for this thesis.

My family deserves special mention for their inseparable support and prayers. From the start until the accomplishment of this thesis, they have been my source of strength and love. Thank you for your conditional support of my studies. Thank you for giving me a chance to prove and improve myself through all walks of my life.

Bushra

DEDICATION

Every challenging work needs self-efforts as well as guidance

of elders especially those, close to our hearts

I dedicate my efforts to;

To My Grand Father (Late)

First and foremost, I dedicate this research work to my paternal grandfather Muhammad Yousaf (Late). Whose love for me knew no bounds and, who taught me the value of hard work. Thank you so much, I will never forget you.

To My Praiseworthy Grand Mother

Your prayers are what I need more than anything else in life

To my Charismatic Father, M. Khalid Farooq

Their affection, love, encouragement and prays, they did

day and night made it possible to get such success and honor.

To my Praiseworthy Mother, Zaiba Sultana

Her infinite affection, love and care is what kept me going

and made my dreams come true, made impossible, possible.

To My Brother and Sisters

Thanks my caring siblings for your prayers and support throughout my studies.

To my Supervisor and Co Supervisor

Last but not least I truly respect and thank, Dr. Shazia Zamir (My Supervisor) and Farkhanda Tabassum (My Co-Supervisor) without her this would have remained incomplete

CHAPTER 1

INTRODUCTION

1.1 Study Background

Life itself is the name of continuous learning, struggling, and making progress. The idea of learning is as deep-rooted as the development. Human needs can be categorized in two ways: physical needs and the intellectual thirst for knowledge. Learning is a continuous process. It is not only a process that exist inside the institution, but it includes all the activities that are even carried outside the premises of institution, hence, it is the modification of behavior through experience which involves formation of habits, knowledge, and attitude.

Learning styles play a vital role in enabling students to organize information effectively. Every person has a natural or habitual pattern of acquiring and processing information in learning situations. The common ways or patterns by which people learn are known as their learning styles. According to Spoon and Schell (1998) a learning style is a method used by a person to collect, organize, and convert data into meaningful information. Grasha (2000) described the learning styles as the students' academic expectations through the classroom environment and classroom interaction. The learning styles approach encourage students to have multiple interests and expectations. Some students learn from basic sources (experimental evidence, facts), while others use abstractions to explain things (theoretical methodology) (Pashler et al., 2008). The learning styles play a vital role in enabling students to organize information effectively. Learning styles states the specific ways in which individuals are involved in learning. Directly or

indirectly, the teaching/learning situation depends on the learners' learning styles (Klepac, 2012). Different thinkers and educators have their way of describing learning styles. The learning style concept helps to understand how learners differ in terms of learning from each other. Rita Dunn introduced the concept of learning styles in 1960, and since then a variety of psychologists have attempted to describe the term in many ways. According to Wang (2009) learning style is how learners engage and preserve information according to their abilities. It states the approach in which learners gather, establish, and transform information (Wang, 2009). Learning styles, awareness in the context of education, promotes more effective learning and thus, improve academic achievement. The learning style is an orientation toward approaches, addressing learning, and information functions in certain ways (Slavin, 2006). There are other forms and literary styles which are useful for students of all ages. Learning styles are based on two facts: how a student learns and how they like to learn; secondly, content, the material which he or she has been taught (Graf at al., 2010). A well-planned student must know how to find his/her own learning goals, combine learning styles, use good skills, and self-regulate to achieve the best learning results. (Wadsworth et al., 2007). Nja et al., (2019) knowledge of the different learning styles preferences of students admitted to the science education program will lead to more effective learning experiences.

Academic achievement is a mirror or reflection of teaching methodology and students learning outcomes. Students learn in schools and institutions, their records are kept, and this record is called academic achievement (Wolgast, 2009). Success is basically a reliable and successful performance in a specific subject. Academic performance or school outcome is the product of a student's achievement at specific institutions, for a

specific time duration, under a specific guideline of a leader with the right motive. Generally, the examinations are held for promotion to the next grade; the exam system is the only key to achieve the goals, which are decided on explicit time, for specific purposes, within the required time period by an institution (Crespo et al., 2010).

Academic achievement is defined as the measurement of academic results in terms of score. Academic achievement is the record of educational activities which can also be termed as the end-term goal. It is usually measured by test/examination. Academic goals can be easily achieved only when students feel safe, engaged, and respected (Farooq, 2011). Bhagat et al., (2015) learning styles focus on how a student is best able to learn or their preferred method of acquiring knowledge. This is usually influenced by their unique brains and experiences and has a direct impact on the way they get information. Every individual adopts a unique way to obtain knowledge and this way of acquiring knowledge is known as learning styles. These learning approaches of students can significantly influence their learning outcomes. Nzesei (2015) the learning styles are based on students' understanding, their IQ level, the atmosphere where they live, and most importantly, the way they are being taught. That is the reason academic achievements are the center of interest in educational research if the students are being provided with an interesting way of gaining knowledge. Eventually, different learning styles and habits can contribute to more productive learning experiences. In order to build a more positive learning environment for students and children, practical use of learning styles is a prerequisite that may benefit not only students but teachers and parents as well. Moreover, the ability of students to use various types of learning styles allows them to gain information quickly and more efficiently. Miller (2001) believes that educators and teachers have a

responsibility to understand and address the diversity of the learning preferences of students. A variety of methods are available to determine learning styles, with each approach, offering a slightly different viewpoint on the preferred style or preferences.

The method in this study determines the learning styles preferences based on the sensory modalities in which students prefer new knowledge. The three main sensory modalities are collectively referred to as the VAK (visual, auditory, kinesthetic) model by (Fleming, 2001). Fleming (2001) visual learners always remember the best of what they see, with the help of pictures, flashcards, diagrams, charts, and videos, etc. Auditory (lectures, sounds, discussion, words, music) learners are focused on listening and more of what they hear and then say. Kinesthetic learners prefer physical activities. The VAK (Visual, Auditory, Kinesthetic) model recognizes that students use information in various ways called preferred learning styles, which is important for them to collect, distribute and organize data with appropriate learning approaches. If it is done adequately, students not only can understand but also use the information and relate it to the other knowledge already acquired. According to Abbas (2012) visual learning style is a learning style where learners think in pictures and learn best in visual images. It is a learning style in which a learner utilizes graphs, charts, maps, and diagrams in the learning process. As indicated by Helena (2017) sometimes, visual learners favor sitting in the front of the classroom. They also take descriptive notes on the material being presented. Visual learners prefer using images, pictures, colors, and maps to organize information and communicate with others. Learners can easily visualize objects, plans, and outcomes in their mind's eye. Visual learners also have a good spatial sense, which gives them a good sense of direction.

Helena (2017) auditory learning is a learning style in which an individual learns through listening. An auditory learner depends on hearing and speaking as the primary style of learning. They may struggle to understand a chapter they have read, but then have a full understanding as they listen to the class lecture. They can follow verbal instructions readily and prefer to hear information rather than read it. An auditory learner is skill-orientated, memorize tasks well, and benefits from traditional styles of teaching. Helena (2017) kinesthetic learning is a learning style in which learning takes place by the student carrying out a physical activity, rather than listening to a lecture or merely watching a demonstration. The kinesthetic learner usually does well in things such as experiments, sporting activities, art, and acting.

Previous studies have reported that pupils learning achievement could be improved if proper learning style dimensions could be taken into consideration when developing any learning or instructional process (Graf et al., 2010). Kant (2015) defines that the study of science is a great interest to children and provides a natural opportunity for children to grow inability to solve a problem. This inability to solve problems exceeds one of the main contributions that science can make. Science is a logical study beyond the framework of natural causes of natural phenomena that can be explained or related to causal causes. In short, empirical study, as demonstrated by natural causes, is limited to studying natural phenomena (Loo, 2000). The science curriculum will emphasize the growth of critical thought in learners. This critical thought needs to be fundamentally relational. The extension of this principle to science education requires an emphasis on the activities, and issues of the science curriculum (Bailin, 2002). Goodrum et al., (2001) noted that there are two different types of science education: the science of nurturing (related to knowledge to

improve the quality of life and the climate) and the science of making (Technological competence is linked). Faize (2011) in Pakistan, the 2006, the Physics, Chemistry, and Biology school curriculum, planned for grades 9th and 10th, set priorities for science education with a scientific mind, to consider living and the natural universe. Understanding the nature and limits of commentary imposed by the form of science. Faize (2011) in Pakistan, the following problems were illustrated in science learning. The following points are that the science curriculum is outdated. Lack of facilities in approximately 90% of the schools. Science teachers used traditional methodologies for teaching and the students and teachers are less aware of their learning styles. As educators, and faculty, we need to start discussing the diversity of learning styles in order to provide open access to science learning among students in our classrooms and to enable a wider range of students to study science. The present research investigates to test preferred learning styles of science students of grade 10th and to find out whether both girls and boys had similar learning styles. Furthermore, the major purpose of this study is to find the relationship between learning styles and academic achievement of science students at Secondary School Level.

With this, knowledge and specific science teaching strategies can be created and implemented to improve the academic achievement of science students. To achieve these aims, the researcher tested the Null hypothesis. Barsch learning style inventory (1996) was adapted for the assessment of students' learning styles. Students' academic achievement was based on their previous send-up score of grade 9th.

1.2 Rationale of the Study

In this study, the researcher followed the VAK learning style model (visual, auditory, kinesthetic). The VAK model recognizes that students process information in

different ways, which is called the preferred learning styles. This has an important influence on the students' abilities to gather and distribute information and can be organized with suitable learning approaches. By following these learning styles (VAK) sciences students will show a better ability to understand it, use it, and relate it to the other knowledge. The reason for conducting this research is to learn about the learning styles of science students. Knowledge of the science students' learning styles is essential for science teachers. According to Munir and Ahmed (2018) unfortunately, most of the students are less aware of their learning styles. Especially in the public sector, in which fewer students can perform better, the rest can only achieve satisfactory results, and many of them meet failure. All this happens because they do not get a learning environment, according to their abilities, which may affect their academic achievements. Mismatch of teaching methodology and learning styles can create problems for both teachers and the students. If the science teachers are aware of their students' LS (Visual, Auditory, or Kinesthetic) they can opt for teaching strategies accordingly, which may result in better academic achievement.

Exploring the relationship of learning styles and academic achievement is a controversial issue that involves more investigation. Several studies have shown that students' academic achievement is significantly increased when individual styles are considered during the learning process. Alavi and Toozandehjani (2017) concluded that having a context in students learning styles will improve their performance and, at the same time, help students strengthen self-actualization.

A number of studies have been conducted on this topic which explored the relationship of learning styles with academic achievement. After going through the existing

literature, it has been identified that in the Pakistani context, very less literature is available with reference to science students' achievement. The studies that are available, even those that do not, have clear and conclusive findings that could present substantial grounds to address the problem.

Hence, the existing gaps provide substantial grounds for further explore the topic. This is the reason why the researcher conducted this study on the relationship of learning styles and academic achievement of students at Secondary School Level.

1.3 Statement of the Problem

Students create their own learning by using different ways during their educational level. These different ways become their learning styles. These learning styles are very important in students' academic achievement. Unfortunately, learners have not yet learned how to learn or discover their preferred learning styles for different learning material or content in this subject. Also, teachers have not understood the diversity of their learners in a typical classroom, and they keep on embracing the same traditional teaching styles in every context. In consequence, students become bored and inattentive in class, do poorly on tests, get discouraged about the subject, the curriculum, and themselves, and in some worse cases drop out of school. Therefore, this study was intended to identify the relationship of learning styles and academic achievement of students at secondary school level. This study is conducted because the understanding of student learning style is important to assist students in their learning process also to gain a better life ahead with a better academic achievement.

1.4 Objectives of Study

1. To explore the learning styles of science students at Secondary School Level.
2. To identify the academic achievement of science students at Secondary School Level.
3. To identify the relationship of learning styles (visual, auditory, kinesthetic) and academic achievement of science students at Secondary School Level.
4. To find the gender-based difference regarding learning styles (visual, auditory, kinesthetic) of science students at Secondary School Level.
5. To find the gender-based differences regarding academic achievement of science students at Secondary School Level.

1.5 Null Hypotheses

The null hypotheses of the study were:

H_{o1}:

There is no significant relationship of learning styles (visual, auditory, kinesthetic) and academic achievement of science students at Secondary School Level.

H_{o1a}:

There is no significant relationship of visual learning style and academic achievement of science students at Secondary School Level.

H_{o1b}:

There is no significant relationship of the auditory learning style and academic achievement of science students at Secondary School Level.

H_{o1c}:

There is no significant relationship of the kinesthetic learning style and academic achievement of science students at Secondary School Level.

H_{o2}:

There is no significant gender-based difference regarding (visual, auditory, kinesthetic) learning style of science students at Secondary School Level.

H_{o2a}:

There is no significant gender-based difference regarding visual learning style of science students at Secondary School Level.

H_{o2b}:

There is no significant gender-based difference regarding auditory learning style of science students at Secondary School Level.

H_{o2c}:

There is no significant gender-based difference regarding kinesthetic learning style of science students at Secondary School Level.

H_{o3}:

There is no significant difference in the academic achievement of science students based on gender at Secondary School Level.

1.6 Theoretical Framework

The current study was based on the VAK model (Visual, Auditory, and Kinesthetic) developed by (Flemings, 2001). The VAK model recognizes that students process information in different ways, which is called the preferred learning style. In Fleming's model, which is frequently stated as a VAK learning style, learners are recognized by

whether they have a preference for a Visual (graphs, diagrams, painting, movies, pictures, flipcharts) learner with the help of pictures, flashcards, diagrams and movies, they are focusing on what they see. Auditory (lectures, sounds, discussion, words, music) learners focus on listening and more of what they hear and then say. Kinesthetic learners prefer physical activities; these types of learners learn best through experiments, laboratory sessions, creative activities, and field trips. They like to involve themselves in touch feeling, holding, doing, and practical hands-on experiences.

Theoretical Framework of the Study

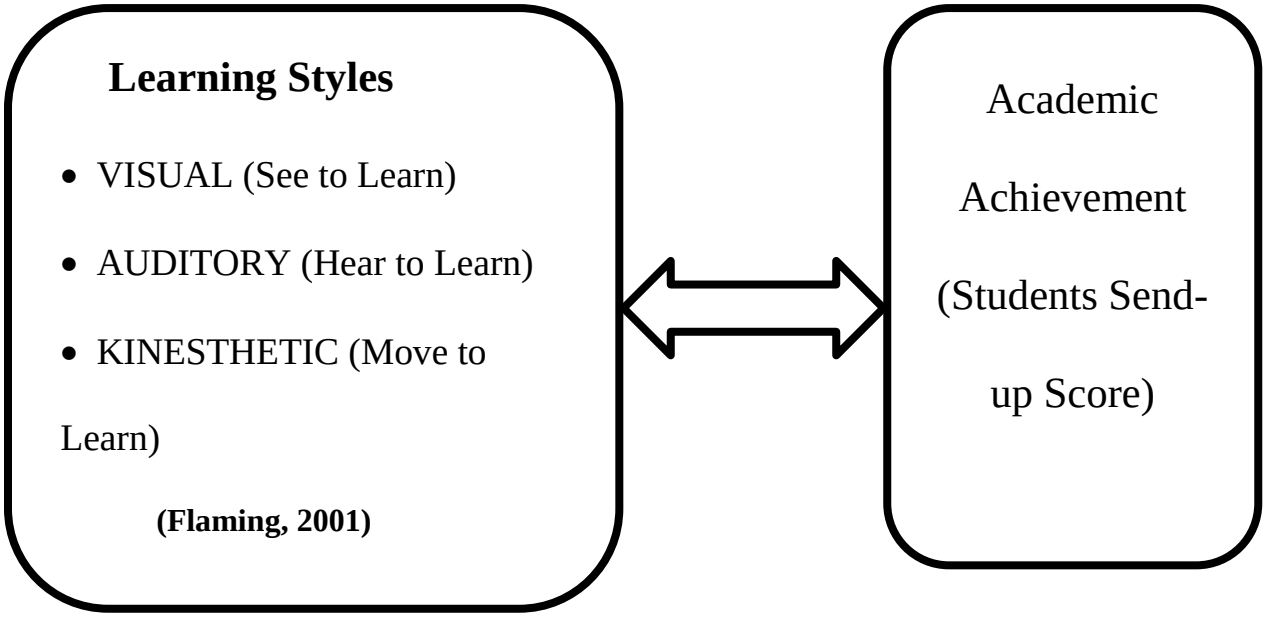


Fig.1.1 Theoretical Framework of the study

1.7 Significance of Study

Learning styles play a vital role in the academic success of students. It is a way to know about the preferred learning styles of the students (auditory, visual, kinesthetic).

Therefore, this study is significant about preferred learning styles (LS) based on the VAK model (visual, auditory, kinesthetic).

This study may be helpful to students, teachers, parents, administrations, and curriculum developers.

This study can help the teachers to understand their learners' learning styles preferences (visual, auditory, or kinesthetic) so they can design their teaching strategies accordingly, because when the teachers know the learning styles of their students, they can present the lesson in a more effective way. This study might also help teachers in planning to tackle students according to their capabilities and can improve academic achievements.

This research also helps the science students to make them aware of their learning styles (Visual, Auditory, and Kinesthetic) for the utilization of better academic achievement. This research can also be beneficial to learners who may take responsibility for their own learning and give importance to the learning process. S/he develops an understanding of his/her own form of learning style and become much more satisfied with the environment s/he interacts with. But, most significantly, educators will assist students in exploring their learning styles and developing successful and life-long learners.

This study is also beneficial to parents to understand their child's specific learning styles and help them master their schoolwork and enable them to lead a successful life.

This research is significant because it adds more knowledge to the existing literature regarding the relationship of learning style and academic achievement of science students studying in the Pakistani context. Hence, it will help the educational institutions.

1.8 Methodology

This section includes population, sample, sampling technique, research instrument, data collection, data analysis, and delimitation.

1.8.1 Research Approach. A quantitative research approach was used to classify problems by producing numerical data that could be converted into useful statistics.

1.8.2 Population. The grade 10th science students of Govt. High Secondary Schools in Rawalpindi were the population of the current study.

1.8.3 Sample. For the current study, the sample size consists of N= 317; that is, 17% of the population, that is 1836. The sample of Male n=163 (17%) and Female n=154, (17 %) were obtained after applying the stratified proportionate sampling technique. The sample was taken from 24 Govt. high secondary schools among those 12 Schools for the Boys and 12 Schools for Girls.

1.8.4 Research Instrument. Barsch Learning Style Inventory (1996) was adapted for the assessment of students' learning styles. Academic Achievement was assessed based on previous send-up score (grade, 9th December 2019, results).

1.8.5 Data Collection. Data was collected through a questionnaire. The researcher personally visited the Govt. high secondary schools in Rawalpindi to collect the data.

1.8.6 Data Analysis. The researcher used different types of tests to analyze the data. Data was analyzed through SPSS.

1.9 Delimitation

- Due to lack of resources and time limitations this research work was delimited to grade 10^{th} science students.
- Data were collected from 12 girls' and 12 boys' Govt. Secondary schools of Rawalpindi.

1.10 Operational Definitions

1.10.1 VAK model. The VAK model is based on the (Visual (V), Auditory (A), or Kinesthetic (K)), developed by (Flemings, 2001).

1.10.2 Visual learning. Visual learners always remember the best of what they see, with the help of pictures, flashcards, diagrams, charts, and videos, etc.

1.10.3 Auditory learning. An auditory learner depends on hearing, what they hear, (interviewing, music, discussion, lectures, listing stories)

1.10.4. Kinesthetic learning. Kinesthetic learners prefer physical activities, these types of learners learn best through experiments, laboratory sessions, creative activities, and field trips. They like to involve themselves in feeling, holding, doing, and practical hands-on experiences.

1.10.5 Learning styles. The learning style is how learners engage, preserve information and abilities. It states the approach in which learners gather, establish, and transform information.

1.10.6. Academic achievement. The measurement of academic success in terms of the score is known as academic achievement.

1.10.7. Science students. The students studying physics, chemistry, biology/computer science.

1.10.8. Secondary School Level. 9th and 10th grade students.

Summary of the Chapter

This chapter has contributed to the introduction, the rationale of the study, the statement of the problem, research objective, research hypotheses, significance of the study, the theoretical framework of the study, operational definition of the study, and the short methodology of the whole study.

Other than that, the study is going to measure the relationship between learning style and the academic achievement of science students. It is hoped that the results of this study will help the students in recognizing their preferred learning styles that suit them to ensure the improvement of their academic achievement. It also hopes to be a guide to assist the lecturers or instructors in improving their teaching styles that will match with the student learning styles.

CHAPTER 2

REVIEW OF THE RELATED LITERATURE

This section provides a description of the literature on this study. The description is made up of two things: learning styles and academic achievement. The discussion of this section refers to a recent study on learning styles and its relationship with the students' academic achievement. Most of the literature was obtained from the secondary sources that are online available. Articles, journals, thesis, and e-books are the sources of literature review.

2.1 Learning

We will never stop learning in our lives throughout our education system, during courses and lectures, and even during our everyday lives. We need to learn new things and learn how because modern life requires us to be adaptable all the time and be able to start new tasks. Consequently, it is important to know how to learn, and learning methods become the key to this knowledge.

When people ask what the organization does, the standard answer is to help children learn. Learning has become a key topic in the last 10 years, not only for professionals and students in the fields of psychology and education but also in political and economic contexts (Santrock, 2008). One of the reasons is that the world has become highly globalized and competitive, which has led people to equate education with employment and prosperity (Illeris, 2009). Educational systems need to develop the necessary

knowledge, attitudes, and strategies to enhance communication, cooperation, problem-solving, and innovation. Change and innovation have become the new status quo. This idea has, however, proven to be difficult to achieve as teaching techniques of the 19th Century are still being used in the classrooms of the 20th century while attempting to engage students of the 21st century. In response to these needs, a new and improved method is needed to solve educational problems such as learning (Slade & Griffith, 2013).

What does it mean to learn? The word learning is difficult to recognize, even as one of the most important subjects in modern psychology (Saljo, 2009). For more than 2000 years, philosophers, scholars, and educators have tried to explain and define learning (Gray & Macblain, 2012). For more than 2000 years, philosophers, scholars, and educators have tried to explain and define learning (Gray & Macblain, 2012). However, there is usually no accepted definition of the concept (Illeris, 2009). Learning is described from a behavioral perspective as understanding, information, and awareness of learning through practice or professional knowledge. Hence, this results in a fairly constant, measurable, and defined change in observable behavior and helps people to develop a new or revised mental structure (Gross, 2010). From a cognitive perspective, learning is an active process, including people's acquisition or reorganization of the cognitive structure that processes and stores information. It is not about what the students are doing, but about what they are learning and how they are getting it (Ertmer & Newby, 2013). Constructivism learning is called a phase in which new material is considered in the previous student's knowledge stock (that is, the knowledge people have gathered throughout their lives). Each person will gradually assimilate a new interpretation of information that is suited to the knowledge basis already in place and makes sense since people have a different store of knowledge

(Cooper, 2013). In short, constructivism involves the fusion of learning and understanding (Ertmer & Newby, 2013). Thus, learning is seen as a positive consciousness building and a life cycle that follows modern thinking patterns (Cooper, 2013).

Gokalp (2013) life is the name of learning, struggling, and making progress. The idea of learning is as deep-rooted as development. Education is a tool for change. Basically, the goal of education is to improve the six dimensions of personality: physical, social, behavioral, moral, visual, and emotional. Development is linked to performance, so the purpose of learning is success. It is the act of acquiring, modifying, or enhancing new understandings, behaviors, abilities, or values, and may include the compilation of different types of information. In other words, it acquires current professional knowledge, abilities, habits, or development through practice or experience. Different educators and psychologists have different views on learning. Battersby and Gordon (2006) described learning as a transformation that occurs in the brain mainly for problem-solving. It is an internal process that leads to changes in behavior. Human needs can be categorized in two ways, Physical needs, and intellectual thirst for knowledge. Learning is a continuous process. It is not only a process of the institution, but it is a process that exists inside and outside the institution. It is a modification of behavior through experience, which involves the exquisite of habits, knowledge, and attitude (Klepac, 2012). Piaget (1964) describes the learning can be influenced by development. They explained growth as product awareness, development, and learning as the formation of passive associations. He still pays attention to the creation of information and claims that cognitive growth has arrived before he realizes it. From his point of view, once they are read cognitively, an infant cannot learn a definition. The term cognitively ready hereby infers child development. Cognitive

development takes place first, then they can learn because, as Vygotsky (1978) He argued that studying was an aggressive approach and did not wait for preparation. Vygotsky (1978) Learning leads to the improvement of stage development and a key element in learning is social connection. In addition to social interaction, learning can also be described as an entity in this way. Parson (2001) learning gains expertise: the permanent shift in living species that is not determined by genetic predisposition; because of practice or experience, it is often a reasonably stable change of actions. The effect of experience is understanding. For e.g., a 1st-grade student sings twinkle twinkle little stars, and the 2nd-grade child automatically leaves a warm ladle. One of them is describing learning, and the other is not a learning illustration. How do instances that are learned and not learned differ? The contrast lies in the experience. The 1st-grade pupil's actions, in other words, are the product of his practice. He didn't sing the twin little stars' song organically, and the reflexive activity is a hot spoon to withdraw.

2.2 Learning Theories

Learning theory explains how people learn and helps to understand the dynamic learning process. These theories provide a conceptual framework for the interpretation of learning and suggest solutions to learning difficulties. The suggested learning theories can still be easily divided into the following categories.

2.2.1 Behavioristic Learning. The main supporters of this theory are Thorn Dike, Watson, Skinner, and Guthrie. Behaviorists believe that the most important element of learning is environmental behavior. Reeve (2007) said environmental changes can lead to behavioral changes. For them, individual distinctions are less significant because they are targeted at creating beneficial behavior or decreasing the occurrence of unwanted behavior.

Specific variations are less significant because they are aimed at creating desired behavior or at reducing the frequency of inappropriate actions. The idea of Parson (2001) is the same, that is, learning is a change in an individual's behavior in publicly observable behavior. They think that learning is the result of activities that arise in a mechanism of contiguity, i.e., learning, at the same time. Whenever two events happen together, they become connected with each other again and again. Classical conditioning that involves the interaction of stimuli and response, is the strongest principle of contiguity. Without prior instruction, the stimuli contribute to the response, there is a natural response to each stimulus as there is a reaction to each behavior. Throughout his study of the digestion system of dogs, he discovered the theory of classical conditioning. Once the food was presented, he saw the dog salivating. Whenever food is offered to the dog, Pavlov starts to ring a bell. At first, no reaction was observed but gradually the dog learned the sound of the bell through experience, and the response was conditioned. The unconditioned stimulus (food) has previously provided an unconditional response (salivation), which is now natural to the bell state. Thus, the conditioned stimulus (the sound of a ringing bell) produces a response (salivating) by offering food to the dog as a result of the coupling of the two activities. The theories of Association are based on the contiguity principle. Guthrie (1935) proposed this theory, which Zais (1976) further clarified. The combination of stimuli that preceded a movement tends to follow the movement when it occurs Because of its simplicity, Attention to the Guthrie principle. In any case, he said, we understand what we do and copy what we experienced in the same situation. He further said learning is accomplished in a single, continuous stimulus and response combination. Then what was the role of experience in the criticism of it? They clarify there are different reactions under

stimuli, and that the last reaction is the learning of the person out of practice elimination of the stimulus because the person repeats the last answer he has learned on the first path when the situation repeats under a certain stimulus. Because whenever under the same stimulus, this person repeats the last answer he learned in the first experiment. He said, the practice did not improve learning but improved the total achievements. The first path is learning and the practice enhances a person's actions and results.

Operational learning was the alternative theory of behavioral learning. Skinner introduced it. The learner behaves in the environment while working, and, as a result, the repetitive behavior of the learner increases or decreases. Skinner (1938) described the basic law of operant conditioning, as If a reinforcing stimulus is presented after the occurrence of an operator, the strength is improved. The operant and the re-in-force emphasize two factors in this theory. Cheng at al., (2007) described his methodology as the theory of the black box in which environmental data goes through the entity who learns and operate. But nothing can be done about the black box of a human. This method is a contrast to cognitive theory, as the proponent is keen on what happens to people as they obtain and interact aggressively with input from the world.

2.2.2 Cognitive Theory. The philosophy of learning started to shift away from the use of behavioural models in the late 1950s to an approach that was based on cognitive science theories and models. Psychologists and educators have tended to de-emphasize their anxiety about transparent, observable behaviour, highlighting more difficult cognitive functions, such as reasoning, problem-solving, language use, idea creation, and perception of knowledge.

Cognitive theories stress the preservation of acquaintance, inner intellectual concepts as well as the processes involved in defining different tasks (the inquiry of how the mind absorbs, organizes, stores, and retrieves information) (Ertmer, 2013). Cognitive scientists believe that learning is less concerned about the performance of the participants and the knowledge and understanding of the learners. In the learning process, students are supposed to be active participants (Ertmer, 2013). For instance, students in the classroom learn their academic skills not only by Learn & write, while still by seeing and know what their tutors and peers do. The core content of the social cognitive philosophy is learning from interpretation and visualization. This perspective was initially named social learning theory because it argued that watching and engaging with others requires multiple people's learning.

In the next segment there will be explored 3 crucial fields of social cognitive theory.

2.2.2.1 Modeling. Bandura believes that almost all human learning will not be affected by its consequences, but will be taught explicitly through a more effective paradigm (Slavin, 2009). As a model illustrates not only how to accomplish a task, but also how to inquire about a project, intellectual skills are also more readily trained (Ormrod, 2006). Bandura pointed out that a person needs 4 parameters to accurately simulate behavior (marked as observer learning) (Ormrod, 2006). The following criteria are concentration, retention, replication of motor and motivation. In order to accurately mimic a model, the pupil must first pay attention to the model and to essential aspects of the behavior of the model. Instead, the pupil must recognize the action learned (retention) to repeat the activity, after paying attention (motor imitation). Eventually, learners have to want to write whatever they have achieved (or be inspired) (Ormrod, 2006).

2.2.2.2 Vicarious reinforcement. social cognitive theory has another important alternative to strengthen beliefs. According to Bandura (Macblain, 2014) by reinforcement, the human behavior can be molded and precast. He supported his theory with vicarious reinforcement, which is an important aspect of indirect reinforcement. Correspondingly, as a student sees other students achieve fame from girls by playing a guitar, an example of vicarious activity is when he begins to learn to play a guitar for admiration (Ormrod, 2006).

2.2.2.3 Self-regulated learning. In order to describe the attributes of intellectual students, theories and models of self-regulation (SRT) appeared in 1980. According to SRL, students have an extensive diversion to enhance their own learning and governing capabilities to regulate their behavior, cognition, and motivation to attain academic progression in the future. Some of the main self-regulatory mechanisms influencing learning outcomes can include setting goals and controlling resources, changing learning techniques, self-monitoring and reflection, controlling input, assisting in finding and oriented learning (Rowe & Rafferty, 2013) the self-regulatory processes are structured within each of these stages and covered the areas of perception, inspiration, and behavioral context. In the planning phase, self-regulatory challenges are associated with tasks such as establishing goals and identification of current expertise. Whilst the intellectual field differentiates the skills and methodologies that are valuable for the mission to be discussed. Similarly, the intensity of the role is established by sensorimotor ability and the expertise required to solve the assigned work are listed. The conduct of the participant more toward the mission, including such arranging time and effort, is affected by psychological values. The self-regulating method goes on to the self-monitoring level after the planning stage. Participants become aware of their own state of mind and motivation and use of time and

energy. The process that requires expertise in this stage to be self-observed as well as a greater understanding of goals which will then guide action and measure performance. The concluding procedure of reflection involves decisions taken by students on the overall evaluation of the mission (Rowe and Rafferty 2013). Rowe and Rafferty (2013) students who self-regulate their academic practices do higher than pupil who do not have been observed by educational researchers. These students are expected to promote the growth of their interpersonal skills and routines, which can also enable them in other ways to learn effectively. To boost their academic performance, they are also able to apply effective learning techniques.

2.2.3 Constructivist Theory. In a method that relies on current information and experience, the cognitive operations of students and the learning experiences that students partake in, the sense and interpretation of information is acquired (Dennick, 2012). Constructivism is not a particular thought philosophy, but incorporates a variety of various philosophies, many of which consider students to be constructive partners in understanding construction (Cheng et al., 2012). These theories of learning have influenced current thought in education and have been adopted in the last two decades by virtually any curriculum improvement effort (Slavin, 2011). They would be inspired to change their structures only until students recognize that their previous experience is inadequate or unacceptable to comprehend anything. When learners are presented with facts or puzzles that cannot be accounted for by their current systems, they often become confused. A new construct must also be developing for learning to occur. This will include breaking down and remaking neuronal associations. It requires time, consumes resources and needs commitment (Hartle et al., 2012). To redevelop a framework to produce understanding,

students should be encouraged to relate their own unique perspectives to the information gained (Ismail, 2011). Such strategies are also used as learning dependent on pupils. The tutor becomes the "guide on the other" instead of the sage on the stage. In short, tutors should give learners ladders that lead to greater learning, but the learners themselves must scale the ladders (Slavin, 2011). Constructivism claims that learning can still proceed if students individually participate in the topic and improve themselves. Because of this desire for coordination, many constructionist teaching methods use student-led exercises. However, to learn about constructivism, a lesson needs to be taken from the previous studies that demand much more than just that they do as they wish (Hartle et al., 2012).

Primary figures in this area are Piaget, Vygotsky all of whom will be addressed in the next section.

2.2.3.1 Piaget. piaget has created the concept of cognitive learning (1970). This concept is originated on the idea that the relation between people's perceptions and emotions contributes to comprehension and purpose. This theory is typical as one of the first theories was the creation and growth of child philosophy (Macblain, 2014). He claimed the child was deeply and fully interested in the process of learning. He also assumed that a child's cognitive development approaches four phases and sub-phases (Macblain, 2014). These four dimensions were classified as perceptual machines (from infancy to adulthood), pre-operational stages (2 to 7 years), functional stages (7 to 12 years) and structured work (12 years and older, but not attained by all). All pupils follow the same direction regardless of culture or race (Macblain, 2014). Piaget nevertheless maintains a significant influence in education, amid these critiques. Teachers must ask open questions so that pupils' thought can be encouraged and improved. They observe learners and focus

on the process rather than the performance of learning. This theory has fueled interest in child growth and contributed to alternative hypotheses being developed by others (Macblain, 2014).

2.2.3.2 Vygotsky. modern constructivist philosophy builds extensively from the ideas of Vygotsky (Slavin, 2009). Vygotsky (1978) It was reported that kids may not grow in solitude, but in a set of connections between social interactions, such as interactions between themselves and other persons, such as family, peers, classmates, teachers, and important objects, such as books. He claimed that children were born with simple cognitive elements, including visual perception, memory, focus, and the capacity to rapidly interpret knowledge. This helps to develop the child talents thought towards higher order as reasoning, organization, and retention. Therefore, the infant has an inherent capacity to learn by drill (Macblain 2014).

2.2.3.3 Bruner. both Vygotsky (1978) and Piaget's (1970) theories about cognitive growth in children were inspired by Bruner (1966)". Bruner's early studies during the 1940s focused on the effects of needs, inspiration and aspirations and their perceptional factors. In children's schooling, he stressed initiative and problem solving. In the growth of thought, he underlined the role of social contact, language, and instruction. He developed the "scaffolding idea", which is the kind of help that children need to achieve their "ZPD" (Gray & Macblain 2012). Bruner (1966) saw learning not as something that happens to people, but rather as a mechanism in which the individual is actively involved. This notion is fundamental to the learning philosophy of Bruner and varies greatly from that of early behaviourists who see learning more in terms of prompts and replies. Bruner (1966) was mainly concerned with what happens in the mind of an individual between the time a

stimulus is released and the time the person reacts. The idea that people represent the world in which they live is at the core of Bruner's philosophy, and as such, their learning takes place through different modes, "namely the inactive mode (concerned with actions), the iconic mode (concerned with pictures and images) and the symbolic mode (concerned with words, symbols and language) (Gray & Macblain 2012). Bruner (1966) also took special care to stress culture 's significance. His arguments informed thought and the way in which the view of ourselves and the world we live in is created. Bruner (1966) considered the way in which children are supported in school by their learning to be central to the growth of their thinking, learning and potential. Gray and Macblain (2012) indicated that by performing more difficult and challenging activities if they are sufficiently assisted, children may be very interested in pushing their own learning forward (Gray & Macblain, 2012). The level of curiosity of children in a subject was also seen by Bruner (in Gray & Macblain, 2012) as one of the best triggers for their learning. He put great emphasis on learning through experimentation and on solving problems through involvement. He proposed that to create new knowledge and skills and further improve their reasoning, children would use existing knowledge and life experiences. Discovery learning is regarded as a way of improving the internalization of context and the conceptualization of new facts into current knowledge for those who actively support it. There are issues with learning from discovery, though. "Misconceptions may have been acquired and adults handling the learning may be ignorant of these. Some parents also see learning from discovery as underused time (Gray & Macblain, 2012).

A description of the main aspects of the various theories of learning discussed in the section.

Table 2.1

Description of Learning Theories

	Behaviorism	**Cognitvism**	**Constructivism**
What is learning	Observable behavioral patterns and how external factors affect these patterns describe learning.	Learning is what students know, and how students come to understand. Students are active partners in the process of learning.	Learning takes place as learners are closely concerned with the subject and develop their own knowledge bases. "Students based learning".
Emphasis	How do stimuli elicit responses and how, if the responses are rewarded, they become learned?	Information acquisition, the learning processes of the pupil and how the mind collects, organizes, stores, and retrieves data	Lessons are based on the students previous experience. Students then create new definitions based on experience.
Main Theory	Pavlov; Thorndike; Skinner	Bandura	Vygotsky; Piaget.

The entire puzzle is not revealed by these learning hypotheses. It may be argued that the learning process is one of the core elements in the broad field of education.

Teachers have constantly searched at ways to strengthen their implementation such that on the learning front, the increasing number of different students in their classrooms learn and succeed. While it is well recognized that individual students ' general cognitive ability can play a significant role in overall learning outcomes, this is understood to be only part of the answer. An appreciation of the particular learning style of the pupil (Azevedo & Akdere 2010) is one of many additional pieces of the puzzle that is required to enhance the image of learning and academic performance. In the next part, these learning styles form the foundation of the debate in which the definition of learning styles will be discussed and the various types of models of learning styles will be analyzed.

2.3 Learning Styles

As teachers, educators, and faculty, we must begin to discuss the variety of learning styles among students in our classrooms in order to provide open access to science learning and enable a broader range of students to pursue studies in science. So, what is a learning style?

The learning style (LS) may vary based on experience. Many people think that everyone needs a different LS and method. Every person has a combination of LS. Some find that they have to learn by visual some may learn by auditory, to while others may learn through kinesthetic. Learning methods show the idea that people differ about the type of teaching or study that is most effective for them (Pashler & Bjork, 2008). In general psychology, the focus on learning methods can be traced back to the 1920s, when the theory of psychological species was proposed (Sternberg & Grigorenko, 1997). In education, the concept of learning has been recognized since the mid-1970s (Griffith, 2012). Since then, many classifications have been proposed based on conceptual and empirical investigations

to describe how people think and learn. LS has been regarded as assistance for learners consisting of cognitive, social, and physiologic behavior to identify, interrelate, and react to the learning environment. LS states the specific ways in which individuals are involved in learning (Sarasin, 1999). Sheve et al., (2010) mentioned in their book, that LS is how learners engage and preserve information and abilities. It explains how learners collect, build, and transform information. The LS is the orientation toward approaches and addressing learning and information functions in certain ways. Pritchard (2010) mentioned in their book LS of students, gives the teacher the framework on what method and technique to use according to the nature of the ability of his/her learner. Other learners learn fast, others learn slowly. The teacher brings different ideas and resources, which they can satisfy students' needs no matter what his / her LS. Sims and Sims (1995) mentioned that if the teacher encourages a certain approach to learning, some students can work and learn less than others in the classroom. It is thus necessary to understand the LS for students. Awareness of various LS preferences would inevitably contribute to more productive learning experiences. Similarly, Anandkumar et al., (2011) emphasize that LS understanding would allow teachers to use productive teaching techniques and methods to encourage student academic achievement. It will also give constructive reviews on their abilities and shortcomings in the teaching and learning situation of both teachers and students. Similarly, LS awareness may have consequences for instructional design, empowering teachers to incorporate in the classroom a learner-centered curriculum model. Dalmolin et al., (2018) suggest that the concept of students LS would eventually enhance their educational experience. Barman and Yusoff (2014) awareness of LS may improve the

academic achievement of the students. LS awareness should have an impact on pedagogy how teachers choose to teach and should improve the academic achievement.

Determining pupils' learning designs provides information regarding their specific preferences. Understanding learning designs will build it easier to form, modify, and develop an additional economical syllabus and academic programs. It can even encourage students' participation in these programs and encourage them to achieve skilled information. Therefore, the determinant LS is kind of value to realize simpler learning. Previous studies have shown that students can enhance their learning output if proper measurements of LS can be considered when designing the learning process (Graf at al. 2010). In the field of education, the use of learning comprehension facilitates more successful learning and increases student success. The awareness of LS in the educational background and promote effective learning, thereby improving academic success. As Keefe (1997) asserts, the three greatest confusions would be how can we improve the success of our students if we do not? Find out how to learn? How can we pretend to take it seriously? In the learning community as we have no answers to the questions: What is the pattern of learning? How can we get ourselves and improve the performance of our students? The use of student awareness in education promotes effective learning. The notion that students' LS should be paid more consideration by mentors, course planners, and academic psychologists. Diagnosing them, inspiring students to work on them and to prepare for teaching and learning experiences around them is an effective intuitive appeal. When this is done, by understanding their strengths and shortcomings, learners can become more inspired to learn. Mentors, on the other hand, may adapt to students' strengths and vulnerabilities, so informal activities are likely to improve retention and achievement rates,

and learning skills provide a basis for lifelong learning (Keefe, 1997). The way that they like to learn is your preferred style. This has nothing to do with how knowledgeable you are or with what skills you have learned. When new information is taken in and remembered, it has to do with how the brain works most efficiently. There is no such thing as a form of learning that is right or wrong. Success occurs with several different LS and no one style is right. All of us have our own unique ways of acquiring new knowledge. The important thing is that you become aware of your unique style of learning (Santos, 2018). sternberg (1997) suggests that a better understanding of LS helps teachers make their teachings more versatile and use a wide variety of teaching methodologies. “Although” it was found that LS influence their academic achievement significantly. Learning theories are the basis for LS, to solve a problem in a learning task, each person uses relatively stable learning to develop and process information. According to Feldman (2004), LS represents our preferred approach to knowledge acquisition, use, and thought. At the point when a situation has been looked by an individual, it is his LS which drives him to obtain, hold, and use the information to deal with that circumstances, each one has various approaches to deal with these circumstances. Felder (2005) said that students are distinguished by different LS that concentrate on various types of information and tend to operate in different ways on perceived information. The LS of a student in the simplest term is a particular way for a student to know the best. Many other researches in the related literature reports the beneficial results of researching teaching and LS. Many educational thinkers and scholars consider behavioural patterns as a significant influence. They accept that it has the ability to incorporate them into teaching to promote successful student learning (Graf & Liu, 2009). In addition, LS awareness will empower students for lifelong learning

as well (Reid, 2005). Another important factor found in the literature is that it is important to recognize and respond to their LS requires if students read, recall complex skills, become competitive academically, encourage and control learning appropriately. This is particularly relevant where the teaching methods of the teachers do not complement the students' LS (Hulme & Allcock, 2010). The several positive results that can be achieved from understanding learning patterns in the classroom have also been illustrated by other scholars. Several scholars Bosman (2015) note that teachers become more self-motivated to focus on their own teaching ideology until they are conscious of the idea of LS. These same authors also add that knowledge of teachers is also sensitized to the extent that self-directed and autonomous learning is enhanced. Regardless of the instructional method of their instructors, students continue to take responsibility for their own learning. Many scholars Wang (2006) also discuss several other beneficial outcomes that can be accomplished in the classroom by understanding learning types. All these scholars conclude that students behavioural habits are a critical influence and one of the most significant influences affecting academic performance in certain situations. Wang (2006) Knowledge of learning styles tends to promote teaching and implementation and consequently to enhance the success of students. Orhun (2007) reinforces this opinion by adding that their academic accomplishments substantially improve as learners are trained by means of methods that complement their LS, and when they become aware of their own LS. The opinions mentioned above are supported by other scholars Cutolo & Rochford, (2007) they maintain that their academic success will increase until students know their particular LS and adjust those LS based on which teaching approaches they encounter during their education. In other aspects, understanding students' learning patterns is also

helpful. It enables educators understand their learners and enables them to understand how their learners take in and deal with information. To interpret the material, if learners are conscious of their preferred preferences, they can also help express what they need. Teachers can be more versatile with the way they deliver knowledge and plan lessons and learning objects through an understanding of learning preferences (Mestre, 2010). To increase students' academic achievement is to recognize their favorite or dominant modes of learning. Teachers will change their instruction to incorporate these individual learning patterns after this has been completed. This should increase classroom learning and boost the academic performance of pupils (Mastre, 2010).

Eilisha (2007) pointed learning styles are often culturally-based and students from different culture would therefore have different ways or patterns of learning, thinking and behaviour. Similar views were also shared by Teng (2007) on an understanding of culture is necessary as it would affect learning styles. Furthermore, Ward (2006) also identified variety of factors that influence on learning styles such as prior learning experiences, assessment methods, values and religion amongst others. Seo and Koro (2005) even pointed that without efforts to understand students' cultural background, the main goal of higher education that is quality education cannot be fully realized. Loh and Teo (2017) studies which seem to indicate that Asian students tend to be dependent learners relying on their teachers to provide content materials in contrast to countries they choose to pursue their education that encourage more independent learning

The style of learning is all about how people learn, regardless of what they learn. The process of learning is unique to each individual; even within the same educational setting, learning does not occur in all students at the same level and consistency, often in

the same educational setting (Saban, 2005). Research has found that pupils have distinct method for the process of learning and that a single method or technique is insufficient to provide all pupils with ideal learning conditions. (Brown et al. 2009). This may be connected to the various histories, strengths, weaknesses, interests, goals, motivation levels, and study approaches of students, which can be due to students' various experiences, skills, susceptibilities, desires, goals, motivation levels, and study approaches (Felder & Brent, 2005). Educators may become more aware of these diverse approaches in order to improve academic education. LS may indeed be helpful in helping students and teachers understand how to enhance the way they acquire knowledge (Mastre, 2010).

LS research focuses primarily on how learners learn and find answers to questions Understanding the LS of students provides data about their particular preferences. Identifying LS can make it much easier for more appropriate curriculum and educational programs to be created, modified, and developed. It can also encourage the participation of students in these programs and inspire them to acquire professional knowledge. Therefore, in order to achieve more efficient learning, determining the LS is quite valuable (Brown et al., 2009).

2.4 Importance of Knowing Learning Styles

Learning styles (LS) are very important in enhancing the quality of life to obtain more valuable experiences they need to learn. LS is very important for a student to develop his or her academic achievement when they are in school. Lohri (2003) an individual's LS will demonstrate how to concentrate on the different types of data they obtain. Moreover, LS also assist students in recognizing and interpreting knowledge. Lohri (2003) further added that recognizing the LS of the students would enable teachers to develop effective

strategies for teaching and learning. A common issue in the education system is that students fail to succeed in school because they are poor in the management of different learning conditions in schools. Fatt (2000) states that one of the major educational challenges is the failure of students to tackle different learning situations. The use of different LS in the classroom would, therefore, encourage teachers to promote teaching and learning which involves solving problems in the classroom (Fatt, 2000). In classroom teachers are preparing students for real-life situations by promoting problem-solving skills. Through making students aware of their particular LS teachers should also help them to be aware of the advantages of LS for different subjects and hope that they can adapt their LS in different learning circumstances. (Fatt, 2000).

According to Fatt (2000) The pupils would not benefit from inappropriate instructional approaches with the student's LS, if teachers have a learning atmosphere that is adapted to the individual LS of their students, students can learn better and more easily in their own LS instead of adapting to the teaching style (Fatt, 2000). According to Manochehri and Young (2006). LS is a strong indicator of the desired learning activity of a particular person. When teachers understand the LS or behavior of a students, problems that may arise with classroom learning can be minimized. However, the combination of LS of students with different teaching styles will increase their achievement and satisfaction (Manochehri & Young, 2006). Naimie et al., (2010) the suitability of teaching style and LS has a positive impact on the students' achievement. According to Kahtz & Kling (1999), the development of teaching approaches and the provision of suitable teaching and learning resources for different LS should be a priority for all teachers. This is because reacting to guidance that fits their LS is better for students. Kahtz and Kling (1999) also claimed that

the incorporation of various LS into the classroom environment will greatly benefit all classroom students. Additionally, integrating the teaching methods of teachers with the LS of the students would allow students to gain a deeper understanding of a specific subject. For several factors, the Study of LS is important; there are three critical ones, however. First of all, the learning patterns of people can vary because, inherently, everybody is different from each other. Secondly, it gives the ability to teach in an efficient manner by using a wide variety of approaches. A monotonous learning experience can be created by sticking to only one paradigm unthinkingly, but not every pupil can enjoy the class lesson. In other words, it would be all words and not embedded in truth to understand and instruct. Third, if the truly appreciate the classes to which they are assigned, it will achieve many things in schooling and communication. However, being aware of the learning styles, personality characteristics and motivational disparities of our students will help us to handle our courses properly and on terms (Coffield et al., 2004).

No learning style is either better or worse than another. In fact, each learning style has its own strengths and limitations. But if the learner knows their limitations, they can extend their abilities and reach the highest potential (Muluk et al.,2020).

2.5 Models of learning Styles

Coffield at., al (2004) discussed in their book about various theories of learning styles that have been helpful in research and whose inventories of their reliability and internal consistency has been tested. Raiyn (2016) Originally, the dimension of LS in Science are suggested as a paradigm for examining teaching and learning; moreover, its utility applies beyond the scientific disciplines. The main theories of LS include:

2.5.1 The Dunn and Dunn model. Dunn and Dunn (1978) developed an extensive model. According to the model by Dunn and Dunn, LS is divided into five main strands called stimuli (Sternberg, 1997). Dunn noted that students varied in their interpretation of the ideal place to study with regard to their environment. From an environmental point of view, the Dunn (1978) noticed that the concept of an appropriate place to learn was different for students. Some wanted a warm place with brightly lit desks, a lot of people, and a lot of verbal communication, while others chosen chiller, less relaxed lighting with a more casual and quieter atmosphere. Although many teachers feel they have little influence over these factors, Dunn (1978) discusses how the simple square box of a classroom can be separated into distinct regions of varying environmental climates. The emotional aspect focuses on the stage of self-directed learners. At a certain point in the continuum are self-starters who can carry out a longer-term project and who track and schedule themselves until the job is complete. In comparison, some students require substantial help and need their assignments with regular due dates in tiny chunks. These students are going to be disastrous for semester-long projects without regular reviews. Considerate the apparent need for encouragement for your students enables you to build learning opportunities that help students excel and learn more. (Coffield, at al 2004). Students also vary in how they communicate with peers. Many students do not like group projects, rather than learning by themselves; others rely on group collaboration and encouragement. Others still favor the more traditional approach to adult learning. Another essential aspect defined by Dunn's concerns the physiological preferences of individual differences. The most significant factor here is undoubtedly the modality of learning; some of us are visual; others choose the auditory channel. Another element here is mobility or

the ability to move around periodically. In this dimension time is another important element. Some of us are citizens in the morning, and others are not fully working until some other point in the day. When they set up learning centers to facilitate the mobility of students, the teacher integrates these aspects (Coffield, at al 2004). A 5th and concluding component of LS is psychological". This aspect denotes to the broad approaches used by pupils to resolve learning difficulties. Others target internationally to aim at the larger picture, while others tend to approach different components of an issue individually. (Coffield, at al 2004**).**

2.5.2 Kolb's learning Model. David Kolb designed one of the most persuaded models of LS, which is referred as 'Kolb's LS Inventory Model'. Kolb reveals as the LS which is oriented towards people's learning ability based on four ways of learning process. According to him, the mode of learning for individuals is not mere a predetermined attribute but a distinctive inclination which varies from person to person depending upon situations (Azevedo & Akdere, 2010). Kolb also demonstrates the learning mode as complete set of processes which is not primarily oriented towards the potential out comes (Hawk & Shah, 2007). For testing his LS Inventory, theory, he designed the instrument to test experiential learning mode, in early 1970's. It encouraged him to test the experiential teaching process, since he was not happy with the conventional way of teaching. While observing the process for testing this method of teaching, he found that some students showed interest in activities like exercises and sports but did not show preference towards their lectures in the class. Concluding his findings from the observed method of teaching, he planned to design a learning model that could understand the needs of the individual for learning by evaluating specific disparities (Coffield et al. 2004). Later, in the year 1984,

Kolb designed the LS inventory to be employed in assessing the learning differences with experiential theory of learning. For the effective assessment of LS & differences, this style of learning designed by Kolb, has become a crucial model & instrument as It notes that a beneficial agenda for the enterprise and administration of wisdom experiences would be given. This style is mostly focused on stating the way, ideas & daily situations are dealt by any individual for learning purpose. This LS by him, is based on a bipolar outlook" of two learning continuums namely "perception" and "programming (Jaleel & Thomas, 2019).

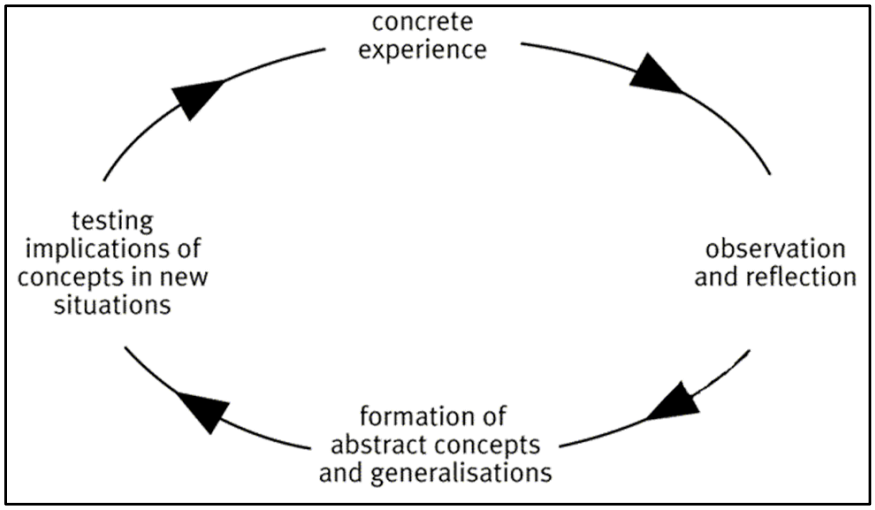


Figure 2.1 Kolb Model Source Bosman (2015)

The various LS observed in the above fig. are demonstrated by Barmeyer (2004) who describes the following;

- A receptive & experience-based learning approach is represented by a high score on CE. These individuals mostly depend upon feeling-oriented judgments". The high-scored individuals on CE tend to be individual-oriented. They effectively acquire by getting themselves involved in the discussions

- A tentative & reflective approach of learning is indicated by a high score on RO. High RO individuals mostly rely on vigilant observations & focus on learning in a streamline way such as by lectures
- An analytical & conceptual approach of learning" is manifested by a high score on AC. Logical thinking & rational evaluation is strong attributes of these individuals. They are more attracted to objects and icons and less inclined to humans. They learn from impersonal learning circumstances with control. An active orientation is reflected by a high score on AE which is dependent on experimentation. They learn effectively from designing projects & do not prefer usually the passive learning modes.

Four types of LS; convergers, divergers, assimilators and accommodators, are yielded by combination of all these LS (Bhatti & Bart 2013). When the learning activities accept all the four modes, it leads to effective & absolute learning process. However, the learning may start at any other model in the described cycle, based upon one's preference to learn (Jaleel & Thomas, 2019). As described by Kolb in the year 1984, the four modes of successful learning are seen as;

2.5.2.1 Convergers. In Such individuals are good at problem solving & aim to be good decision makers. They are inclined to make concrete abstract. They have the abilities to practically implement ideas & theories and take advantage out of them. They are quite perfect in identifying the problems & make deductive reasoning. They are more inclined to employ technical skills in impersonal issues (Jaleel & Thomas, 2019).

2.5.2.2 Divergers. These individuals are good imaginative & creative & always bring new ideas. They keenly observe feeling, people & values & examine the things from

different perspectives. They generate new ideas by brainstorming. Such individuals have the ability to see tangible situations with new perceptions. They mostly observe the things with a critical view. They have a huge treasure of information & always enjoy piling up the information. Creativity, knowing others, observation, problem solving & new ideas' production by brainstorming is their great strengths (Jaleel & Thomas, 2019).

***2.5.2.3 Assimilators*.** They mostly prefer the real examples. They act based on feelings rather than on mental interpretation & take action swiftly. They gather information by holding dialogues with people. The students who adopt this style of learning include leadership & guts to take risks (Jaleel & Thomas, 2019). According to Bosman (2015), the students who are capable to use each of the above described LS are definitely the effective learners. However, every student may adopt any style with preference instead of having ability to develop other styles in combination. The model devised by Kolb, has many potential benefits. JilardiDamavandi (2011) stated the questionnaire; designed as LS instrument, to be administered in a simple way with high degree of reliability. It has been regarded to be the most influential in terms of research, assessment & evaluation. On other hands, this model of LS has been criticized by many philosophers for its complexity.

2.5.3 The Myers-Briggs Indictor (MBTI). This model was developed in the light of Jung's speculations by Katherine Cook Briggs, and her little girl Isabel Briggs Myers who studied human personality theory over a year (Bachari, 2011). The MBTI encourages individuals to analyze and recognize their own actions. This model describes preferences for personality rather than assessing skills and gives all learners preference equal weightage. The MBTI model has been based on the four learning dimensions (Kumar & Ahuja, 2017).

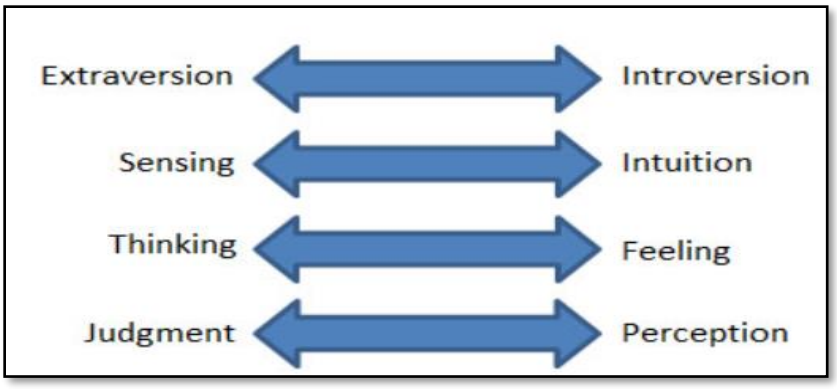


Figure 2.2: Myers-Briggs Indictor Source Jaleel & Thomas, (2019)

2.5.3.1 Introvert (I) versus extrovert (E). The introvert was always enthusiastic and focused on thoughts, concepts, and abstractions. Extroverts are geared towards motion and tend to communicate with others. extraverts like being with others and receiving strength from the environment and the peoples. Introverts are gaining energy from alone and need quiet reflective times throughout the day (Kumar & Ahuja, 2017).

2.5.3.2 Sensing (S) versus intuition (N). Sensors gather information and focus on what they see, sound, and hear in their immediate environment. Take a closer look at the broader sense and learn of patterns, meanings, and relations in an intuitive way (Kumar & Ahuja, 2017).

2.5.3.3 Thinking (V) versus feelings (F). Thinkers look for the logical solution, while Feelers decide on their desires, beliefs, and needs of others (Kumar & Ahuja, 2017).

2.5.3.4 Judging (J) versus perceiving (P). There are definitive, structured, and self-controlled styles of learners to judge. The emphasis of these types of learners was on finishing the assignment. Judgers like order and things to be managed, whereas perceivers like open and fluid things and are hesitant to commit themselves (Kumar & Ahuja, 2017).

The MBTI literacy class can be condensed to consist of four letters in 16 kinds of LS. For example, one student could be ISFJ (introverted, sensed, feelings, judged) and others could be ISTJ (introverted, sensed, Thinking, judged). (Kumar & Ahuja, 2017).

2.5.4 Felder-Silver LS Model (FSLSM). This model is designed to help both teachers and learners. Students are then able to consider their different behavioural patterns, which will then motivate them to learn more. It can also help teachers provide content that corresponds to the different LS present in their students (Graf et al. 2009). The Felder-Silverman model draws on the idea that students have interests in terms of how they obtain information and process it. Felder describes the four dimensions which reflect a preference for learning.

2.5.4.1 Sensing and intuitive learners. The model of LS, in Felder-Silverman, describes the sensing learners as those who prefer to deal with facts. They focus on tried and true methods of formulae when solving problems. They are looking at real-world scenarios. On the other hand, intuitive learners are keen on creativity and novelty. They are more drawn to hypothetical scenarios and abstract ideas. They are looking for new ways of solving old problems. The sensory learners enjoy learning with certain, or factual materials. They tend to demonstrate and study evidence rather than intuitive pupils and prefer to relate to learning the material to their current application in real-time. For example, intuitive learners concentrate on the complex concept, theories, and their implications. They are more creative and innovative, and enjoy the possibility of seeking possible outcomes, and correlate of new thinking. Therefore, in open-ended tests and questions they appear to achieve better (Graf et al. 2009).

2.5.4.2 Active and reflective learners. The Felder and Silverman's learning type model is also important to the prevailing pedagogy of science classrooms, explaining the difference between responsive learners and analytical learners. The active pupils are more dynamic and learn by doing their learning materials. In addition, they are more inspired by interaction with others and prefer to learn by working in groups. Reflective Learners learn about things through thought and reflecting. They tend to work alone because they do not get excited about learning by engaging with others. Active pupils enjoy activities in the classroom, as they help, the process information. Alternatively, reflective learners might get overwhelmed by the activities or group projects. They absorb knowledge better as they work independently and can take longer to think about what they have learned or read (Graf et al. 2009).

2.5.4.3 Visual and verbal learner. Visual the learner always remembers the best what they saw with the help of pictures, flash, cards, diagrams, charts, and films. Verbal students collect more from vocabulary and describe representations and diagrams, listen to their peers, or write outlines (Graf et al. 2009).

2.5.4.4 Sequential and global learner. The students are described through their understanding of the final measurement. Sequential students learn in simple and clear little radical ways to explore arrangements. Global learners, on the other hand, are focused on holistic thought and are bouncing to an expansive stage. They are attracted to unusual learning material and discover new ways of solving complex problems in the process (Graf et al. 2009).

These measurements are helpful in understanding the variety of LS and how instructional methods in science classrooms provide or do not provide these diverse groups

of students with daily access to learning. Science coursework, irrespective of the instructor's pedagogical style, is usually rich in the amount of knowledge provided. Felder and Silverman suggest in their model that students will vary greatly in the types of knowledge that they choose to obtain while learning (Raiyn, 2016).

2.5.5 Honey and Mumford learning style model. The term LS was defined by Honey and Mumford as 'the description of the behaviors, and attitudes that define a preferred way of learning. Honey and Mumford (1986) state that, there are four different LS or preferences that are used by individuals. They recommend that most learners tend to prefer just one or two of these LS, and that particular learning practice should meet the needs of specific LS. According to him, LS is a description of the mind and behaviour states that reflect the favorite learning strategies of the learners. Honey and Mumford (1986) developed a questionnaire that helps identify LS for individuals.

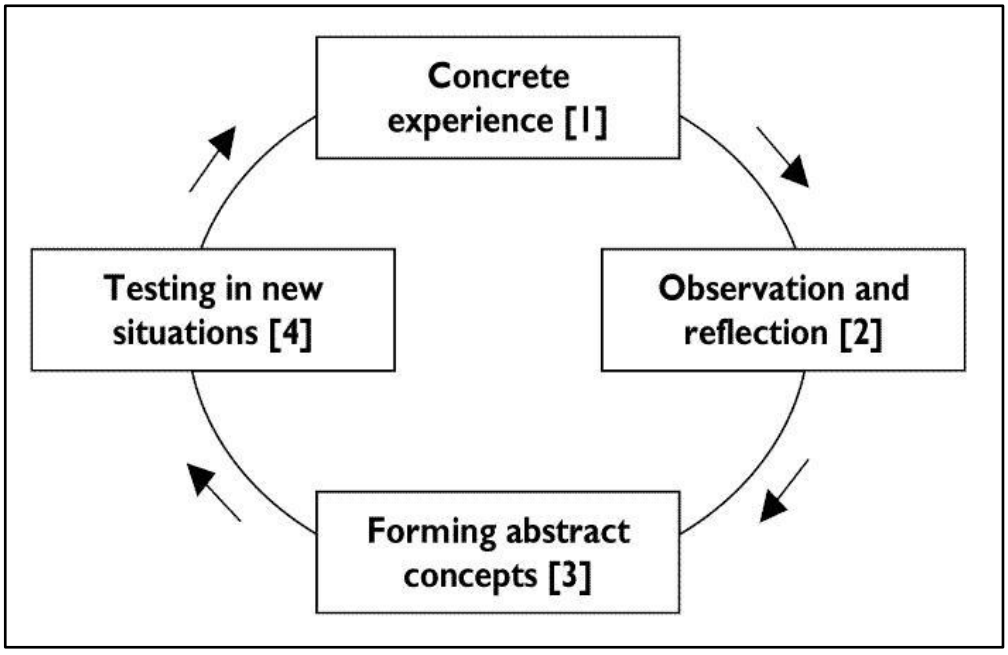


Figure 2.3 Honey and Mumford Learning Style Model Source Bosman (2015)

2.5.5.1 Activist. Learners of the activist learn through doing, have an open-minded approach to learning. They want to learn various tasks from new experiences, and actively participate in learning material. Keywords: Critical problem solver, Group conversations, Role play (Bosma, 2015).

2.5.5.2 Reflective. Reflective students are not actively involved, they learn from their instincts and observing the situations. They have to prefer learning from new experiences, examine and create a report. They need time together with new data and think about the problem from various perspectives and to reach a valid conclusion.
Keywords: Conversations with others, observing situations, Case study, need more time to learn (Bosma, 2015).

2.5.5.3 Theorist. Such learners like to grasp behind - the-action theory. To participate in the learning process, they need models, principles, and data. Prefer to analyze and synthesize the structural, logical ' theory by drawing new knowledge.
Keywords: models, measurements, stories, quotations, contextual evidence, hypothetical thoughts (Bosma, 2015).

2.5.5.4 Pragmatist. These people must be able to see how to apply the learning in the real world. They also find an opportunity to put into practice What they have observed and admire in the experimenters, and to test out new ideas, expert reviews theories.
Keywords: Time to reflect, about how to implement learning in the real world (Bosma, 2015).

2.5.6 Fleming's VAK Learning Style Model. There are numerous ways of classifying learning, one of the most used models is based on interactions of sensory modality that need to be employed as data is gathered and sent (Dobson 2010). Studies on how you relate

and how this affects your learning has led to three distinct styles of LS. VAK model given by Fleming in 2001. The VAK model admits that students process information “in a different way” referred to as Preferred LS (Fleming, 2001). This has an important influence on the student's abilities together and distribute information and should be organized with suitable learning approaches. When that is done appropriately, students show improved ability to understand it, use it, and relate it to another knowledge.

In Fleming’s model, which are frequently stated to as VAK LS, Learners are recognized as having a visual preference (photographs, videos, diagrams), learners are being focused the best on what did they see, with the help of pictures, flashcards, charts, and films. Auditory (music, discussion, lectures), learners are being focused on listening. Whenever a learner listens, he or she would be able to read and write easily. In this regard, learners are provided auditory aids, in which lectures discussion and recordings play a vital role to enhance their abilities and make their learning more interesting. Kinesthetic learner prefers physical activities; these types of learners learn best through experiments, laboratory sessions, creative activities, and field trips. They like to involve themselves in moving feelings and experiences.

2.5.6.1 Visual learner. Students who use visual learning style think in the form of pictures and learn best through see. The visual contents are presented in various formats, such as images, flowcharts, illustrations, videos, models, graphs, comics, coloring books, presentation, posters, games, and flash cards (Rodger et.al., 2009). The above formats can be used by teachers to show vast volumes of data in ways that are easy to interpret and help disclose patterns and relationships. Students recall knowledge better based on different tests when it is illustrated both visually and verbally. These techniques help to better

manage learning expectations and achieve academic achievement for students of all ages. Raiyn (2016) Students use their eyes to gather visual knowledge in a visual learning environment. Visual learning also enables students to improve visual thought, which is a type of learning in which the learner better understands and absorbs knowledge by integrating thoughts, phrases, and concepts with pictures. According to Fatt (2000) students with visual learning see the world by building or memorizing mental images. Fatt (2000) also said that visual learners prefer reading and observing with visual aids. Visual learners prefer to learn by watching movies, pictures and graphs which will help them to integrate the lessons learned. In addition, when answering a test, visual learners are more likely to answer the test if it has visual a diagram. Additionally, according to Cegielski et al., (2000) students who demonstrate visual learning tendency are more likely to excel when given visual task assignments.

Visual learners always remember the best what they saw, with the help of pictures, flash, cards, diagrams, charts film, etc. but if something is simply said to them, they might forget. In pictures, visual learners prefer to think. So, they typically construct a mental image of what is mentioned in the text when reading (Boneva & Mihova, 2014).

For these learners, the PowerPoint presentation is ideal because it displays phrases, photographs, or maps. Visual Learner learns comfortably and with the best way of seeing, using a variety of colors, when they use colors, they will have an ability to judge them. On the other hand, seeing drawings, different paintings, and pictures. Every painting or drawing is having a complete theme or life in it. The visual learner will judge these themes or life by looking at them and can learn to complete the story. Visual learners can also learn through graphs and charts help his/her to learn whatever he/she uses to learn. These learners

are motivated to compile their assignments by taking part quickly in the class, to ask the questions if they do not understand. These students learn easily when they are being provided by written material in the form of textbooks, class notes, multimedia projects, flash cards, diagrams, charts, images relevant to learning material, maps etc. (Helena, 2017). They learn through the involvement of the classroom by planning their role watching others' performances or demonstrations. Visual learners cannot afford typical classroom, or traditional classroom because they feel comfortable with using their eyesight, they demand more creative and modern activities to see them and then learn from these. Whatever typical classrooms cannot provide such activities in class, except lectures, so such students cannot show satisfactory results. So, it would be better for these learners to provide them with the best environment (Pritchard, 2009).

Muluk (2020) students have their own preference of learning style, it is useful to be aware of learning styles in order to improve and enrich their learning experiences. For example, when learners have poor academic performance in listening, lecturers can adopt different learning strategies such as visual learning strategies. This includes taking notes while listening, which helps both lecturers and students create and achieve the interaction to accomplish the goals of learning.

2.5.6.2 Auditory learners. Students with auditory learning styles prefer sound mediums which enable them to make better decisions about what they hear or read. By listening, individual learners. An auditory learner relies on the learning method of listening and communicating. These learners are having an active, sharp, and present mind. Whenever a learner listens, he or she would be able to read and write easily. In this regard, learners are provided auditory aids, in which lectures, discussion and recordings play a

vital role to enhance their abilities and make their learning more interesting. They enjoy talking to others. They dislike reading books. By their listening power, they can understand the lectures very attentively (Pritchard, 2009). Kayalar and Kayalar (2017) stated that auditory learners are outstanding listeners. The attributes of auditory learners include learning through hearing, choosing to read or compose, having difficulty communicating by body language and facial gestures, considering written commands that are more difficult to follow than verbal ones, loving dialogues, plays, dictation, and preferred music. They need to hear, or say, something to know. By listening to players and repeating or fulfilling verbal orders, they are excellent at learning concepts and prefer to listen first to lectures and then take notes or to rely on writing notes. They like class discussions, but noise will easily hinder their attention and concentration. Sometimes, by thinking to them, clarifying incoming information by listening and communicating aloud, they can solve challenges. They are outstanding at sharing stories and jokes. According to Jaleel and Thomas (2019) such types of learners can show better performance in conceptual activities. They prefer to listen to the lectures, audio recordings to learn their task. An auditory learner is ability oriented. They benefit from conventional instructional forms, seminars, and techniques of question responses. Instead of reading it, auditory can quickly obey verbal orders and prefer listening to the information. Auditory learners who talk well orally will find it difficult to communicate in written form. Auditory learners, they have learnt, are excellent at answering rapidly in a lesson. They can perform well in oral examinations and learn through listening to oral information, lectures, speeches, and oral sessions effectively. They may be not willing to compile their own notes or conduct personal research. They may prefer delivering presentations instead of written assignments (Helena, 2017). Auditing

pupils strive to understand the real meaning of words by listening to sound cues such as tone changes. An auditory student will repeat it clearly and remember it when a phone number is memorized. They like to recall what was said correctly, but from further reading or writing out details, they can gain little. They want to demonstrate their learning in the community to others and learn from the conversation (Helena, 2017).

2.5.6.3 Kinesthetic Learner. According to Jaleel and Thomas (2019) kinesthetic instruction is a method of showing the pupil how to perform a physical exercise rather than either listening to a lesson or watching a demonstration. Kinesthetic learner prefers physical activities, he or she prefer to take notes, use scratch paper, and most of all to do experiments to reach the point. Through doing and organizing the content, these types of learners learn through the hand-on physical task, outside fieldwork, individual projects, and other activities like maintaining different things with proper way, or arrangement of a different tasks on different occasions. Such as farewell parties, multi-functions, or other family parties. Sports coaches, counselors, professional athletes are the best work for kinesthetic students. Kinesthetic learners learn through moving, touching, doing, and exploring the world around them. They feel comfortable to learn by performing practically (Pritchard, 2009). They do not believe in creaming books or writing. They enjoy looking around them and exploring the area which they want to know. They always have the curiosity to discover something new, so, they are enjoying collecting data and engaging in different tasks. These learners learn best through experiments, laboratory sessions, creative activities, and field trips. When studying or practicing, they can also listen to music. Focusing on two different topics at the same time. They like to involve themselves in touching feelings, holding, doing, and practical hand-on experiences. Learners with a

single choice for LS are referred to as unimodal, whereas multimodal is known to those who choose a variety of styles (Helena, 2017).

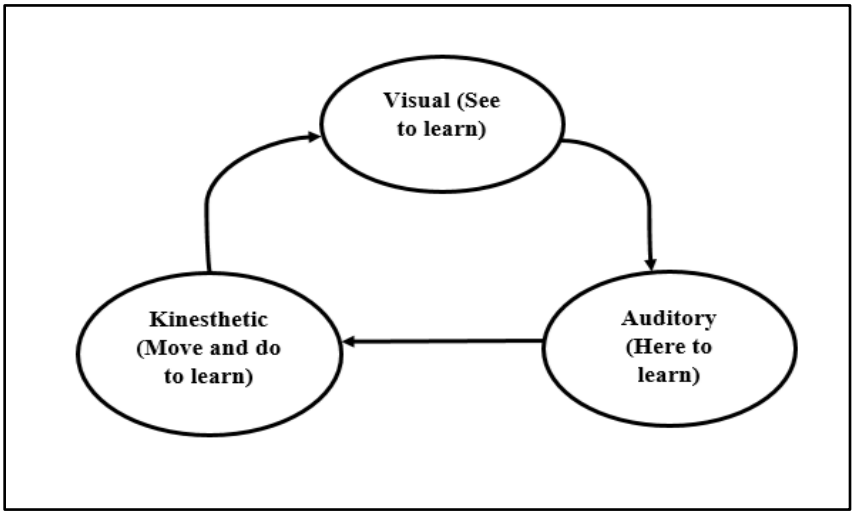


Figure 2.4 VAK MODEL Source Moubayed (2018)

Based on the VAK theory, instructors should ensure that activities are designed and carried out in ways that offer each learner the chance to engage in a manner that suits them best. Since the students' needs in a typical classroom are much diverse, the teacher will have to employ different instructional methods that help each of the individual learners interact with the content in a manner that he/she understands it well (Fleming, 2001).

2.6 Science Education

Discipline of science is determined from the Latin word Scientia meaning Information or understanding. Prior, it was not related to any down to earth aptitude or experimentation, as we get it nowadays. It was closer to logic instead of empirical examination. Science is a collection of logical and measurable facts that are developed and quantitatively articulated by scientific analysis and mathematical techniques (Ross, 1990).

Theoretical study of environmental factors (i.e. neurophysiological) influences that can be clarified or attributed to causal processes outside the limits of natural causes. In short, as shown by natural causes, scientific study is limited to studying natural phenomena. In the end, empirical evidence of scientific understanding is essential (Loo, 2000). Shamos (1995) argues that science belongs to the category of the most dynamic theoretical enterprises that cannot be described correctly in a line or two for the expert, brief explanations can be relevant, but seldom describe the picture. Shami (2001) the scientific study of nature and how it impacts our world and us is research. It is an integrated body of information and a formal investigation and interpretation process. This concept of science is not only limited to a body of knowledge, but also deals with the systemic exploration of the universe (scientific method) and the extraction of evidence from suitable sources.

The purpose of Science Education (SE) applies both to scientific material and to scientific pedagogy'. In addition, science education is also related to the social dimension of culture (Faizi, 2011). According to Mohanty (2004) It gives the understudies fundamental logical information, which may offer assistance to them in finding arrangements to most of the socio-economic and natural issues. Science instruction gives a sound and adequate information base to the understudies within the region of agriculture, environmental issues and issues, nourishment and eat less together with the fundamental logical aptitudes for the work (Mohanty, 2004). Mohanty (2004) Science Education (SE) provides the particular knowledge of the pupils. It could help them find explanations for the most common, financial, and environmental difficulties. Poisson (2001) addressed the scope of "SE" differs from one state to another state. The attention, furthermore, keeps on moving among the substance of science, instructing approaches, logical instruments, and

values. In science education, countries like Japan and Israel emphasized on technology". SE in "England" The teaching of science refers to the substance of science and the enhancement of the rational state of mind, but the most prominent focus is on the social element of science. The situation is different in China. Six separate areas are the subject of SE. That includes the sphere of science, the domain of knowledge.

Poisson (2001) the realm of organizational skills, the domain of scientific method skills, the domain of application, the imaginative domain, and the domain of attitude.

The Science curriculum will emphasize the growth of critical thought in learners. This critical thought needs to be fundamentally relational. The expansion of this rule to science instruction requires an accentuation on the exercises, issues, and issues of the science educational modules (Bailin, 2002). It encourages students to analyze the universe with a questioning mind and, relying on certain logical analysis and proof, draw the inference. The Science curriculum also helps students to start a movement to improve different forms of criteria. It allows them to be knowledgeable people who can challenge different critical issues.

It is quite naive to assume that science empowers students to undertake a shift to boost different types of needs. Endeavor science studies can provide the information, but it is quite another matter to apply that. This includes resource problems, democratic will and determination, and so on. There is no support that science can bring anywhere. Here, science will bring little support. (Faize, 2011).

Goodrum, at al., (2001) argue that improving scientific literacy is the key aim of science education and providing a better considerate of the principles and mechanisms of science, the role and effects of science on community and our lifestyles. General,

information is often misunderstood, but what might reflect the main elements of 'science literacy' is a general point of view. This lack of clarity on the idea of 'science literacy' is discussed in the 3-dimensional paradigm of (Hodson, 1998).

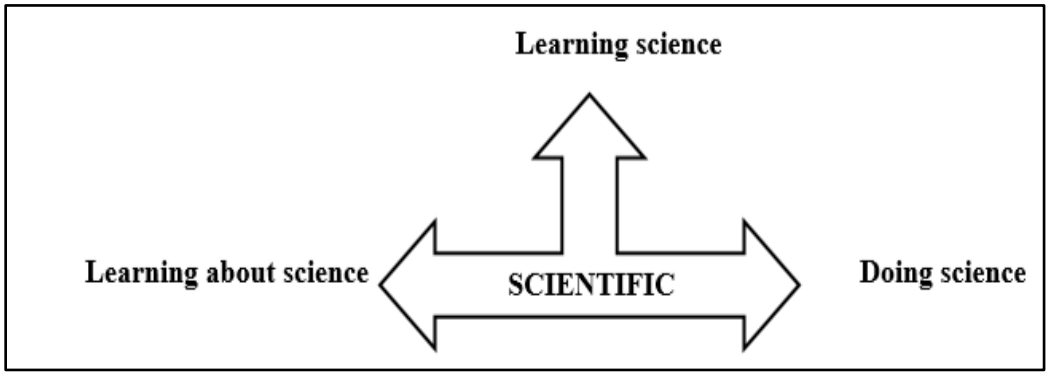


Figure 2.5 Hodson model for scientific literacy (1998)

There is a wide acknowledgment of this investigation. How to create such proficiency, be that as it may be the generally unexplored domain? It is, by and large, declared that it can be finished by conducting considers within the sciences, but there is no evidence to back this (Faize, 2011).

The American Association for the Advancement of Science (1989) described scientific literacy as Knowing that research, mathematics, and technology are interdependent human enterprises with capabilities and limitations; recognizing core science ideas and principles; knowing the natural world and respecting both its diversity and unity; and using scientific experience and scientific ways of thought for individual and social purposes. (American Advancement of Science Association (1989). Three goals in science education were provided by (Faize and Dahar, 2011). The primary objective alludes to thinking setting, which includes the interpretation of concepts, and simplifications. The second is the utilization of a translation of the information acquired to

determine the challenges experienced by the understudies in regular day to day existences. Last but not least, the development of a good mindset to yourself, to the education of science, and society. The second goal, however, is low emphasis. This can be seen by the fact that students are not able to overcome their daily challenges with school science or college science. Moreover, scientific education has struggled to create a constructive outlook in students towards themselves, towards the curriculum of science and culture (Faize and Dahar, 2011). Poisson (2001) said that some of the other purposes of science education are to encourage a sense of inquiry about the activities unfolding around you. Students need to grasp the key scientific ideas and their contribution to the real field of science. In the meantime, students must consider the problems of scientific creation in such a way as to include guidance for the advancement of society.

Three objectives of science education were stated by Bybee and DeBoer (1994):

- To pursue scientific awareness
- Learning the processes of research
- To apply scientific expertise (p. 357).

It can be seen that the aims of science education set by Bybee (1994) are very similar to the objectives of Ediger (1999). Faize (2011) “However what they mean by research methods is not clear”, which is highly doubtful”. Instead, data integration also needs to be made simpler, since the response is not probable. Goodrum, Hackling, and Rennie (2001) noted that there are two different types in the science education: science of supporting (related to the information to move forward the quality of life and the climate) and the science of making (relates to mechanical capability). Science Teaching Goals in

Pakistan. Faize (2011) in Pakistan, the 2006 Physics, Chemistry and Bio school curriculum planned for grades 9th and 10th formulated the following science coaching goals.

- With a scientific mind, knowing the living and natural world.
- Awareness of the nature of perception and the limitations set by Science Form.
- Enabling students to adapt scientific expertise to daily life issues in a logical way.
- Showing appreciation for critical reasoning, empirical fact, intellectual evidence, and honesty
- Growth of the skill of logical speech, whether verbally or orally, in students written writing
- Enabling learners to work in teams.
- The conscientious and wise use of research equipment and scientific ideas.

Faize (2011) there are a variety of drawbacks in the national science curriculum (2006), however. What the text means in the scientific mind is not clear. It is ambiguous and uncertain about this term. The sense of this word and such other words as 'scientific method' can be talked about and wondered at. In the meantime, it is a wishful idea to encourage students to relate science expertise to daily issues. In addition, it is important to respect critical thought and scientific integrity, but the essence of science does not rely on facts but focuses on the opposition and the need to display respect for this disapproval. Faize (2011) in addition, the document emphasizes in a wise and responsible way the use of scientific equipment; but what does this assertion really mean? Does it say the scientific equipment is treated carefully or something else? There is a need for this argument. Further, clarifying and describing. Similarly, in Pakistan particular work is neglected. Lak of the

science lab and lack of awareness about their LS. The science teachers are less aware of the styles of students learning and do not focus on the LS (Faize, 2011).

Meyers and Jones (1993) declared the dual particular dimensions of learning in science. Meyers and Jones (1993) realized the dual specific dimensions of learning in science. One suggests to learning by thinking perusing, tuning, testing, and writing, and referring to that moment from learning, is an element of education that is general knowledge.

Leach and Paulsen (1999) Nevertheless, the issues remain that "Science learning" are being be supplemented without a "practical element". People have been found to like and maintain certain interactions that they have gained through presentations or another group project. In this respect, science teachers have a critical role. An instructor who takes more care of his pupils supports them and succeeds in inspiring his students to learn and fulfill their learning needs. If the instructor is unable to create interest in his teaching, is ineffective in classroom management, and has an unpleasant attitude, with a decreasing interest in science subjects, the results are the opposite. Furthermore, the "Experimental work has been found by Leach & Paulsen (1999) to sensitize concrete and actual sciences, allows learners to explore and ask a question, encourages students to think about, and thus create questions about various phenomena. In the final review, students will understand how science poses problems and finds solutions to them. The fascinating thing about scientists is that they get their expertise from nature questions and experiments. The experimental and class learning need each other in the light of these objectives. A significant part of the total learning process is the experimental form.

Najike (2004) addressed a variety of problems in science education faced by developed countries. Teacher-centered instruction, undue focus on reputations, and rarer chances for learning the content of science. For some form of motivational learning, students do not come to classes. Their aim is to take examinations to receive a certificate. Activity-based instruction is seldom carried out, and instructors still use the traditional instructional form.

In science, the use of various teaching methods has a beneficial impact if they are student-centered. Cooperative learning do-talk-record and problem-solving are some of the modern teaching techniques (Goodrum, Hackling, and Rennie 2001)). When the teacher attempts new teaching approaches, the pupils become much more self-reliant and tend to resolve issues themselves (Halai & McNicholl, 2004). However, in a socially interactive setting, students learn better. To make good use of such a setting the professor must focus on his critique (Baig & Halai, 2006). “Although elaborating on science education” Blosser & Helgeson (1990) acknowledged a variety of improvements to science teaching. Initially, emphasis on active participation of students in doing research. Pupils can better understand the nature of science by engaging regularly in research. Yet mental activity is confused with functional jobs. True awareness emerges when novel concepts are sufficiently linked to the long-term memory of the conceptual matrix. This includes a system that requires work memory, both of which are mental activity. Nothing can be done with a practical work. Social consciousness and problem solving are the second focus in “science education. Pupils are now encouraged to think objectively about diverse topics relating to science and how they can impact society. The pupils have also specialized in problem-solving skills. Two very distinct concepts are misunderstood by the writers here. It is one

challenge to see science in its relationship with society, while problem-solving is a completely different field. Faize (2011) these claims are both wild assumptions. They are not stating and how this could happen. They are saying that will happen. It is not real. The first provides alternatives. The description of "problem-solving ability" shows that certain abilities are assumed. They do not and neither do they. The third priority is on collaborative scientific learning and knowledge exchange. Competition in science is now being replaced not only in the classroom but also at the national level by immersive learning and discussions. This creates a tremendous problem -cooperative and competitive learning. For both, there is a position, and both are useful. The former is the answer most of the time. The latter can, however, produce some very impressive and optimistic results. Tahir and Ullah (2006) the 2006 "Physics Chemistry and Biology curriculum in Pakistan highlighted a change from conventional teaching methods and encouraged the use of modern methods of teaching. It proposed that an engaging and vibrant environment should replace passive teaching and learning. Using interactive, the students must be engaged. Techniques such as conferences, courses, tutorials, circles of learning, presentations, case studies, feasibility studies, methods for projects, etc. Teachers can prevent memorizing learning. It will be substituted by understanding in an orderly way. The instructor must make use of debate and demonstration to make the learning of science exciting and successful. In the meantime, enhancing the "psychomotor capabilities" is also very essential. For this one, the goal is to provide students with the opportunity to perform experiments and to control scientific equipment. The learning process would make the hands-on project more interesting and purposeful. Tahir and Ullah, (2006) sufficient space in 2006 national curriculum to connect most concepts with science, technology, and society". In terms of

subject selection and incorporation of investigative skills, the current curriculum is satisfactory. The textbooks require some improvements; however, these changes include relations and linkages between various ideas, reinforcement of practices, enrichment of experiments, and the development of a system for continuous evaluation of students.

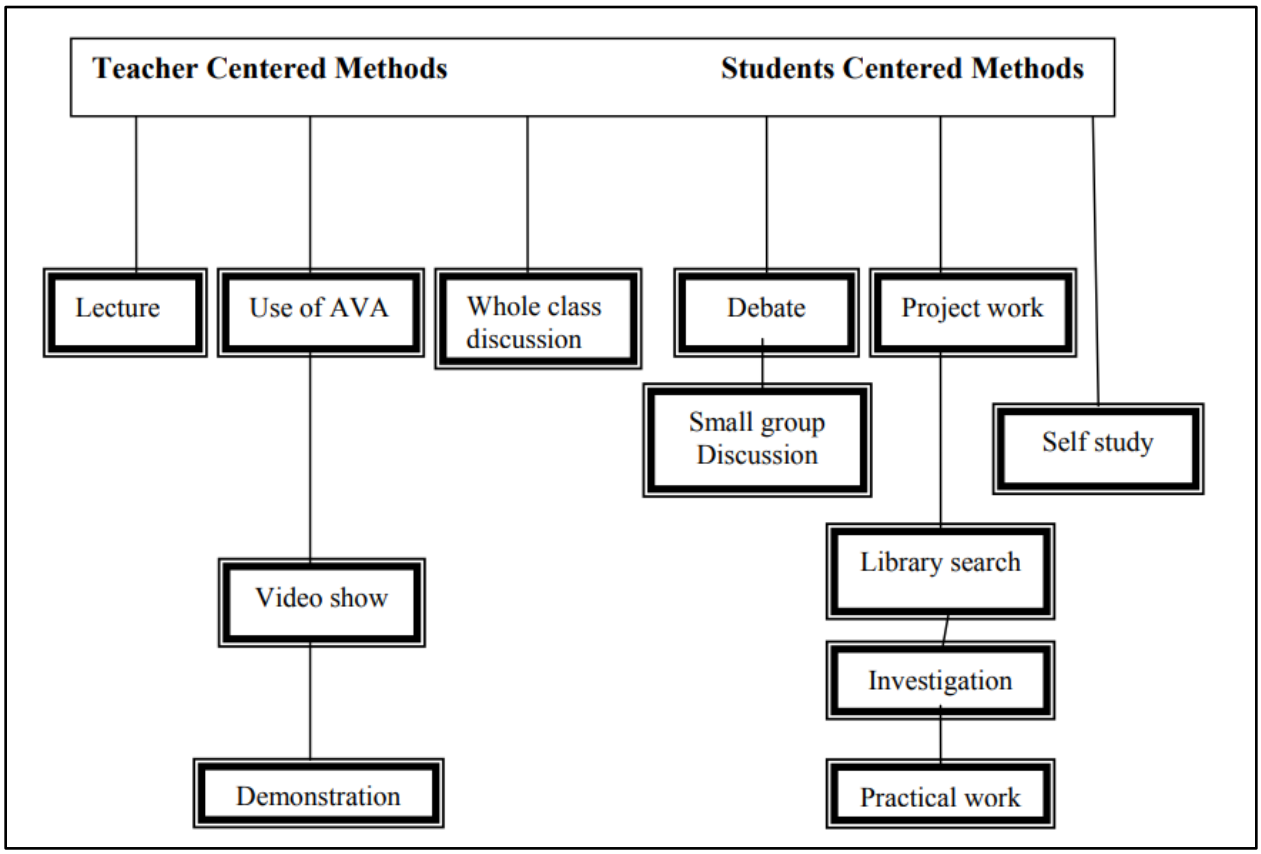


Figure 2.6 Spectrum of teaching techniques in the science classroom

Source: National Curriculum for Physics for grade IX & X (2006), Ministry of Education, Government of Pakistan.

2.7 Science Instructional Differentiating

The problem seems easy to Tanner and Allen (2004), integrating students researching why they have left science courses with strategies for categorizing learning methods. Science teachers must distinguish and diversify the pedagogical methods used in

science classes, to meet multiple communities of learning. In certain cases, it would not be practical or beneficial to tailor the course work to the individual LSs of each student.

It might not also be too critically important if students differentiate their LS and the frame they are using, but it may lead to their academic performance by encouraging self-consciousness by using learning techniques that complement their LS. However, what is crucial is that during the scientific course experience the instructor's teaching style is open to learners with various LS. Differentiated education, a type of education focused on different pedagogical methods (Tanner and Allen 2004).

2.8 Difficulties faced by the science students during their learning process in Pakistan

Faize (2011) highlighted the problems;

- Inadequate knowledge about their LS.
- Absence of services in nearly 90% of the schools
- Shortage of an appropriate number of high school science teachers
- Absence of adequately educated teachers in science
- Lack of encouragement among science teachers
- Science curriculum is outdated
- Science teachers used traditional methodologies for teaching
- Lack of cooperation between different organizations and agencies, For example, curriculum, boards, resource centers, boards, etc.

Malik (2007) is of the view that the science curriculum only has factual information and the teachers are following the traditional lecture method to teach it; novice, thought

provoking and effective methods of teaching of science are still not practiced by the teachers. so, the LS is regulated in this situation. Science educators and students are less conscious of their LS, according to Munir, Ahmed, Hussain, & Gani (2018) most science educators used conventional instructional approaches to cover the topic without understanding the desired learning patterns of students (visual, auditory, and kinesthetic). If an instructor uses conventional teaching methods and forces all students to remain passive during their lessons, the desired style of learning in that classroom will be overlooked, which will in turn impact students' academic achievement.

From past literature studies, in relation to their learning preferences, many students had a tremendous opportunity to face the learning scenario. Bacha and Bahous (2011) revealed that in the schools, nearly 80 to 90% of secondary teachers put their students to serve as good audiences.

Damrongpanit and Reungtragul (2013) science teachers had planned to choose traditionalist instructing strategies more than humanity instructors. There were a few circumstances that clarified the contrast of students' accomplishments and success, not from educating strategy and great learning characteristics and competencies of understudies and got to be the basic issue in the disparity of each student's learning method.

In institutions, "science instructors" "instruct science subjects on the same design as devout schools instruct philosophy subjects. The education relies on the rote learning of concepts. Memorized knowledge is delivered within the assessment at that point". The pupils still had no chance of testing the data they have remembered (Sadiq, 2003). In addition, certain issues are listed, low education spending, lack of adequate numbers of science teachers, shortages of science laboratories and science infrastructure, inadequate

science curricula and inadequate oversight of the science education curriculum are some other reasons of backwardness in science (Memon, 2007). Student issues began to increase, classroom escape, disruptive behavior, dropout, or adverse perception. The results of the mismatch between teaching and LS is compatible with all concerns (Damrongpanit & Reungtragul, 2013). For this analysis, the researchers attempted to affirm the link between LS and academic achievement, on the basis of findings of previous manifest concepts and to highlight the vital role of various LS in the classroom, especially on important subjects of the basic level of secondary education; biology, computer science, physics, chemistry.

2.9 Being Clear of Learning Styles

Tanner and Allen (2004) finally, perhaps the easiest step towards reconciling various modes of learning and the issue and the existence of multiple LS is primarily to take into consideration more complex pedagogical types. In most school, college and university campuses, there are now many opportunities to help students understand their own style of learning. It can go a long way to start a course by encouraging children recognize about their own learning processes and interests. Tanner and Allen (2004) So, we are back to where we stopped. Educators aspire to learners about their preference styles either they are a visual or auditory learner. The problem is we do not know to teach the pupils with these LS in one classroom. In order to explore. To discover innovative ways opening the door to studying science to a wider spectrum of students, hopefully go beyond the teaching strategies that performed well for us as students and incorporate various forms of learning in our classrooms. And it is not a sudden, major change to broaden the repertoire of one’s teaching style, but more a gradual technique that can be tackled in small steps, testing new techniques one at a time and maybe with just a certain duration of class. Our

own perspectives will be enhanced by attracting a more diverse community of students into science and adding new intensity and depth to our research enterprise.

2.10 Academics

A person who teaches the academic (text) is known as a teacher. The scheme of study targeted by an institution for a specific grade is called course, syllabus, and text. The child who inters in the institution for learning is the academic learner. The learners are bound to wear a specific dress to show uniformity is called an academic dress (Wolgast, 2009).

2.11 Academic Performance

Academic success, also known as school result, is the sum of a student's accomplishments at a specific institution, over a specific time period, and under the guidance of a specific leader to achieve the desired goal. Academic performance and academic result are records held by students in schools and institutions. The student works under the supervision of the instructor in a specific location for a specific period of time, and their success is evaluated by exams. Academic performance is the name given to this method. Learners choose the best institution in which to succeed academically. Learners standardized study begins in schools. In school, students obtain formal education as well as knowledge such as academic, humanities, reading, and other subjects, and as they advance through the grades, they develop the maturity to choose a particular career. For uniformity, the learner wears a specific uniform or dress, which is referred to as academic dress. An academic course is when a student studies a particular topic (Wolgast, 2009).

2.12 Academic Achievement

The record of educational activities is known as academic achievement. Tests and exams are often used to assess academic success. Academic achievement depends upon students' performance which emphasizes learning to attain high goals. In a subject influenced by test results, teachers develop expertise, abilities and skills, typically measured by the instructor as academic achievement (Armstrong, 2006).

Academic results, such as tests and evaluations, can be best measured in a number of ways based on students' mental abilities (Farooq, 2011). Exams and assessments are the most effective ways to assess academic achievement and comprehension in high school. Since they are administered by the school administration, these written assessments or examinations are referred to as home exams. In Pakistan, the annual assessment system is used to upgrade or degrade candidates, because if a student is knowledgeable but does not attend the annual exam, he or she will be put in the same class before the exam is passed (Poropat, 2009).

Physical exercises are important in creating a positive academic atmosphere because a healthy body leads to a healthy mind, and language is a means for understanding and sharing feelings and information. Exercise, in turn, improves executive functions including attention, working memory, motivation, and so on (Farooq, 2011). Academic achievement can only be improved, according to Nez (2005), when students feel safe, dedicated, and respected. The atmosphere for learning and engagement in democracy and well-being is created by social, emotional, legal, and educational (academic achievement) contexts. If a student's behavior is good definitely his / her academic achievements will be the best. Students become successful in any area of life when they are strongly inspired

about a subject or when they know the good things from their inner happiness. Their interest grows, and they are inspired to excel. However, when they are confronted with a tough situation, they lose confidence, become nervous, and hesitate. They drop out of school as a result of their reluctance. However, it is also true that tension will cause students to learn more. Often students see difficulties as obstacles and gain the confidence to complete challenging tasks, but other times they see tension and lose heart, which may manifest itself in social actions and academic disappointment (Nez, 2005). Many factors, including interest, teaching approach, education, age, home and social climate, patterns and problems, and so on, have a significant impact on academic achievement. Many researcher studies and their conclusions are: Student progress in academic accomplishments is dependent on the socioeconomic standing of parents or caretakers of students in society. According to Considine and Zappala (2002) academic achievement is influenced by the social and economic position of parents. According to Ali et al., (2013) the output of higher education depends on previous academic performance. Bratti (2002) stated that the previous educational outcomes of the student are the most important predictor of the potential success of the student, referring to the higher previous appearance that will offer better results in the future. The essential learning provides a base for high stage learning. It is statistically established that in future academic years, those students who have done well in the initial classes of their studies will do better. It has been recognised from the remaining several years that there is a first-rate addition in finding literature and reviewing research materials with much focus in this dialogue on metrics of educational performance. Traditional successes assess academic success at university or higher levels or creative interventions are the strongest determinants of potential academic benefit. However, many

of the investigators do not agree with this point of view. Reddy and Talcott (2006), Their results show that a student's success changes at any point, often due to the institution, and sometimes due to a variety of other factors. (2006) (Huws). In order to build the personality of students, climate plays a crucial role. The educational setting is strongly responsible for bringing change in a pupil when students spend much of their time at school. (Hollywood, 2007). Academic success is a crucial factor in determining the performance of particular students (Ahmad, Jelas & Ali 2011). Quality education is important for an an acceptable academic achievement. As a consequence, in an era of increased spending in education, decision makers and academics are increasingly concerned about low-quality schooling. They also learned that bad educational results can have negative consequences on the economic and social growth of a nation. On the discreet stage, ineffective education and low academic achievement not only limit one's progress in school, but can have a negative impact on the individual's future income and competitiveness (kasirye, 2009).

In a variety of classes, academic success or performance is related to the knowledge and abilities acquired by a pupil. The standardization of academic success or advancement is measured by assessments, tasks and final examination outcomes (Garner & Harrison, 2013). As a measure of student success, is described by (Ahmad, 2011). Academic achievement or results in a number of subjects is dependent on the skills and abilities learned by a student. Examinations, assignments and final test grades measure the degree of academic success or advancement and focus on the standards set by the educational institution (Garner & Harrison, 2013). Some features are demonstrated by successful achievers or top performers. Single and in silence, are still broadcasting. At regular hours, they study, take notes from the classroom, ask questions from the teacher, Read the material

before the lecture, research notes before the exam and speak to other students about your homework (Cerna & Pavliushchenko, 2015). Several scholars have drawn the interest of the determinants of academic success and accomplishment. The skills of all students evans, (Rickardson & Waring, 2013) and the creation of acceptable alternatives for academically unsuitable students are equally important to teachers and scientists (Caprara et al., 2011). The academic success of a student is the result of multiple individual and contextual factors. Students are not in a bubble and will not excellence without social support in their families, neighborhoods and schools (Chase et al., 2014).

The teacher taught syllabus known as text, course, and syllabus for a specific time duration in a specific institution. The tests and examinations are tools for measuring academic achievements. The teacher's teaching methodology highly influences the performance of students. Motivation and interest of students also influence their academic Achievements. The teacher uses different techniques to motivate students to a desire topic or subject. The students' personal interest impacts his/ her academic Achievements. Facilities such as labs, conveyance, and library also affect the pupils' success. The teacher measures academic performance of pupils through tests and assessments while the students are promoted and demoted on the basis of the examination process. (Askling, 2010). Teacher record the student's academic achievements as a result. Assessments are based on written tests and examinations. These findings are denoted as grades and GPA etc. The examination system is used to check the academic Achievements of the students. The result of academic achievements is based on the teacher's methodology, the student's understanding, motivation, and interest, it is highly influenced by the course/ text, given time period and facilities. The academic achievements will be on the peak when the teacher

uses the latest methodologies, the students are highly interested in learning and text or books are according to their mental age, the given time suited to the class and the basic facilities such as proper lighting, labs for science subjects, etc. are provided. If the environment of school or home is disturbing, it will highly influence the student's academic achievements (Askling, 2010). Interest derives motivation and interest. While the success of student academic performance is based on the intelligence, interest, and motivation of the student. Those students who are intelligent and motivated to the desired topic can gain easily and their academic achievement is also very well. While those students who are intelligent but less interested in a topic needs hard to score high in academic achievement. Human is different physically and psychologically. These differences lead them to the difference in personality i.e. shyness, active, cooperative, intelligent, lazy, etc. Intelligence is an intellectual ability. Usually, intelligence is measured through the completion and accuracy of a given task. Therefore, if a learner completes a task in less time means his/ her IQ level is high, on the other hand, if he/ she did not perform well it is considered that their IQ level is average or below average. But it is also a fact that sometimes disturbance, the lake of interest, etc. causes less score in a test. (Deary, 2007).

2.13 Secondary Education

A key component of the school system, it is like a bridge that links primary education and higher secondary education. Secondary education is very important because it is an adult's teenage, they face physical and mental changes if the younger took proper guideline they will become productive, effective, energetic citizens. The parents, school background environment, etc. impact on secondary and post-secondary education (Afonso, 2006).

2.14 Board of Intermediate and Secondary Education (BISE) Rawalpindi

Pakistan Gazette Book (2000) provides information on the Rawalpindi Board of Intermediate and Secondary Education. It was established in October 1977 because of bifurcation of BISE Sargodha under Punjab Boards of Intermediate and Secondary Education Act NO. XIII of 197. “The BISE Rawalpindi has since been confined to the Districts of Attock, Chakwal, Jhelum, and Rawalpindi. The Board main source of income is the examination and other fees collected from the applicants. There is no state or financial institution grant-in-aid involved. In Pakistan, the annual board system is held from Grade 9. Before grade 9 the private sector and public sector taught different types of courses. But for board exams, all schools must regularize the same text and it also conducts a competition. The board organizes, regulate, check, and update the secondary education. The board awards the scholarship, medals, and prizes who got positions (Rasool, 2007).

2.14.1 Curriculum. Curriculum is the sum of experience (good, bad) activities (fun, educative) and environment which studies students' acts in educational careers under the guideline of the educational head. The curriculum is like a milestone for achieving goals. The curriculum designer also takes care of a different variety of students to make an easy, interesting, and updated curriculum (Hirst, 2010).

2.14.2 Evaluations. Evaluation is the chief source to understand what is done and understand in the academic year through an academic environment. Evaluation is a systematic authentic source to get brief information about the learning experience. Evaluation processes help to decide as the promotion and demotion process is done on evaluation bases. The aim of the appraisal is to evaluate the current status of the evaluation target in order to equate that status with a series of accomplishments. The appraisal notes

that the education of individuals requires the use of many techniques to measure the success of students. Evaluation is a systemic method in which efficient instruction plays an essential part. It starts with the concept of the expected learning result and concludes with a decision on the attainment of goals (Ameen, 2007).

2.14.3 Evaluation process in Pakistan. The success or failure of the promotion or demotion of students is based on the annual examination system in Pakistan. But at the secondary level, these examinations are conducted by the board of education administrators. These types of exams are usually called board examinations. Examinations have two types, external and internal. The internal examinations or home examinations are conducted by the school while the external or board examinations are conducted by the board of education administrators (Ameen, 2007).

2.15 Gender Based difference in Academic Achievement

Numerous reports have mentioned that in academic success, boys and girls are distinct. There was a substantial gap between boys and girls, according to (Mehrafza, 2004) study. The research indicates that the overall academic performance was higher in girls than in boys. (Nori, 2002) also found the major different in academic achievement of boys and girls. Academic quality was higher in girls than in boys. Ismail and Awang (2008) also suggest that girls have attained considerably higher scores in “Malaysia and Singapore” than boys in mathematics and science and that gender gaps in academic achievements have been more noticeable at the secondary level. A further research into academic study found that many variables were defined as corresponding to academic achievement (Abar & Winsler, 2008). They include Age, sex, social class, LS, community, autonomy, etc.

2.16 Factors which influence learning and Academic Achievement

2.16.1 Motivation. Motives for success are one of the most researched personality traits correlated with academic performance. In cases where success is judged against a criterion of quality, motivations are enabled. In addition, it is believed that the stimulation of motivations relies on the probability of success or failing in a given task. In addition, it is believed that the stimulation of the motivations depends on the probability of success or loss in a given task. When a motivation is triggered, it inspires the person by encouraging the approach (attraction to the activities, feelings of satisfaction, acceptance of the approach-goal). Motivation can affect the learning and success of a student and can also anticipate and clarify the academic success of that student. If they feel they can do well, students are more motivated and find learning opportunities that are rewarding rather than laden with anxiety or frustrating. They will retain their interest in studying the content and will obtain higher academic results if students are motivated (Mega et al., 2013). In relation to success in academic environments, several studies have shown that motivations for accomplishment are significant. Bjørnebekk et al., (2013) found that the link between grades examination and success, motivation has been statistically significant. This opinion is supported by Cheung (2008) They also remember that there is a significant connection among academic achievement and motivation. In relation to success in academic environments, several studies have shown that motivations for accomplishment are significant. A small but statistically important association between test grades and incentive for accomplishment was found by Bjørnebekk et al., (2013). Cheung and Chang (2008) learning enthusiasm of students is closely related to their academic success, share this view. They also add that research carried out in the United States found that when they

find the learning role fun and engaging, students will do well and persist on school assignments, and are thus inspired to learn. Other reports, however, have not found any statistically important link between motivations for achievement and academic achievement (Bjørnebekk et al., 2013).

2.16.2 Culture. Academic achievement (education) highly affects the culture and social environment. Culture and society also have a great impact on academic achievement. Every child can learn and act as learning is an essential condition for living and survival. Every school is made to teach and every child/ student interns to learn. It is in the environment of school and society, what the child has learned what the future desire of a student is? etc. Some children did not reach good institutions due to poverty, family crises threats of society, language, a culture so they became deprived of good learning or high achievement in academic performance. language, a culture so they became deprived of good learning or high achievement in academic performance. (Henri, 2006). The teaching and learning environment, languages, etc. are learning tools. Language symbolizes thoughts in words, it is just like a paintbrush which not only explains the mind of an artist but also captures the minds of child/ students. But in schools and institutions, the students and teachers are bound to speak, read, and write a language particular or familiar to the community or society. The mind of a child is blank papers in which the society write or make images before going to school while the schools or institutions highlight that image through effective teaching. But it is also a fact and threat by a society that mostly the community wants to teach their child their own culture, linguistics, norms, values, and religion, if a teacher wants to teach them according to their own wishes, it will be a work of consistency and long rung process (Henri, 2006).

2.16.3 Social and Economic Status. Children of low Social, economic status face social and emotional challenges. These types of students are usually weak and complex personalities. They feel insecure so they became less confident and unstable personalities. The young students require a good and healthy environment for physical and mental growth. The low social income status child might become frightened and facing depression. They have a lake of confidence so became unstable and unsuccessful throughout his/her life (Durlak, 2011). The Consodine and Zappala (2002) research findings are that students from high social economic status families performing better at school than low social-economic status families. Sentem (2003) findings are that schools are a social institution where the students could learn from teachers, books, classmates, and even from the school environment. The school background has a great influence on the child's academic achievement of the students. The facilities, qualities of lectures (teaching of lectures (teaching methodology) also affect the student's academic achievement.

The research of Grater (1995), Conside and Zapala in (2002) finds out that families have a greater effect on students' academic achievement. The high social, economic families spent on education which polishes the intelligence of their ward. It is also verified by Sentamee (2003), Kwesiga (2002) and other researchers that the school background also affects and highly influences the student's academic and social behavior. The researcher also argues that a student's success in College or University depends on the achievements of high schools. The social behavior is affected by the external environment and the institution transforms their knowledge through text, teacher's teaching methodology, a student learning process which can be reflected by the student's academic achievement

(output). Academic achievement is a mirror or reflection of the teacher's methodology and students' learning outcome (Kyoshaba, 2009).

2.16.4 Rewards. The rewards are very important for improving academic achievement. Allah has said in the Holy Quran that I will reward those who fulfill my orders and will punish those who will deny me. Everyone like praise and students tries to make good his / her LS and academic achievement to get rewards (Horner, 2005).

2.16.5 Stress. There has been a strong review of the influence of stress on learning. Research has shown that the physical and psychological forms of stress impair cognitive capabilities. However, there is little agreement in the literature as to whether tension in the learning process plays an inhibitory or facilitative function. In the one hand, it has been demonstrated that stress and reaction to adverse experiences in a number of areas, they have an excitatory impact on functional processes. Inquire about has appeared that upsetting conditions and related stress-related hormone rises can contribute to reduced cognitive considering, reaction time, versatility, as well as spatial thinking lacks, dialect shortfalls, speed of comprehension, and official working (Palmer, 2013). The release of stress-related hormones can be disruptive for people who have undergone Pressure that is sustained or distressing. It can regulate neuronal function to escape the ability of hormones and regulate the response to biological pressure and explains why traumatic memories are so embedded in a person's innate cognitive abilities (Palmer, 2013). It is often argued, however, that stress keeps emphasis in the sense of a learning experience, enhances retention and retention of pertinent knowledge, and is important for effective learning. People with higher levels of working memory can use conceptually oriented problem-solving strategies in a low stress environment, while people with lower levels of working

memory can use simplistic methods to solve the same problem. If environment demands are higher, Persons that have more memory space use issues with equivalent or less suitable solutions than people with less working storage capacity (Palmer, 2013).

2.16.6 Climate of school and classroom. The institute atmosphere is essential to the accomplishment of pupils, and therefore to academic progress. The term learning setting denotes to institute interactive interactions that affect the intellectual, social and psychosomatic growth of a child. The definition also refers to the school's and the classroom's environment. Constructive relationships between teachers and students can build a positive school atmosphere. Teachers who inspire their students to work, stress the dedication to learning, ensure who they create an atmosphere of enjoyable learning (characterized by constructive feedback and exploration, learning), generate a sense of safety, and attract the attention of students. This increases school consistency and performance overall and thus enhances students 'academic achievement (Awang et al., 2013). The undesirable environment of the school, on the other hand, is characterized by perceptions of inequality, hostility, and victimization, with a negative connection to institute dedication and academic attainment (Lynch and Leventhal, 2013). Stress fact that students learn self-discipline if their self-respect takes to prevail in the school situation. When schools are well equipped and student requirements are addressed well in the form of adequate facilities, consistent, and areas of learning, as well as successful teachers, the academic achievement of students, are to be high (Njoroge and Nyabuto, 2014). Efficient teachers show appropriate teaching styles, professional guidance and advice, constructive reinforcement, efficient instruction, and use of rewards and penalties effectively (Bostrom 2012). There are multiple classrooms in every school. The classroom role is mainly to

facilitate learning (Fiksl and Abersek, 2014). A healthy school atmosphere encourages incentives for students to work, creates internal motivation, and reduces fear. The classroom might be arranged in such a way where roaming will be easy, easy to approach, proper lighting, easy to look at the blackboard for all students, and the students are cooperative with each other. In this way, the students will not only perform well in academic achievement but also they will be helpful, responsible, and cooperative with the other students (Durlak, 2011).

2.16.7 Learning atmosphere. One of the greatest noteworthy causes that can impact pupil success is the instructor. Bostrom (2012) states that teachers over 10 years of teaching skills typically have greater performance than students with fewer experienced teachers. However, we should keep in mind that specialist teachers usually control schools rather than less skilled teachers, and thus more productive classes should be given to achieve the best possible academic outcomes (Bostrom 2012). It was also noticed in Wichadee (2013) when teachers feel at ease with their job, confidence in their field and engage in development, their pupil academic achievement is much higher than those taught by dissatisfied teachers. The subject knowledge of the teachers is also important, in addition to experience. The students' progress in their academics was also far better than that of frustrated teachers because they were satisfied with their jobs and skilled in teaching their subject and engaged in professional development programmes. Teacher happiness, comfortable job conditions and the introduction of successful teaching approaches to complement the learning patterns of the students were considered essential factors that may have beneficial impacts on the teaching process and thus on the success of the students (Wichadee 2013). Other factors which can also affect academic accomplishments include

good interactions between teacher and pupil. These considerations are important than the size of the class, instructor expertise or instructional means available. If teachers are able to fulfil the needs of the pupils for a social interaction and build good interactions or motivation, students would be more involved and inspired. This ensures that they are more likely to go to school, participate, socialize, and indulge in studying, thereby becoming more likely to attain academic achievement. In the other hand, students who disagree with their teachers frequently develop disciplinary issues and therefore receive low grades at school (Awang et al., 2013).

2.16.8 Disparity in learning and teaching styles. Students not only practice in different forms but teach in numerous ways as well. Ideally, the students perceive and view knowledge from various points of view: viewing and listening, thinking and action, intellectual and intuitive thought, interpretation, and simulation. Thus, a disparity between the teacher's teaching style and the LS of most students will contribute to bad results and undesirable arrogances towards a course (Naik, 2013). Therefore, aspects of the form of teaching and learning should complement each other. This does not happen much enough. Determining the academic style of each pupil is challenging, and either teaching it solely or putting students in separate classes based on their preferred interests. Teachers may, however, discuss the LS provides a variety of learning possibilities to fit all groups of students in a class (Aliakbari & Qasemi 2012). Analysis found that a study mode and teaching style together helps students to maintain and use data longer than their peers, who are familiar with differences in understanding and design. (JilardiDamavandi, 2011).

There is also clear observational indication since different backgrounds that success of students is improved as their LS are determined. Ahanbor and Sadighi (2014) According

ability can be improved by teachers modify their instructions and giving students a range of ways to understand what is being discussed in class. Therefore, teachers should perform a needs review before using any instructional materials to assess their students' LS. In short, the combination of teaching styles with LS of the students is essential for successful students' academic success (Zhou, 2011).

2.17 Learning Styles by Gender

Gender differences are variances between males and females that are based on biological adaptations that are the same for both sexes. This differs from sex differences in that sex differences are driven by actual biological gender disparity (such as distinct physical differences) rather than by differing environmental factors that affect our cognition and behavior (Ameen, 2007). Gender interest is learning for students is not new, a lot of research has its own approach. Gender has different preferences in LS. The serval researches indicated that female and male learn in a diverse way (Gabe, 2002). Lincoln and Rademacher (2006) female learners tended to use their auditory senses while male learned to better while taking notes. The LS to represent the differences or interests between learners, which have an effect on learning. There are biochemical, social, psychological, and mental changes of both male and female students. In the perception, intellectual, sensation, and behaving of pupils, there are a variety of answers also in one demographic. In various genders, multiple differences can occur. Chohen (1986) used various tools to research LS of male and female students, Gender-based differences in LS have also been reported. Kovalik (2008) They think differently, play differently, fight differently, perceive the world differently, hear otherwise and show their feelings differently. The author claims this is due to the disparity in the minds between girls and boys. A research by Gokalp

(2013) shows the outcomes of this study to prove that there is a substantial metamorphosis between the student's LS and academic achievement. JilardiDamavandi et.al., (2011) the result of this showed there is a statically significant Gender-Based difference in LS. The gender factor shows a different style of learning preferences and differences exist in terms of gender between the style of learning preferences. Siddique, Abbas, Raiz, and Nazir (2014) on this research on Pakistani students endorsed this argument, stating that male and female students exhibit different perceptual LS. The students' visual, community and kinesthetic LS on gender is considerably different. The finding of this analysis by Din (2009) presented that there was a substantial mean difference in LS to grade achievement at the level of the Masters. The outcome of this research has also shown that there is no substantial disparity between male and female students with LS.

Geetha and Praveena (2017) also concluded that there is a substantial disparity in high school students' learning patterns and interest in biological science. Wehrwein, Lujan, and Dicarlo (2007) Gender discrepancies between undergraduate physiology students in LS preferences. Thus, there are considerably different learning patterns for male and female pupils. The teacher is responsible for managing this variety of learning types and designing suitable approaches to learning.

2.18 Relationship between learning styles and students Achievement

In many ways, devoted educators sought to boost their students’ academic success (Abidin, 2011). According to Abidin (2011), any such way is to perceive the gaining knowledge of each student to determine the strengths of academic achievement. Castro and Peck (2005) claimed that preferred LS can be enhanced the academic achievements of the students. Abidin et al. (2011) participants have been influenced by several LS or a mixture

of different LS. It must also be noted that student LS affect students overall academic achievement. Some previous studies on LS have provided some significant results in trying to identify learners by skill. Dunn (1978) created a comprehensive model they must deal with environmental Psychological Sociological Physical and Emotional LS features. It must also be assumed that these learning types must be provided directly with data on teaching strategies and students' academic achievements.

The one cause of the loss through the academic lifecycle is that students cannot observe in the area where they live, what they have learned during their academic life. With the help of using ideas they have discovered throughout their academic education, often students have not been able to describe regular phenomena. Not because of the lack of know-how, all university students attend seminars and practical exercises and are further judged for what they have learned and found. Ashkenazi (2006) is not only a question about the lack of capacity to transform domain-specific information into everyday lifestyles. Evidence shows that the understanding obtained by individuals is divided and unpredictable. Most pupils are no longer trying to pay attention to learned know-how, so from the very start of their studies, they are unable to understand the fundamental ideas. Nakhleh (1992) Suggests that the students' meanings sometimes differ from what the professor retains and has attempted to provide. It is possible to distinguish different forms of misunderstandings as college students are asked to clarify their interpretations of the expectations package. Such misunderstandings conflict with subsequent theoretical analysis when examining the mental architecture of the participants. But this lack of logical information does not conflict with the capacity of the students to work accurately in trouble-fixing circumstances. In a look at the "idea to get to know as opposed to trouble

fixing. A study undertaken by Sawrey (1990) asked students to answer questions that were focusing on the same idea. With the help of using a mathematical formula, the first was a computational solve quarries; the second evolved into a logical question that has no associated formulation with it. Only 31 percent gave the second (conceptual) question a correct answer, and 88 percent solved the primary one correctly. This indicates that most scholars are discovering ways to use a formula to solve problems without having basic idea know-how. In this way, the discussion can be concluded that each student in a class did not own and comply with the same method of mastering. This pressured to accept that distinctive pupils favored specific getting to know patterns. These distinct LS affect their learning performance. Verma and Sherma (1987) Carried out a report on “educational accomplishment in terms of teenage learning types”. The key results are the college students’ organization having players knowing that style has higher performance within the overall vicinity of the study than the organization having avoided mastering fashion. Another observation was carried out with the aid of Dunn (1989) Another observation on college students for preparation: impact of studying style on success and mentality" carried out with the help of (Dunn, 1989). The consequences discovered that gaining knowledge of style had a marvelous impact on fulfillment and mental setting as the students preferred to study alone executed significantly higher in getting to know by myself circumstance and the students desired to study with friends accomplished significantly better in peer condition study.

2.19 Related Researches

One of the most important issues in learning is that individuals are responsible for their own learning. When learners are responsible for their own learning, they will give

meaning to the learning process, leading to effective learning. Exploring the link between LS and academic success is a controversial issue that requires more investigation. Several studies have shown that students' academic achievement is significantly increased when each style is considered while learning (Elci, Kilic & Alkan, 2012). Alavi and Toozandehjani (2017) concluded that having a background of the learning styles of students can enhance their learning and at the same time help students strengthen self-actualization.

The following section explores the link LS between academic achievement of students. This claim is further discussed.

Abidin and Rezaee (2011) found that there was a substantial correlation between the LS and students' academic success in an Islamic school of Malaysia. A study conducted by Alade and Ogbo (2014) the purpose of this study was to investigated the relationship of learning styles preferences and academic achievement of chemistry students at Secondary schools in Lagos metropolis, Nigeria. The finding of this study revealed that there is a significant relationship between learning styles and academic achievements of the students. Further concluded that at chemistry students in Nigeria preferred visual learning styles. Maxwell (2017) the purpose of this research was to investigate the important connection between learning styles and academic performance of the students at secondary school. It was a correlational study. The sample size of this study was 345. A stratified sampling technique was used for data collection. The VAK model of Flaming (2001) was used. Person correlation was applied to test the null hypothesis. The findings showed that there was an important association between visual, auditory and kinesthetic learning styles and academic success of the students. Study by Holliday (2009) on the relationship between

visual learning style and academic success of pupils, using the survey research design and a population of 321 primary schools' pupils, the study reveals that visual learning styles significantly enhance academic achievement of pupils at the primary level. A study carried out by Mulalic (2009) to define the Perceptual learning styles of the students. It was based on VAK model. The result of this study showed that the most preferred style of the student learning was Kinesthetic. And minor preferred style of the student learning was Auditory and Visual. Hebaishi (2012) the findings, however, revealed the lack of a momentous association among LS and academic success. Conversely, there was a strong positive association between the use of learning approaches by participants and their academic performance. Nja et al., (2019) found that visual and auditory LS significantly correlate with the academic success of the science students at undergraduate science students. Khurshid (2012) the purpose of this study is to find out the relationship between learning styles and academic performance of the college students in Islamabad. The results found a statically important link between visual and auditory LS and the academic achievement of science students at postgraduate colleges in Islamabad. Anand and Rajendraprasad, (2016) concluded that there is significance relationship between visual and auditory LS and the academic achievement of the primary school in Karaikal District. İlçin (2018) the aim of this research was to measure the relationship between learning styles and academic performance in TURKISH physiotherapy students. The Pearson correlation coefficients was used to check the relationship between learning styles and academic achievements of students. The results exposed that there is a relationship between learning styles and academic performance of students. Khan (2019) the research population was composed of BS programs from all public sector colleges in Punjab Province. The Branch LS inventory

(BLSI) develop by Branch (1996) was used as a research instrument. The research showed that the auditory learning style had a significant correlation with the academic achievement of science students. Almomani (2019) indicated that kinesthetic LS and students' academic success are not interrelating in king south University. The outcome of Zayed (2017) also identified that there was no statistically significant link between kinesthetic LS and their educational success. Rahman & Ahmar (2017) also exposed that there was no statistically noteworthy association between LS and academic achievement. Furthermore, both displayed equal references to (VAK) LS. Chaudhary et al. (2015) The aim of this research was to recognize their connection with the academic success of medical undergraduate students in Pakistan's different medical colleges. A cross-sectional analysis of 597 medical students (100 from each college) from six medical colleges was conducted. To categorize students' learning types, the validated VARK questionnaire version 7.0 was used. The questionnaire is composed of 16 elements that define four research modes. (VAK). The results indicated that the preference for LS (VAK) and academic performance were not related. Dalmolin et al. (2018) discovered that there was a positive connection between learning styles and academic performance of students. Jhaish (2010) the study results showed that the success and auditory style are very well correlated, but no significant correlation exists between performance and kinesthetic and visual styles. A study carried out by Vaishnav and Chirayu (2013) to explore the relationship of different learning styles on academic Achievements of the student at Secondary School Level. It was based on the VAK model (visual Auditory Kinesthetic). VAK learning style inventory was used to check the preferred learning styles. Pearson correction co-efficient used to check the correlation between learning styles and academic achievements at Secondary School Level.

It has to be concluded that Kinesthetic leaning style are more prevailing than visual and auditory. Kinesthetic learning styles and academic achievement has a positive high correlation. (r=0.658). The other two auditory learning styles and visual has a positive relationship but they have not strong for auditory r=0.287 and visual r=0.129. Ismail (2010) carried out a study on the implication of visual learning styles on pupil academic success in Bilkent using survey research method. The study was conducted among 102 pupils between the age of five and ten who responded to the Jeffrey Barsch Learning Style Inventory and their test scores were used to calculate the statistical Pearson correlation. The study showed that there is a weak positive statistical relationship between visual learning styles and achievement of pupils in foreign language. Nzesei (2015) the purpose of this study is to determine the relationship between learning styles and academic achievements of the English students in Kenya". Barsch Style Inventory (1996) was used for the collection of data. The findings of this study showed that there is a strong positive correlation between student learning styles (visual. Auditory kinesthetic) and academic achievement of English students at Secondary School Level in Kenya. A study carried out by Magulod (2019) revealed there were significant relationships between learning styles, study habits and academic performance of students in applied science courses. The most preferred style was kinesthetic of Filipino University students in applied science courses. Nja (2019) this research work investigated the relationship of learning styles and academic performance among Science Education undergraduates of the University of Calabar, Nigeria. The results revealed that there is a significant relationship of learning styles and academic achievement of the science students. Hina el al., (2010) the findings indicate that most of the pupils have auditory and kinetic LS and a connection to various multiple

intelligence categories. The results from Akhtar (2010) the study found that LS does not influence the achievement, but the evaluation system impacts the success. Khan at al., (2019) the result indicated that most students prefer visual LS, and there is an important link between LS and academic achievement of college students. Geeetha and parveena (2017) science students preferred to learn biology through kinesthetic LS. Anand and Rajendraprasad (2016) concluded that there is significance relationship between visual and auditory LS and the academic achievement of the primary school in Karaikal District. Meshack (2015) showed that there is a strong correlation between the learning patterns i.e. visual auditory kinesthetic and academic achievement of secondary students who prefer the three educational patterns (VAK). Leung et al., (2014) found that the only factor that has a significant macroeconomic link with the final grade is the kinesthetic LS. Aliakbari and Qasemi (2012) high performance was having more visual pupils, while the less visual performance was seen in contrast to auditory and kinesthetic. Abidin et al., (2011) carried out a research to investigate the relationship between visual learning styles and academic achievement using a total of 317 pupils in an Islamic school in Malaysia and employed the survey research method. The Learning Styles Survey (LSS) instrument which is based on Joy Reid's Perceptual Learning-Style Preference Questionnaire (1987) was used. The statistical procedures employed in this study were one-way ANOVA, and multiple regression analysis. The analyses of the data indicated a significant relationship between overall academic achievement and visual learning styles. It was also found that the high, moderate and low achievers have a similar preference pattern of learning in all learning styles.

With respect to LS and gender, many studies have shown that female and male learn differently. Amran (2011) stated that visual LS was chosen both male and female, and the least chosen kinesthetic form. Ren (2013) stated that males are visually and kinesthetically, while females are more auditory. The finding of this analysis by Din (2009) showed that there was a substantial mean difference in LS to grade achievement at the level of the Masters. The outcome of this research has also shown that there is no substantial disparity between male and female students with LS. Gokalp (2013) the results of this analysis indicate that there is a disparity between the students LS and academic achievement. Siddique et al., (2014) findings of this research revealed that male and female students show different perceptual LS. The visual, group and kinesthetic LS of the students about gender were substantially different. JilardiDamavandi (2011) it showed that there is no statically important gap between LS students and academic achievements. Amran et al. (2011) showed that, with respect to gender and LS, the majority of men and women preferred the kind of visual LS and the least favourite kind of kinesthetic LS. According to Park (1997), female students prefer a kinesthetic type of learning, while males were more tactile than females. Meanwhile, Lincoln and Rademacher (2006) suggested that female learners tended to use their auditory senses while male learners learned to better while taking notes (reading or writing LS). Siddique, Abbas, Raiz, and Nazir (2014) on this research on Pakistani students endorsed this argument, stating that male and female students exhibit different perceptual LS. The students' visual, community and kinesthetic LS on gender is considerably different. Munir at al., (2018) revealed that girls having a more visual and auditory LS as compared to the boys and boys preferred kinesthetic LS and there is a significant difference between visual auditory and kinesthetic LS based on

the gender at the Secondary School Level. Rahman and Ahmar, (2017) this study was conducted on the 1st year college students of Indonesia. The results found that mathematics girls prefer visual and auditory LS more than boys and boys preferred kinesthetic learning styles as compared to the girls in Indonesia. Wehrwein (2006) the results showed that there is a momentous gender difference in LS (i.e. visual Auditory and kinesthetic) to undergraduate physiology at Michigan State University.

As per Dunn and Dunn (1978), just 20-30% of school-age youngsters seem, by all accounts, to be Auditory students, 40% are visual students and kinesthetic 30-40% learners. Barbe and Milone (1981) expressed that for younger students the most successive methodology qualities are visual (30%) or mixed (30%), followed by auditory (25%), and after that by kinesthetic (15%). Value, Dunn, and Sanders (1980) find that the most kinesthetic are exceedingly young people, that there is a gradual development in visual qualities through the rudimentary stages, and that most teenagers can understand and keep data in the auditory sense only in the fifth or sixth grade. Munir and Ahmed (2018) the aim of learning is success. If LS are effective and useful, if students are giving good results and showing a positive attitude it means LS are useful. In the other side, the unsatisfactory performance of the pupils shows the weakness of the LS.

Summary of Chapter

As a whole, this chapter discusses the learning styles and academic achievement of science students. This chapter focuses on describing the concept of learning, learning theories, learning styles, models of learning styles, science education, and also explain the academic achievement and the previous research on learning styles and their relationship with academic achievement. The related definitions and terms are also described in this

chapter. From the discussion, it can be concluded that there are flexible results on the relationship of learning styles and academic achievement depending on the subjects of the programs that the student involves. As for that, this study aims to identify the relationship of learning styles and academic achievement of science students at the secondary level. This study is expected to help students in applying the effective learning styles that they preferred as well as assist the teachers or instructors in delivering the teaching styles in the best way. This might help to improve the academic achievement of science students.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter describe the methodology of the present research. It includes the research design, population, sample and sampling technique, data collection procedure, research instrument, validity and reliability and data analysis.

3.1 Research Design

Durrheim (2006) has stated that research design is a set of instructions, guideline and procedure to study the research problem. The design consists of objectives of the study, hypotheses and particular method to achieve objectives. The purpose of the current study was to check the relationship of two variables that is learning styles and academic achievement of the secondary school science students, so that is why the researcher used a correlation research design to measure these two variables. Baker (2017) the correlation is a statistical procedure to measure and describe the relationship or association between two variables. The researcher may not know whether the variables are related, or may suspect that one influences the other. In either case, no attempts were made to manipulate an independent variable in correctional design. Curtis et al., (2014) a correlational research design investigates relationships between two variables without the researcher controlling or manipulating any of them. Correlation research is a significant in surveys about educational research and refers to an effective investigation tool to collect data in relation to address educational problems (Gay, Mills & Airasian, 2006). Correlational researches

are carried out to know the relationship between two variables. It also explains whether the relationship is positive, negative, or neutral (Gay, Mills & Airasian, 2006). According to Arbuckle (2013) a single-headed arrow denotes a cause to effect (regression model) between two variables. A double-headed arrow between two variables denotes a correlation between them. Seeram (2019) the statistical measure of the strength of relationships between two variables is the Pearson correlation coefficient, which is symbolized by the letter (r). The value of the correlation coefficient ranges from r= –1.00 to r = +1.00. So, in this situation the researcher used the double handed arrow to links between the two variables, and to check the relationship of two variables. The researcher applied the statistical test that is the Pearson correlation. In order to measure the value of the correlation coefficient range, researcher follow the rule of thumb given by (Ratner, 2009).

3.1.1 Research Approach. For purpose of achieving research objectives and to deal with the research study the researcher used the quantitative research approach. Research approach is a border concept which reflect the research paradigm. The quantitative research approach is based on numerical measurement and statistical test are used for data analysis. Holton and Burnett (2005) quantitative research involves collecting and converting data into numerical form so, that statistical calculations can be made and conclusions drawn. Creswell (2014) the quantitative research approach are plans and the procedures for research that includes the detailed methods of data collection, analysis, and interpretation.

For this study, an adapted questionnaire of Branch learning styles inventory (visual, auditory, kinesthetic) develop by Branch (1996) was used by the researcher to collect the data from male and female grade 10^{th} science students of Govt. High Secondary Schools in Rawalpindi. Academic achievement was based on their sendup score of grade 9^{th}. After

gathering the needed data, appropriate statistical tools were used to interpret the findings of the current study. Descriptive statistics such as mean, and frequency were used. Inferential statistics such as correlation and independent sample t-test were used to test the null hypotheses of the current study.

3.2 Population

The population for the current study was the students of Govt. High Secondary Schools in Rawalpindi. The total number of Govt. High Secondary schools in Rawalpindi are 168 among those; 90 are Girls' and 78 are Boys' schools.

The List of Govt. High Secondary schools in Rawalpindi were received from the EDO (Executive District Officer) and got the exact list of total enrollments in grade 10th science students. The list of schools in the Govt. sector was listed in Appendix M.

3.2.1 Target Population. The target population of this study was the grade 10th science students of Govt. High Secondary Schools in Rawalpindi

Table 3.1

Target population of Male and Female science students in Govt. High Secondary schools of Rawalpindi

Sr. No.	Number of Selected Schools	Gender	No. of Science Students
1.	12	Male	946
2.	12	Female	890
Target population	24		1836

The above table indicates that the researcher selected 24 Govt. Higher Secondary schools in Rawalpindi. 12 Schools for Boys and 12 Schools for Girls for the collection of the data. The table also shown that the target population of the current study was N= 1836 including male n= 946 and female n=890 science students of grade 10^{th} from Govt. High Secondary schools of Rawalpindi.

3.3 Sample and Sampling Technique

When conducting a research, it is not impossible to consult all individuals in a specific group (or population) when collecting data for quantitative research, and it is often impractical. It is more appropriate to choose a sample. The sample is, therefore, a practical method for investigating a whole population (Formosa et al. 2011). According to Mujere (2016) a sample is a group of people, objects, or items that are taken from a large population for a measurement. The sample representative of the population ensures that we can generalize the findings from the research sample to the population as a whole.

Two groups were involved in the present study. One is a male science student and the second is a female science student. The Population of the current study was based on these two groups. According to the needs of the research objectives, the researcher used stratified proportionate sampling techniques in this study to ensure adequate distribution of population elements in the entire sample. The sample of the present study consisted of two strata of male and female science students.

The following steps are the specific steps of the sampling procedure:

Step 1: The sample consist of this study was the grade 10^{th} male and female science students of Govt. High Secondary schools in Rawalpindi, were defined first and foremost.

Step 2: Two stratum of male and female were derived for the current study based on gender.

Step 3: For the current study, researcher took the sample size by using Krejcie and Morgan's (1970) table to determine sample size from a target population (N= 1836). According to this table, the sample size of the current study was N=317 of 1836; that is, 17% of the target population.

Step 4: For collecting data from each stratum of female and male science students of Govt. High secondary schools in Rawalpindi, the researcher applied the stratified proportionate sampling techniques to obtain the sample size of male n=163 (17%) and female n=154 (17%). The fig. 3.1 shows the complete picture of target population and sample size of this study.

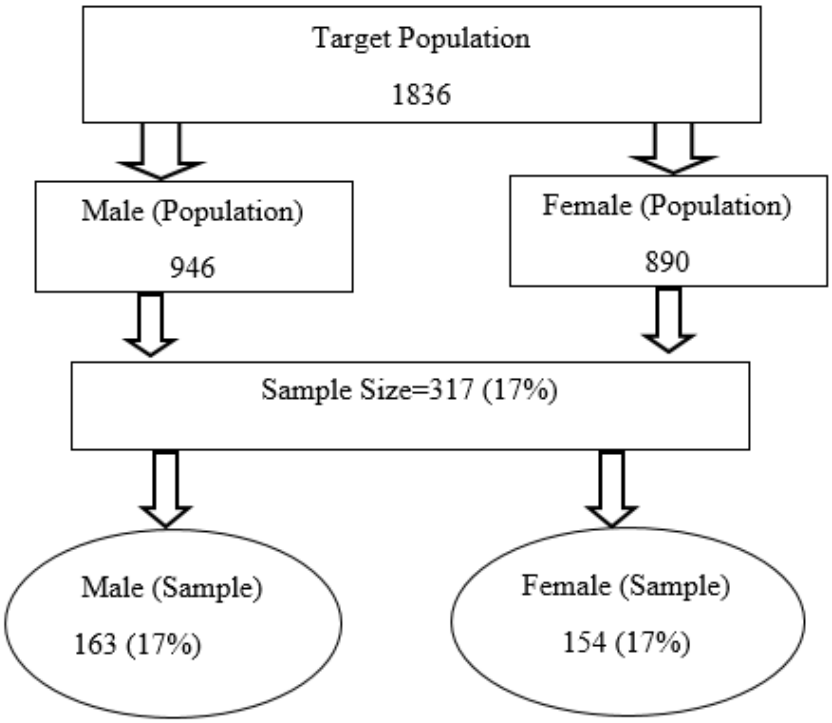


Figure 3.1 Target population and sample of the study

3.4 Research Instrument

The Branch learning Style Inventory (visual, auditory, kinesthetic) developed by Branch (1996) was adapted as a research instrument, and whose approval was officially obtained and received online. The instrument of the present study consists of two parts, the first part was a demographic part, in which the researcher took the information about participants, demographic information such as gender, institution name, and the second part was based on the 44 statements related to students' learning styles (visual, auditory, kinesthetic). Each statement has five options on the Likert scale that was, 1=strongly disagree 2=disagree; 3=uncertain; 4=agree; 5=strongly agree. Students select the corresponding description/statement and write down the scores of their chosen object. Academic achievement is evaluated based on previous (December results of grade 9th science students in 2019).

Table 3.2

Items of Learning Styles (Visual, Auditory, Kinesthetic) Questionnaire

Scale	Demission	No of statements	No of Items
LS	Visual (V)	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	15
	Auditory (A)	16,17,18,19,20,21,22,23,24,25,26,27,28,29	15
	Kinesthetic (K)	30,31,32,33,34,35,36,37,38,39,40,41,42,43,44	15
		TOTAL	45

The Above table 3.2 shows the initial version questionnaire that was based on the of the learning styles (visual, auditory kinesthetic). The total items of the learning styles questionnaire were 45, including 15 visual statements, 15 auditory statements, and 15 kinesthetic learning style statements.

Table 3.3

Academic Achievement criteria of science students grade 10th of Govt. High Secondary Schools in Rawalpindi.

NO.	Percentage of Marks	Remarks	Coding in SPSS
1.	33% and above but below 40%	Satisfactory	1
2.	40% and above but below 50%	Fair	2
3.	50% and above but below 60%	Good	3
4.	60% and above but below 70%	Very good	4
5.	70% and above but below 80%	Excellent	5
6.	80% and above	Distinction	6

The table 3.2 shows the academic achievement criteria of grade 10th science students of Govt. High Secondary Schools in Rawalpindi. The researcher obtained marks from students and converted them into percentages and then into coding for SPSS. Under coding in SPSS '1' represents 33% and above but below 40%, '2' represent marks between 40% and above but below 50%, '3' represent marks between 50% and above but below 60%, '4' represent marks between 60% and above but below 70%, '5' represent marks between 70% and above but below 80% and '5' represent 80% and above.

3.4.1 Demographic Information. The Researcher has prepared the demographic form. It included things to collect data on the following variables.

- Gender: refers to the participant's sex of the study. Researcher asked the participants to check one: 1. Male 2. Female.

- Name of the Institution: It refers to the name of the institute in which the participant is Studying.
- Academic score

3.4.2 Five Point Likert Scale. Five-point Likert scale scoring was based on criteria i.e.

1. Strongly disagree
2. Disagree
3. Not sure
4. Agree
5. Strongly agree

3.4.3 Validity of the Instrument. Validity of a research instrument assesses the extent to which the instrument measures what it is designed to measure (Taherdoost, 2016).

Taherdoost (2016) content validity is the type of the validity that defined as "the degree to which items in an instrument reflect the content universe to which the instrument will be generalized" (Straub et al., 2004). Jhangiani and Chiang (2015) define that construct validity is about ensuring that the method of measurement matches the construct that want to measure.

In this research the researcher consulted the academic experts to determine the content and construct validity of adapted research instrument of learning styles. Three expert opinions were taken to determine the content and construct validity of the research instrument from the National University of Modern Languages, Islamabad. In the light of the experts' opinion, the instruments were finalized.

The learning style instrument was also translated into the Urdu language (for a better understanding of the students) by the Lecturer of Govt. Viqar-un-Nisa, College Rawalpindi. In addition, the tool has been validated by the Urdu language expert.

3.4.4 Suggestions of the experts. In the demographic information don't add the age. Add the name of the institution to the demographic information. In the demographic information add the coding male 1. and female 2. Under Operational definition explain components of VAK model (visual, auditory, kinesthetic). Add I learn better in class when I listen to my class fellow instead of I learn better in class when I listen to someone. Add-l can learn better about a subject by listening to a lecture instead of I can remember best about of subject by listening to a lecture. Add I memorized things I heard in class better than things I have read instead of I can remember things I have heard in class better than things I have read. In the likert scale change, the order from strongly disagree to strongly agree instead of strongly agree to strongly disagree. Add I learn better by reading aloud than writing on paper instead of I learn better by repeating load than writing on paper. Add I like to take notes for visual review instead of I like to write things down or take notes. Questionnaire may contain at least 15 statements per subscale for pilot testing. In the light of the experts' opinion, the instruments were finalized.

3.4.5 Pilot Testing. Pilot testing of the questionnaire was examined before the distribution of the questionnaire. The pilot testing was conducted in two Govt. high secondary schools in Rawalpindi. Researcher personally visited the schools and collected data. The questionnaire was distributed among 60 science students (30 boys and 30 girls) of grade 10th. Deficiencies of the questionnaire were obtained with the help of pilot testing and suggestions for its improvement

Table 3.4

Schools of Pilot testing (n=60)

S.No	Name of Institute	Gender	Total
1	Govt. Girls High Secondary School No.1Bagh Rawalpindi	Female	30
2	Govt. Boys High Secondary School Islamia No.1 Rawalpindi	Male	30

3.4.5 Reliability of the Instrument. A Reliability of the questionnaire was tested using Cronbach Alpha. The reliability value is shown below in the table:

Table 3.5

Cronbach's Alpha Reliability of Learning Styles Scale (LS) Scale Pilot testing (n= 60)

Scale	Major Types	Items	Cronbach's Alpha Reliability
Learning Styles			
	Visual	15	.854
	Auditory	15	.867
	Kinesthetic	15	.889

The above table shows the reliability of the learning style scale, that is, visual auditory, and kinesthetic. The reliability of Visual (.854), Auditory (.867), and Kinesthetic was (.889).

Table 3.6

Inter-Scale Correlation of learning styles (Visual, Auditory Kinesthetic) Scale Pilot Testing (n=60)

	Visual Learning Style	**Auditory learning Style**	**kinesthetic Learning Style**
Visual learning style (LS)	1		
Auditory LS	.701**	1	
Kinesthetic learning style	.792**	.899**	1

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

The table shows that learning styles (visual, auditory, kinesthetic) were statistically significantly correlated with each other at the 0.01 level of significance. It has been observed that there is the highest correlation between auditory and kinesthesia (.899**). Although the correlation between auditory and visual was found to be the lowest (.701**).

Table 3.7

Item Correlation of Learning Styles (Visual, Auditory, Kinesthetic) Scale(n=60)

Items Code	R	Items Code	R
V1	.619**	**A24**	.525**
V2	.526**	**A25**	.503**
V3	.579**	**A26**	.131
V4	.691**	**A27**	.705**
V5	.536**	**A28**	.768**
V6	.500*	**A29**	.509**
V7	.462**	**A30**	.744**
V8	.567**	**K31**	.582**
V9	.632**	**K32**	.674**
V10	.590**	**K33**	.728**
V11	.547**	**K34**	.809**
V12	.676**	**K35**	.724**
V13	.771**	**K36**	.705**
V14	.581**	**K37**	.653**
V15	.591**	**K38**	.627**
A16	.672**	**K39**	.600**
A17	.563**	**K40**	.623**
A18	.621**	**K41**	.618**
A19	.585**	**K42**	.666**
A20	.726**	**K43**	.660**

A21	.531**	**K44**	.537**
A22	.585**	**K45**	.529**
A23	.736**		

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

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

The above table 3.7 shows the Item correlation of learning styles (visual auditory, kinesthetic) Scale. The highest total correlation was the item No A34 (.809**) and the lowest item-total correlation was the item No. A26 (.131).

3.5 Final Version of Questionnaire

The table 3.7 shows that 1 out of 45 items had a level of correlation of less than .30, which was A26. So, the A26 was excluded.

Table 3.8

Items of Learning Styles Questionnaire

Scale	Types	Items Coding	No of Items
Learning Styles	Visual (V)	V1- V15	15
	Auditory (A)	A16- A29	14
	Kinesthetic (K)	A30- A44	15
		Learning Styles	44

The above table shows the final version questionnaire of learning styles (Visual, Auditory, Kinesthetic). There were total 44 statements of learning styles questionnaire out of which 15 were Visual statements, 14 were Auditory statements and 15 statements for the Kinesthetic learning styles.

3.6 Data Collection

Approval was granted from the heads of the institutions. Data was collected through a questionnaire. The researcher has personally visited schools to collect the data. The self-administered approach was used where students completed the Branch Learning Style Inventory (BLSI), which proceeds 10-15 minutes, in the classroom. All the instructions related to questionnaire were given to the students and queries were entertained as per need. The researcher made it clear to the students that all the study findings would be applied only to research work. Ultimately, valid questionnaires were taken into consideration.

Academic achievement was assessed based on send-ups score (grade, 9th Science Students' December 2019).

3.7 Data Analysis

Data analysis is intended to organize, structure, and derive significance from research data (Eshiwani, 2004). After collecting data from male and female science students of grade 10th, the researcher analyzed the data by using SPSS 21.0. For the purpose of data analysis, the researcher used statistical techniques like, Mean Frequency, Correlation, Independent t-test were used for the fulfillment of the current objectives.

Table 3.9

Data Analysis

S.NO	Objectives	Hypotheses	Statistical Test
1	To explore the learning styles of science students at Secondary School Level.		Mean
2	To identify the academic achievements of science students at Secondary School Level.		Frequency
3	To identify the relationship between learning styles and academic achievement of science students at Secondary School Level.	**H_{o1a}**: There is no significant relationship of Visual learning style and academic achievement of science students.	Correlation
		H_{o1b}: There is no significant relationship of Auditory learning style of science students and their academic achievement at Secondary School Level.	Correlation

		H_{o1c}: There is no significant relationship of Kinesthetic learning style and academic achievement of the science students at Secondary School Level.	Correlation
4	To find the gender-based difference regarding learning style (visual, auditory, kinesthetic) learning styles	**H_{o2a}**: There is no significant difference in the visual learning style and academic achievement of science students based on gender.	Independent t-test
		H_{o2b}: There is no significant difference in the auditory learning style of science students based on gender.	Independent t-test
		H_{o2c}: There is no significant difference in the kinesthetic learning style of science students based on gender.	Independent t-test

5	To find the gender-based difference regarding academic achievement of science students at Secondary School Level.	**H_{o3}**: There is no significant difference in academic achievement of students based on gender.	Independent t-test

3.8 Ethical Consideration

The researcher remembered ethical considerations during the execution of the study. The present research was based on the relationship of learning style and academic achievement of students at secondary level. In the questionnaire the participant name was not mentioned, and the investigator also tell the respondents that their responses should be used only for the research purpose.

3.9 Delimitation of the Research Study

This study was delimited to the following:

- Due to lack of resources and time limitation research work was delimited to the grade 10^{th} science students.
- Data were collected from 12 girls' and 12 boys' Govt. Secondary Schools of Rawalpindi, respectively.
- Due to COVID-19 the students of grade 9^{th} were promoted without final examination to grade 10^{th} so in this research academic achievement was assessed based on sendup scores (grade 9^{th} science students, December 2019).

Summary of the Chapter

This chapter discussed the methodology of the present research. It includes the research design, research approach population, sample size, sampling technique, data collection procedure, research instrument, validity of the research instrument, pilot testing reliability of the research tool, and data analysis and the end delimitation of the study were discussed. In this study the target population of this study was grade, 10^{th} science students. For the present research, an adapted questionnaire of Branch learning styles inventory (1996) (visual, auditory, kinesthetic) was used by the researcher to collect the data from the male and female science students at the Secondary School Level in Rawalpindi. Academic achievement was based on their sendup score of grade 9^{th}.

The questionnaires have been distributed to the respondents by hand. Chapter 4 has discussed further the results of this present study.

CHAPTER 4

ANALYSIS OF DATA

4.1 Introduction

In this chapter, the researchers discussed data analysis and its interpretation in detailed. The data of the present study were obtained from (19th September to 20th November 2020). The respondents of the present study were both male and female science students of class X. The Branch learning Style Inventory (visual, auditory, kinesthetic) developed by Branch (1996) was adapted as a research instrument. The adapted questionnaire of this study was a list of 44 statements related to students' learning styles (visual, auditory, and kinesthetic). Each statement has five options of the Likert scale that was 1=strongly disagree, 2=disagree, 3=uncertain, 4=agree, 5=strongly agree. The researcher provides a complete guideline to the science students of grade 10th and asked them to give a response during the administration of the survey. Due to COVID 19, 9th grade students were promoted to 10th grade without final exams. Therefore, in this study, the academic achievement was measured based on send-up scores (December results, 2019 of 9th grade science students). After gathering the needed data, appropriate statistical tools were used to interpret the findings of the current study. Descriptive statistics such as mean, and frequency were used. Inferential statistics such as correlation and independent t-test were used to test the null hypotheses of the study.

4.2 Gender Wise Distribution (N= 317)

Table 4.1

Gender Wise Distribution (N= 317)

Gender	Frequency	Percent
Male	163	51.4
Female	154	48.6
Total	317	100.0

The table indicated that there were 317 respondents out of which the male respondents were 163 (51.4) and the female were 154 (48.6).

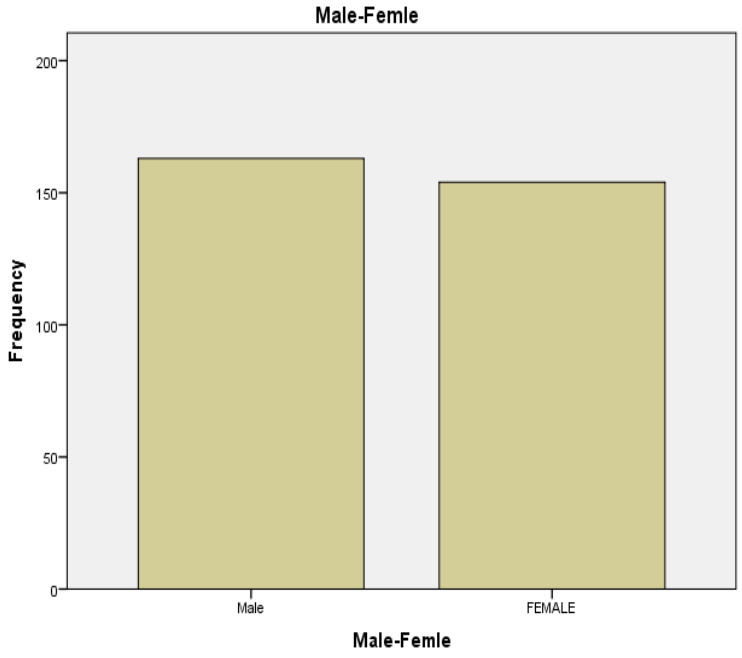


Figure 4.1 Gender-Based Distribution (N=317)

Objective 1: To explore the learning styles of Science Students at Secondary School Level.

Table 4.2

Mean of learning styles of Science Students at Secondary School Level. (N=317)

No.	Variables	Means	Remarks
1.	Visual	4.24	Agree
2.	Auditory	4.22	Agree
3.	Kinesthetic	3.8	Agree

The above table shows that the mean value of visual (4.22), Auditory (4.22), and Kinesthetic learning style is (3.8). The highest mean score observed for visual learning style is (4.24), on the other hand, the lowest mean score observed for Kinesthetic is (3.8). So the results concluded that science students prefer the visual learning style according to the mean value. The least preferred style according to the mean score was kinesthetic learning style (3.8).

Objective:2 To identify the Academic Achievement of Science Students at Secondary School Level.

Table 4.3

Average results of science students at Secondary School Level (N=317)

No	Average results of students	Frequency	Percent
1.	33% and above but below 40%	11	3.5
2.	40% and above but below 50%	18	5.7
3.	50% and above but below 60%	24	7.6
4.	60% and above but below 70%	70	22.1
5.	70% and above but below 80%	140	44.2
6.	80% and above	54	17.0
	Total	**317**	100.0

The above table indicates that most of science students (140) are between 70% and above but below 80%. However, 70 students are between 60% and above but below 70%, but only 5 students are between 80% and above. While 24% students are between 50% and above but below 60%. 18 students are between 40% and above but below 50%. And the lowest respondents of the academic achievement are only 11 are between 33% and above but below 40%.

Table 4.4

Average results of the Female science students at Secondary School Level (n=154)

No	Average results of students	Frequency	Percent
1	33% and above but below 40%	2	1.3
2	40% and above but below 50%	5	3.2
3	50% and above but below 60%	11	7.1
4	60% and above but below 70%	31	20.1
5	70% and above but below 80%	59	38.3
6	80% and above	46	29.9
	Total	**154**	

The above table indicates that 59 of the female students are between 70% and above but below 80%. While 46 of the females are between 80% and above. 31 are between 60% and above but below 70%. 11 of the female students are 50% and above but below 60%. 5 of the female students are between 40% and above but below 50%. And only 2 females are between 33% and above but below 40%.

Table 4.5

Average results of Male science students at Secondary School Level (n=163)

No	Average results of students	Frequency	Percent
1.	33% and above but below 40%	9	5.1
2.	40% and above but below 50%	13	7.4
3.	50% and above but below 60%	13	7.4
4.	60% and above but below 70%	39	22.3
5.	70% and above but below 80%	81	46.3
6.	80% and above	8	4.6
	Total	**163**	

The above table exhibits that 81 of the male students are between 70% and above but below 80%. While 39 of the male are between 60% and above but below 70%. 13 are between 50% and above but below 60%. 13 of the male students are 40% and above but below 50%. 8 of the male students are between 80% and above. And only 9 male science students are between 33% and above but below 40%.

Objective 3:

To Identify the relationship of learning styles (visual, auditory, kinesthetic) and academic achievement of science students at Secondary School Level.

H_{o1}: There is no significant relationship of learning styles (visual, auditory, kinesthetic) and academic achievement of science students at Secondary School Level.

Table 4.6

Relationship of learning styles (Visual Auditory, kinesthetic) and Academic achievement of science students at Secondary School Level (N=317)

Variables	Visual learning style	Auditory learning style	Kinesthetic learning style
Academic Achievement	.312**	.255**	.092

The above table shows the whole picture of relationship of learning styles (visual auditory and kinesthetic) and academic achievement of science students. The results reveals that there is a moderate positive (.312**) but statically significant relationship of visual learning style and academic achievement of science students at Secondary level. The results also reveal that there is a moderate positive (.255**) but statically significant relationship of auditory learning style and academic achievement of science students. However, there is weak positive but no significant relationship was found in the kinesthetic learning style and academic achievement of science students at secondary level.

H_{o1a}: There is no significant relationship of the Visual learning style and academic achievement of the science students at Secondary School Level.

Table 4.7

Relationship of visual LS and academic achievement of science students (N=317)

No.	Variables	N	r	p
1.	Visual learning style	317		
			.312**	.000
2.	Academic achievement	317		

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

The above table shows that there is a moderate positive (.312**) but statically significantly relationship of visual learning style and academic achievement of science students at secondary level. Therefore, the Null Hypothesis **H_{o1a}** that there is no significant relationship of visual learning style and academic achievement of science students is Reject.

H_{o1b}: There is no significant relationship of auditory learning style and academic achievement of the science students at Secondary School Level.

Table 4.8

Relationship of auditory learning style and academic achievement of Science students (N=317)

No.	Variables	N	r	p
1.	Auditory learning style	317		
			.255**	.000
2.	Academic achievement	317		

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

The above table shows that there is a moderate positive (.255**) but statically significantly relationship of auditory learning style and academic achievement of science students at Secondary School Level. Therefore, the Null hypothesis **H_{o1b}** that there is no significant relationship of Auditory learning Style and academic achievement of science students at Secondary School Level is Reject.

H_{o1c}: There is no significant relationship of Kinesthetic learning Style and academic achievement of science students at Secondary School Level.

Table 4.9

Relationship of kinesthetic LS and academic achievement of science students (N=317)

No.	Variables	N	r	P
1.	Kinesthetic learning style	317		
			.092	.102
2.	Academic achievement	317		

The above table shows that there is a weak positive (.092) but no statically significantly relationship of kinesthetic learning style and academic achievement of science students at Secondary School Level. Therefore, the Null hypothesis **H_{o1c}** that there is no significant relationship of kinesthetic learning style and academic achievement of science students is failed to reject.

Objective 4: To find the gender-based difference regarding Learning styles (Visual, Auditory, Kinesthetic) of Science Students at Secondary School Level.

H_{o2}: There is no significant gender-based difference regarding (visual, auditory, kinesthetic) learning style of science students at Secondary School Level.

Table 4.10

Gender wise difference in LS (Visual Auditory and Kinesthetic learning styles) (N=317)

Variables	Gender	n	Mean	t-value	df	Sig.
Visual LS	Male	163	62.22	4.010	315	.000
	Female	154	65.344			
Auditory LS	Male	163	57.96	3.395	315	.001
	Female	154	60.53			
Kinesthetic LS	Male	163	58.50	3.54	315	.000
	Female	154	55.40			

***p <0.01*

The above table shows the complete picture of gender wise difference (visual auditory and kinesthetic learning styles). The table shows that there is a significant difference in visual auditory and kinesthetic learning styles based on gender. The table also shown that male students prefer kinesthetic learning style while female science students prefer visual and auditory learning style.

H_{o2a}: There is no significant difference in visual learning style between male and female science students at Secondary School Level.

Table 4.11

Gender wise difference in visual learning style (N=317)

Variables	Gender	n	Mean	t-value	df	Sig.
Visual	Male	163	62.22			
LS				4.010	317	.000
	Female	154	65.344			

***p <0.01*

The table reveals that the t value (4.010) about the gender-wise difference in visual learning style are found significant at a 0.01 significant level. The result of the present study concludes that there is a significant difference in visual learning styles among male and female science students at Secondary School Level. Thus, the Null Hypothesis **H_{o2a}** that there is no significant difference in visual learning styles between male and female science students at Secondary School Level is Reject.

Furthermore, the mean value indicates that female science students (F=65.34) prefer the visual learning style as compared to male students (M=62.34).

H_{o2b}: There is no significant difference in auditory learning styles between male and female science students at Secondary School Level.

Table 4.12

Gender wise difference in Auditory learning style (N=317)

Variables	Gender	n	Mean	t-value	df	Sig.
Auditory LS	Male	163	57.96	3.395	315	.001
	Female	154	60.53			

***p <0.01*

The table reveals that the t value (.3.395) about the gender-wise difference in auditory learning styles are found significant at a 0.01 significant level. The result of the present study concludes that there is a significant difference in auditory learning style between male and female science students at Secondary School Level. Thus, the Null hypothesis **H_{o2b}** that there is no significant difference in auditory learning styles between male and female science students at Secondary School Level is Reject.

Furthermore, the mean value indicates that at Secondary School Level female science students (F=60.53) prefer the auditory learning style as compared to male students (M=51.56).

H_{o2c}: There is no significant difference in kinesthetic learning styles between male and female science students at Secondary School.

Table 4.13

Gender wise difference in kinesthetic learning styles (N=317)

Variables	Gender	N	Mean	t-value	df	Sig.
Kinesthetic LS	Male	163	58.50	3.54	315	.000
	Female	154	55.40			

***p <0.01*

The above table exhibits that the T value (t=3.54) regarding the gender-wise difference of a variable Kinesthetic learning style is found significant at 0.01 level of significance. So the result concludes that there is a significant difference in kinesthetic learning styles among male and female science students of secondary schools in Rawalpindi. Thus, the Null hypothesis **H_{o2c}** that there is no significant difference in kinesthetic learning styles between male and female science students is Reject.

Furthermore, the mean value in the above table also revealed that male science students prefer kinesthetic learning style (M=58.50) as compared to the female science students (F=55.40). The present study showed that kinesthetic LS is more prevalent with male science students at Secondary School Level.

Objective 5:

To identify the gender-based difference regarding academic achievement of the Science Students at Secondary School Level.

H_{o3}: There is no significant difference in academic achievement of the science students based on gender at Secondary School.

Table 4.14

Gender wise difference in academic achievement of science students (N=317)

Variables	Gender	n	Mean	t-value	df	Sig.
Academic achievement	Male	163	4.19	4.603	315	.000
	Female	154	4.81			

***p <0.01*

The table indicates that the t value (t=4.603) observing the gender-wise difference of variable academic achievement is found significant at a 0.01 level of significance. So the result concludes that there is a significant difference in the academic achievement of science students based on gender. Thus, The Null hypothesis **H_{o3}** that there is no significant difference in academic achievement between male and female science students at Secondary School Level is Reject.

Furthermore, the mean value indicated that female (F=4.73) having a higher academic score as compared to the Male science students (M=3.96).

Table 4.15

Summary of Results

NO.	Statement of Hypothesis	Results
H_{o1a}	There is no significant relationship of visual learning style and academic achievement of science students at Secondary School Level.	Reject
H_{o1b}:	There is no significant relationship of auditory learning style and academic achievement of science students at Secondary School Level.	Reject
H_{o1c}:	There is no significant relationship of kinesthetic learning style and academic achievement of science students at Secondary School Level.	Failed to Reject
H_{o2a}	There is no significant difference in visual learning style between male and female science students at Secondary School Level.	Reject
H_{o2b}	There is no significant difference in auditory learning style between male and female science students at Secondary School Level.	Reject
H_{o2c}	There is no significant difference in kinesthetic learning style between male and female science students at Secondary School Level.	Reject

H_{o3}	There is no significant difference in academic achievement of science students based on gender at Secondary School Level.	Reject

Summary of the chapter

As a conclusion from the analysis and the findings, in fulfilling the requirement of the first objective, the most preferable or dominant learning styles among the science students was visual learning style. Another objective of the study revealed that overall academic achievement of science students was good mostly students are lie between 70% and above but below 80%. An important objective of this study was to identify the relationship of learning styles (visual, auditory, kinesthetic) and academic achievement of science students at Secondary School Level. By using Pearson Correlation, the results reveals that there is a moderate positive ($.312^{**}$) but statically significant relationship of visual learning style and academic achievement of science students at Secondary School Level. The results also reveal that there is a moderate positive ($.255^{**}$) but statically significant relationship of auditory learning style and academic achievement of science students. However, there is weak positive but no statically significant relationship was found in the kinesthetic learning style and academic achievement of science students at secondary level. Another result of the study showed that there is a statically significant difference in visual, auditory and kinesthetic learning styles based on gender. Male science students prefer kinesthetic learning style and female science students prefer multinomial learning style (visual, auditory). The present research results also indicated that in science subjects' female students perform better they obtained high marks as compared to the male science students.

CHAPTER 5

SUMMARY, FINDINGS, CONCLUSIONS, DISCUSSIONS AND RECOMMENDATIONS

This chapter contains a summary of the study, as well as the findings, discussion and conclusion of the present study. Recommendations for future studies are also given. The detail of this chapter is given below:

5.1 Summary

The present study was correlation in nature. The main aim of this study was to identify the relationship of learning styles (visual, auditory, kinesthetic) and academic achievement of students at Secondary School Level. The first objective of this study was to explore the learning style of science students at the Secondary School Level. For this purpose, the researcher used the VAK learning style model (Visual, Auditory, Kinesthetic). To achieve the first objective, descriptive statistics such as mean was used. The 2nd objective of the study was to identify the academic achievement of science students at the Secondary School Level. Academic achievement was assessed based on previous academic scores of grade 9th (sendup score). To achieve the 2nd objective, the descriptive statistics such as frequency and were used. The 3rd objective of this study was to identify the relationship of learning styles and academic achievement of science students. To achieve the 3rd objective Inferential statistics such as correlation was used. The 4th objective of this study was to find the gender-based difference regarding the learning styles (visual, auditory kinesthetic) of science students at the Secondary School Level. The 5th objective of this

study was to find the gender-based differences regarding the academic achievement of the science students at the Secondary School Level. To achieve the 4th and 5th objectives Inferential statistics such as independent-t-test was used. According to the 3rd, 4th, and 5th objectives, the researcher makes the 7 Null hypotheses to check whether or not the goals of the current study were achieved. The male and female grade 10th science students of Govt. High Secondary schools in Rawalpindi were the target population of this study. The sample size for the current study consist of N= 317 that is 17% of the population that is 1836. The sample size of the Male n=163 (17%) and Female n=154 (17%) were obtained after applying the Stratified proportionate sampling technique. The sample was taken from 24 Govt. Secondary schools among those 12 Schools' for the Boys and 12 Schools' for Girls. An adapted questionnaire was used for the data collection. The Barsch Learning Style Inventory by Barsch (1996) was adapted for assessment of students learning styles. Academic Achievement was assessed on the basis of the previous sendup score of (grade 9th). The reliability of the instrument was checked through SPSS 21 version by applying the Cronbach Alpha Coefficient. Data was collected through a questionnaire. The investigator visited the schools personally to collect the desired data. After collection for the data, it was analyzed and interpreted through SPSS 21. The major findings of the present research were found that visual was the most preferred LS among secondary school science students. The research of present study also indicated that there is a significant relationship of visual, auditory, learning styles and academic achievement of science students, and no significant relationship was observed of kinesthetic LS and academic achievement of science students at Secondary School Level. The results also indicated that male science students prefer kinesthetic learning styles and female science students prefer

visual and auditory learning styles. The study also revealed that there was a gender-based difference in academic achievement of the secondary school science students. The mean value indicated that female have a high academic achievement as compared to male science students.

5.2 Findings

Based on data analysis all the results were drawn. Details of all the findings were given below:

Objective 1: To explore the learning style of the science students at Secondary School Level.

- Descriptive statistics were used to achieve the objective. The results showed that the most preferred LS of science students was visual learning styles as compared to the auditory and kinesthetic LS. (Table 4.2, Page#114)

Objective 2: To identify the academic achievement of the science students at Secondary School Level.

- The findings of this study indicated that the send-up score of science students were good. 140 students are between 70% and above but below 80%. (Table 4.3 Page#115).
- The findings also indicated that 59 of the female students are between 70% and above but below 80%. (Table 4.4 Page#116)
- The findings also exhibit that 81 of the male students are between 70% and above but below 80% (Table 4.5 Page#117).

Objective 3: To identify the relationship of learning styles (visual auditory, kinesthetic) and academic achievement of the science students at Secondary School Level.

H_{o1}: There is no significant relationship of learning styles (visual, auditory, kinesthetic) and academic achievement of science students at Secondary School Level.

The results reveals that there is a moderate positive (.312**) but statically significant relationship of visual learning style and academic achievement of science students at Secondary level. The results also reveal that there is a moderate positive (.255**) but statically significant relationship of auditory learning style and academic achievement of science students. However, there is weak positive but no significant relationship was found in the kinesthetic learning style and academic achievement of science students at secondary level (Table#4.6 page#118)

H_{o1a}: There is no significant relationship of the visual learning style and academic achievement of science students at Secondary School Level.

- The present study revealed that there is a positive significant relationship of visual learning style and academic achievement of science students at Secondary School Level. Thus, the Null hypothesis that there is a no significant relationship of visual learning style and academic achievement of science students was reject. (Table 4.7 page#119)

H_{o1b}: There is no significant relationship of the auditory learning style and academic achievement of science students.

- The research also revealed that there is a positive significant relationship of auditory learning style and academic achievement of science students. Thus, the

null hypothesis there was a no significant relationship of auditory learning and academic achievement of science students was reject. (Table 4.8 page#120)

H_{o1c}: There is no significant relationship of kinesthetic learning style and academic achievement of science students at Secondary School Level.

- The findings of the present study also indicated that there is no significant relationship between Kinesthetic learning style and academic achievement of the science students. Thus, the Null hypothesis that there is a no significant relationship of kinesthetic learning and academic achievement of science students was failed to reject. (Table 4.9 page#121)

Objective 5: To identify the gender-based difference regarding learning styles (visual, auditory, kinesthetic) of the science students at Secondary School Level.

H_{o2}: There is no significant gender-based difference regarding (visual, auditory, kinesthetic) learning style of science students at Secondary School Level.

There is a significant difference in visual, auditory, and kinesthetic learning styles based on gender. The results also shown that male students prefer kinesthetic learning style while female science students prefer visual and auditory learning styles (Table 4.10 page#122).

H_{o2a}: There is no significant difference in the visual learning style based on gender.

- The findings of this study found that there is a significant difference in visual learning styles between male and female science students at the Secondary School Level. According to their results, the Null hypothesis that there is a no significant difference in visual learning styles between male and female science students was

Reject. Furthermore, the mean value indicates that female (F=65.22) prefer visual learning style as compared to the male (M=62.22). (Table 4.11 page#123)

H_{o2b}: There is no significant difference in the auditory learning style based on gender at Secondary School Level.

- The result of the present study indicated that there is a significant difference in auditory learning styles among male and female science students. Thus, the null hypothesis that there is no significant difference in auditory learning styles between male and female science students at Secondary School Level was reject. Furthermore, the mean value indicates that female (F=60.53) prefers auditory learning style as compared to the male (M=57.96). (Table 4.12 page#124)

H_{o2c}: There is no significant difference in kinesthetic learning style based on gender.

- In this study, the difference in kinesthetic LS between male and female science students was found to be significant. Therefore, the Null hypothesis that there is no significant difference in kinesthetic learning styles between male and female science students was reject. Furthermore, the mean value (M=58.50) also highlight that male prefer kinesthetic LS as compared to the female (F=55.40). The present study showed that kinesthetic LS was more prevalent with male science students. (Table 4.13 page#125)

H_{o3a}: There is no significant difference in the academic achievement of science students based on gender.

- The results indicated there is a significant difference in the academic achievement of science students based on gender. Thus, the Null Hypothesis that There is no

significant difference in academic achievement between male and female science students was reject. Furthermore, Female science students (F=4.81) having higher academic scores as compared to the Male (M=4.19). (Table 4.14 page#126).

5.3 Discussions

In improving the quality of life, learning patterns are very important to gain more meaningful opportunities than they need to acquire. For a student to improve his or her academic success while they are in school, the learning styles are very important. According to Lohry (2003) the LS of an individual can show how to focus on the various types of information they receive. Moreover, LS also assists students in recognizing and interpreting knowledge. Nja et al., (2019) showed that students gain knowledge with diverse modes of learning and it increase the academic achievement of the learners. Learning styles plays an important role in the lives of learners. When students recognize their learning styles, they will be able to integrate it into their learning process. Consequently, the learning process will be enjoyable, faster, and more efficient. Students adopt different LS. Students learn more effectively when using their preferred LS (visual, auditory, and kinesthetic) because it affects their academic performance. They can improve their learning strategies becoming aware of their academic strengths and weaknesses (Fayambo, 2015). One of the most significant issue in learning is that individuals take the responsibility for their own learning. When learners take responsibility for their own learning, they show more effective learning (Nzesei, 2015). Students adopt different types of learning, which is a result of this argument that all students learn uniquely. The learning styles would help students to enhance their academic achievement. During learning process, students will adopt different learning styles, especially when they have to cope

with difficult subjects. Students may learn in numerous ways, such as by watching, listening, and doing experiences. For insistence, visual learning style involves the use of seen or observing things including flowcharts, diagrams, videos, and reading books, etc. The auditory learners are being focused on listening and the kinesthetic learner prefers physical activities (Khurshid & Mahmood, 2012).

The first objective of the study was to explore learning styles of science students at Secondary School Level. Descriptive statistics such as (Mean) was used to achieve this objective. The findings of the study showed that visual was the most favored LS among science students as compared to auditory, and the kinesthetic was the least preferred LS. Almomani (2019) said that these learning preferences may be influenced from time to time by several factors such as learning environment, achievement, provision of equipment, students' ability to experiment, solve problems, and some other factors. Brown (2004) visual learning style is especially important in the areas of science education, since students must, more than ever, learn to think visually and communicate their ideas visually. Cheng and Wong (2014) the findings show that the most effective style of learning that received 82.4% of the participants' preferences were graphical.

The present study results are confirmed with the earlier study of Almomani (2019) Secondary school physic students preferred visual learning styles in Saudi Arabia. Nzesei (2015) results revealed the English pupils learn through visual learning style, and Kinesthetic is less common LS at Secondary school in Kenya. Nja et al., (2019) the purpose of this study was to find out preferred learning styles of Science Education students in the University of Calabar. The finding also stated that science students prefer the visual LS followed by auditory and kinesthetic. Khan and Yousaf (2019) found that in the high

secondary students preferred the visual learning style in Pakistan. Gilakjani, (2012) the aim of this study was to analysis the learning styles for Iranian university students. Over 100 students completed a questionnaire to determine if their learning styles are auditory, visual or kinesthetic. The finding showed that Iranian university students preferred learning style was visual. Khurshid and Mehmood (2012) found that the most preferred learning style was visual at the postgraduate colleges in Islamabad.

However, some researchers are opposite for the current study. Vaishnav (2013) study results indicated that kinesthetic LS have been shown to be more common in high school students than visual and auditory LS. Alwan (2012) indicated that the preferred LS was auditory follow by visual LS and kinesthetic was less common style at Secondary school in Jorden. The research by Aloun (2012) found that Secondary school students prefer the auditory LS, followed by kinesthetic learning style.

Alade and Ogbo (2014) majority of the students in public school preferred the visual learning style as compared to auditory and kinesthetic. This could be due to the fact that the population of the students enrolled in the public schools often outnumber, the laboratory facilities which favour kinesthetic style of learning. Oftentimes, students in public schools do not perform practical work until it is time to write an external examination. Hence, their teachers resort to using visual learning aids which support a visual learning style in their students.

The most important objective of this study was to identify the relationship of learning styles (visual, auditory, kinesthetic) and academic achievement of science students at Secondary School Level. The present research found that there is a significant relationship of visual learning style and academic achievement of science students. There

is a significant relationship of auditory learning style and academic achievement of science students.

As a result, it is incredibly clear that LS visual and auditory influence the academic achievement of science students. However, this observation is consistent with the Sternberg (1997) findings that greater knowledge of LS, such as the audio-visual learning style, allows teachers to be more flexible in teaching and to use a variety of classroom methods. It was concluded that the propensity for audio-visual aids affects the pupil's overall academic success. This result illustrates the importance of understanding audio-visual learning styles. Teachers might be mindful of the usefulness of an instrumental method for successful learning to take place.

Some researches support with the current study results, in line with this Khurshid and Mehmmod (2012) found that there is a statically relationship between visual and auditory LS and academic achievement of science students at postgraduate colleges in Islamabad. Nja et al. (2019) concluded that there is an important connection between visual and auditory learning styles and academic success of students at Nigeria. They also suggest that science student's academic performance is improved when they have to access visual and auditory knowledge during learning experiences. According to Anand and Rajendraprasad (2016) stated that there is a significant association between visual, auditory LS and academic achievement of elementary school in Karaikal District. Alade & Ogbo, (2014) found an association of learning styles (visual, Auditory, kinesthetic) and academic achievement of the chemistry students of secondary schools in Lagos metropolis, Nigeria. Meshack (2015) shows that there is a strong correlation between the learning mode, that is visual, auditory, kinesthetic, and the academic achievement of secondary school students

in Kenya who like the three modes of learning (VAK). Khan (2019) the research population was composed of BS programs from all public sector colleges in Punjab Province. Branch LS inventory (BLSI) develop by Branch (1996) was used as a research instrument. The research showed overall preference scores for visual learning had a significant correlation with the academic achievement of the students, and no correlation has been found between kinesthetic learning styles and academic achievement of college students. Almomani (2019) indicated that kinesthetic LS and students' academic success are not interrelating in king south University. The outcome of Zayed (2017) also identified that there was no statistically significant link between kinesthetic LS and their educational success. Rahman and Ahmar (2017) also exposed that there was no statistically noteworthy association between kinesthetic LS and academic achievement of students. A study by Holliday (2009) the purpose of the study to identify the relationship between visual learning style and academic success of pupils, using the survey research design and a population of 321 primary schools' pupils, the study reveals that visual learning styles significantly enhance academic achievement of pupils at the primary level. Awag (2017) the findings of study stated that there is a no significant association of Kinesthetic learning styles and academic achievement of science students. Maxwell (2017) the purpose of this research was to investigate the important connection among LS (VAK) and academic performance of the students of secondary school. It was a correlational study. The sample size of this study was 345. A stratified sampling technique was used for the collection of the data. The VAK model by Flaming (2001) was used. The findings showed that there is an important association between the modes of visual and auditory learning styles of students and their

academic success. The study concluded that both visual, auditory LS increase students' academic success.

However, few studies are in the opposite of the present study Chaudhary et al., (2015) the aim of this research was to recognize their connection with the academic success of medical undergraduate students in Pakistan's different medical colleges. A cross-sectional analysis of 597 medical students (100 from each college) from six medical colleges was conducted. To categorize students' learning styles, the validated VARK questionnaire version 7.0 was used. The questionnaire is composed of 16 elements that define four research modes. (VAK). The results indicated that the preference LS (VAK) and academic performance were not related. Omer (2015) also found no correlation between LS i.e. visual, auditory, kinesthetic and academic achievement of second semester of Electrical Engineering Students Polytechnic in Malaysia. Generally, LS does not have an important connection with academic achievement, but it can be used to describe the pattern in student-owned LS and can also be used by teachers to strengthen teaching methods

The differences of learning styles are influenced by some factors and one of them is gender. Gender becomes the significant variable in learning styles that differs how male and female learn differently. The 4th objective of the present study was to find out the gender-based difference regarding learning styles (LSs) (Visual Auditory, Kinesthetic) of science students at Secondary School Level. The findings of the present study stated that female preferred visual and auditory learning styles while male preferred kinesthetic learning styles and making VAK as most common LS on gender. In this study the researcher found a statically significant difference in learning styles (Visual, auditory

kinesthetic) between male and female science students at Secondary School Level. Since the results also revealed that Male science students (M=58.50) prefer kinesthetic LS as compared to female (F=55.40). Although female science students (F=64.34) was favorable the multinomial styles (visual and auditory) (F=60.53) LS as compared to male students. This result is agreed with previous researches:

Rezaeinejad et al., (2015) suggested that male and female show different style to respond information differently. Males tend to practice the information they got. Breckler et al., (2009) found that female students have multimodal learning preference than male. In line with this Munir at al., (2018) found that females have multimodal learning styles (visual and auditory LS) as compared to the boys and boys preferred kinesthetic LS and there is a significant difference between visual, auditory, and kinesthetic LS based on the gender at the Secondary School Level. Almigbal (2015) also found that females favor the predominant learning styles (visual, and auditory LS) as compared to male, while male preferred the kinesthetic LS as compared to the female in the undergraduate medical students at King Saud University in Riyadh. In ways of speaking, females give much attention in listening, sympathizing, and reinforcing interlocutor. They tend to listen, confront the problems, and maintain friendship because they are more social than males (Tatarinceva, 2002).

Rahman and Ahmar (2017) was conducted research on the 1st year college students of Indonesia. The purpose of this study was to identify the gender-based difference about learning styles of Mathematics students. The results found that mathematics girls prefer visual and auditory LS more than boys and boys preferred kinesthetic learning styles as compared to the girls in Indonesia. Almomani (2019) study indicated that female preferred

visual LS of Nursing Colleges at Universities of Mosul and Kirkuk. Alade & Ogbo (2014) found that female physic students prefer visual and auditory learning styles and male students prefer kinesthetic learning styles, and there is a significant gender-based difference regarding visual auditory and kinesthetic learning styles at Secondary school in in Lagos Metropolis. Almomani (2019) the results also showed statistically significant differences in the learning patterns preferred by students attributed to the gender variable. The results also indicated that male prefer auditory LS and female preferred visual LS at Secondary Students Admitted to King Saud University. Almomani (2019) their preference could be due to erroneous cultural beliefs that handling of dangerous chemicals and laboratory equipment was better done by their male students. This is the nature and interest of the male they have to prefer hands on hands activities. Almigbal (2015) female students appear to learn better than male through conversation, debate, auditory interpretation, and auditory processes. This can be due to the female nature and their need for communication skills inside and outside of the schools setting with the group, and their teachers' emphasis on conversation and debate with them in and outside the educational situation. Brown (2004) female prefer to learn through auditory learning styles this is because with females ranking social interaction with other students and self-confidence as higher than males.

However, Mislina and Hazmilah, (2017) research aimed to assess the gender difference in LS i.e., visual, Auditory kinesthetic. The sample N=278 was taken from Melaka university in Malaysia. A stratified sampling technique was used to collect the data. This research was focused on the model of VAK. The findings show that there is no substantial gender-based disparity in LS i.e. visual auditory kinesthetic. Rai (2017) the objective of this study was to determine the gender-based difference in LS at the secondary

school in Nepal. VAK LS model by Fleming (2001) was used. Results have shown that there is no important gender difference in LS (visual auditory and kinesthetic).

The difference may be explained by the cultural contexts, considering that these studies were conducted in different context and countries. Din (2009) the result of this research also indicated that there is no significant difference between the learning styles of male and female students at the Masters level.

Alade and Ogbo (2014) found that majority of the female students preferred visual learning to auditory and kinesthetic styles of learning. This may be due to their cultural beliefs to avoid dangerous chemistry practical. The handling of dangerous chemicals and laboratory equipment was better done by their male counterparts. This agrees with Sara (2010) who studied the effects of learning styles on career preferences of Senior Secondary school students in Jigawa State, Nigeria. His investigation revealed that the males were more field-independent while the female were field dependent learners. Field-dependent student according to him are those students who think rationally in problem solving while field independent students think irrationally when confronted with a problem.

Gender has different preferences in LS. In short, a gender-based preference in the style of learning is just one context in which males and females are unique. From these studies, we can infer that becoming aware of the different LS of the students, the educators will be able to match these LS with their teaching styles and through this way, the academic achievement and competence of the students will become higher and eventually, students will excel in school. Very few literatures demonstrate a common form of LS in both male and female. Similarity and difference in the outcome can be influenced by the geographical setting, the school environment, and the grades.

Another objective of the present research to find the gender-based difference regarding the academic achievement of the science students at the Secondary School Level. The results of the current analysis reveal that there is a significant difference in the academic success of science students based on gender. Female students (F=4.81) have higher academic scores in science relative to male students (M=4.19). Mutua (2015) Erton, (2010) and Gokalp (2013) This outcome was endorsed by female students who tended to attain high academic success relative to males. Hassan (2016) conducted a study at the University of Peshawar. 200 students were selected from the different departments. The survey of this study exposed that those female pupils get more marks as compared to the male.

Khan (2012) the total number of female educational institutions in Pakistan from primary to degree colleges is approximately 61269. Females were not promoted for education in the past, but now women are similarly educated to men. Males and females have equal rights to educate themselves. And now women compete with men in every field of study (khan, 2012). Generally, in school and college outcomes in recent years, it is that in many cases women students perform better than men. And women also better behave in the classroom, as compared to the male (Hassan, 2016). Generally, student success relies more on the study, these students can get more marks as compared to others, they should be more hardworking. Hassan (2016) It was discovered that female students were more hard-working than male students. Female students, therefore, obtain more marks than male students. Therefore, male students are interested in different co-curricular activities, so male students do not completely focus on studying. Therefore, as opposed to male pupils, female students get more marks. Alavi and Toozandehjani (2017) concluded that having a

background of the learning styles of students can enhance their learning and at the same time help students strengthen self-actualization. Teevan et el., (2011) also emphasize that knowledge of the learning styles can help facilitate teachers to employ suitable teaching strategies and methods to encourage students' academic achievement. This will also provide both teachers and students positive feedback on their strengths and weaknesses in the teaching and learning scenario. Dalmolin et al., (2018) suggest that determining the learning styles of students will ultimately improve their academic achievement. Some students learn by watching, others have to learn the best by listening and some students prefer learning by doing. No learning styles is either better or worse than another one. Usually, each types of learning styles have its own qualities and weaknesses. Thus, students can improve their abilities and achieve better if they aware of these boundaries.

5.4 Conclusion

This research was conducted the relationship between learning style and academic achievement of the students at Secondary School Level. As per the study objective following conclusion were drawn after interpretation data through SPSS.

1. For the current study, the researcher used VAK (Visual, Auditory, Kinesthetic) LS model develop by flaming (2001). According to the study the 1st objective to explore the LS of the science students. As per the results the most preferred LS was visual learning styles among secondary school Science students.

2. To identify the academic achievement of the students. The results indicated that the academic achievement of the science students was good. Mostly students are between 70% and above but below 80%.

3. The most important objective of the present research was to identify the relationship of learning styles (visual, auditory, kinesthetic) and academic achievement of science students at Secondary School Level. The present research showed that kinesthetic learning had no significant association with academic achievement of science students. However, a significant association has been found in the auditory, visual LS and academic achievement of the science students. It means that visual, and auditory LS enhance the academic achievement of the science students.

4. Another objective of the study was to find the gender-based difference regarding learning styles (visual, auditory kinesthetic) of science students at Secondary School Level. The significant difference is found in terms of gender for the visual auditory and kinesthetic learning styles. The results further indicated that Male students preferred kinesthetic learning style as compared to female while female science students preferred visual and auditory learning style as compared to male.

5. Another objective of the present study was to find the gender-based difference in the academic achievement of science students. The results indicated that there is a significant difference in the academic achievement of the students. The present research concluded that in science subjects' female students perform better they obtained high marks as compared to the male science students. Hassan (2016) concluded that female students perform better and obtained good marks as compared to male. Female students were hard worker as compared to the male, while male students prefer co-curricular activities and don does not concentrate on their studies. Perhaps that is one of the reasons why male students do not perform well relative to female students and achieve good marks.

5.5 Recommendations

- Science teachers may present information through charts, diagrams, pictures, models, video clips and write notes clearly on a chalkboard or white board in order to encourage visual learners to learn fast and improved their academic achievement.
- An important association of visual, auditory learning styles and academic achievement was found in this study; hence, it is recommended that science teachers may take these learning styles into consideration while planning their lessons to improve the academic achievement of students. Students may be engaged in conversation about the subject matter and they may be asked for oral summaries of lectures. And draw the concept maps where possible and allow him or her to sit in the place where he/she can see the teachers.
- The researcher recommended that teachers may motivate the science students for visual and auditory learning styles, in this way their academic achievement and learning may get improve.
- It is recommended that science teachers may teach the male science students by audio-visual aids to make them learn and achieve better.
- The educational administration may organize workshops/training for science students and teachers at the secondary level to raise awareness of various modes of learning styles.
- Awareness programs and workshops may be conducted for parents to make them aware of their children's learning styles for their better academic success.
- The curriculum developers and educationists may consider individual learning styles while developing science curricula of secondary school students.

5.5.1 Future Recommendations

- The present study was carried out at secondary level in public sector schools. Primary education is the backbone of education system. It provides the foundation of education system. It is recommended that future research maybe taken primary school teachers and students.
- An important objective of this research was to find out the relationship of learning styles and academic achievement of students. It was based on the VAK model. There are other learning styles model like Kolb, MBIT etc. Future research work may use these learning style model to investigate the preferred learning style.
- The COVID-19 pandemic is not yet ended, and the world health organization is now talking about the forth wave scenarios of the epidemic. Therefore, most universities continue their education with distance education during the pandemic process, and this process will lead to changes in education after the pandemic. Therefore, the researcher recommended for the future studies that to explore the Effects of the Disastrous Pandemic COVID-19 on Learning Styles, Activities and Mental Health of the university students.

5.6 Limitations of the Research Study

Throughout the research process researcher had faced some research restrictions which are as follow:

The students of grade 9th were Promoted to the next class without exams due to the coronavirus pandemic. In this research the researcher wanted to consider the final term exams of grade 9th as their academic achievement but unfortunately researcher only got their send-up score for the current study.

Summary of the Chapter

This chapter the researcher discussed a whole summary of the study, as well as the findings of the current, a detailed discussion and conclusion session was also discussed in this chapter. Recommendations for future studies are also given at the end of this session.

In short, students adopt different types of learning, which is a result of this argument that all students learn uniquely. If learning is made pleasurable, the academic achievement of science students could be enhanced. Students can improve their self-awareness and use effective learning strategies to understand and be aware of the preferred learning methods that may contribute to their academic success.

REFERENCES

Abidin, M. J., Rezaee, A. A., Abdullah, H. N., & Singh, K. K. (2011). Learning Styles and Overall Academic Achievement in a Specific Educational System. *International Journal of Humanities and Social Science, 1(10), 143-153*

Ashkenazi, G. (2006). Learning Style, Personality Type and Academic Achievement in Undergraduate Chemistry. Department of Science Teaching, The Hebrew University: Jerusalem Israel. Retrieved from net on April 23rd 2009 from www.google.com

Anand, R. S., & Rajendraprasad, D. M. (2016). A Study on Learning Styles and Their Impact of Science Teaching Among Primary School Students. *International Education and Research Journal*, *2*(1), 50-52.

Abbas, P. (2012). Visual, auditory, kinaesthetic learning styles and their impacts on English language teaching. *Journal of Studies in Education*, 2(1), 45-76.

Armstrong, T. (2006). *The best schools: How human development research should inform educational practice*. ASCD.

Al-Zayed, N. (2017). An investigation of learning style preferences on the students' academic achievements of English. *International Journal of English Linguistics*, *7*(5), 176-183.

Ali, S., Haider, Z., Munir, F., Khan, H., & Ahmed, A. (2013). Factors contributing to the students academic performance: A case study of Islamia University Sub-Campus. *American journal of educational research*, *1*(8), 283-289.

Allen, D., & Tanner, K. (2003). Approaches to cell biology teaching: learning content in context—problem-based learning. *Cell Biology Education*, *2*(2), 73-81.

Askling, B. (2010). Academic leadership: Prescriptions, practices and paradoxes. *Tertiary Education & Management, 8*(2), 113-125.

Akhtar, Z. (2010). *The effects of learning styles and socio-economic status on learning achievement of secondary school students* (Doctoral dissertation, NATIONAL UNIVERSITY OF MODERN LANGUAGES, ISLAMABAD).

Al-Qasmi, S. A. (2006). *Problem solving in biology at university level* (Doctoral dissertation, University of Glasgow).

American Association for the Advancement of Science, & Project 2061 (American Association for the Advancement of Science). (1998). *Blueprints for reform: Science, mathematics, and technology education*. Oxford University Press.

Awang, H., Samad, N. A., Faiz, N. M., Roddin, R., & Kankia, J. D. (2017, August). Relationship between the Learning Styles Preferences and Academic Achievement. *In IOP Conference Series: Materials Science and Engineering* (Vol. 226, No. 1, p. 012193). IOP Publishing.

Arbuckle, J. L. (2013) a single-headed arrow points from cause to effect. A double-headed, curved

Alade, M., & Oluwatomi, D. (2014). A Comparative Study of Chemistry Students' Learning Styles Preferences in Selected Public and Private Schools in Lagos Metropolis. *IOSR Journal of Research & Method in Education*, 4, 45-53.

Ameen, K. (2007, August). Issues of quality assurance (QA) in LIS higher education in Pakistan. In *World Library and Information Congress* (pp. 19-23).

Abar, B., Carter, K. L., & Winsler, A. (2009). The effects of maternal parenting style and religious commitment on self-regulation, academic achievement, and risk behavior

among African-American parochial college students. *Journal of adolescence*, *32*(2), 259-273.

Alavi, S., & Toozandehjani, H. (2017). The Relationship between Learning Styles and Students' Identity Styles. *Open Journal of Psychiatry*, 7(02), 90.

Abu Sharbain, I. H., Tan, K. E., & Jhaish, M. (2010). The relationship between learning style preferences and academic achievement of English majors at al-Aqsa University in Gaza, Palestine.

Ahanbor, Z., & Sadighi, F. (2014). The relationship between multiple intelligences, learning styles and gender. *Modern Journal of Language Teaching Methods*, *4*(1), 176.

Ahmad, N. A., Jelas, Z. M., & Ali, M. M. (2011). The Relationship between Learning Styles and Strategies with Academic Achievement Based on Gender and Type of School. *International Journal of Learning*, *17*(10).

Alade, O. M., & Ogbo, A. C. (2014). A Comparative Study of Chemistry Students' Learning Styles Preferences in Selected Public and Private Schools in Lagos Metropolis. *Journal of Research & Method in Education*, *4*(1), 45-53.

Alavi, S., & Toozandehjani, H. (2017). The Relationship between Learning Styles and Students' Identity Styles. *Open Journal of Psychiatry*, 7(02), 90.

Al-Hebaishi, S. M. (2012). Investigating the relationships between learning styles, strategies and the academic performance of Saudi English majors. *International Interdisciplinary Journal of Education, 1*(1028), 1-11.

Aliakbari, M., & Qasemi, N. (2012). On the relationship between Iranian EFL learners' learning style preference and their gender, proficiency level and achievement score. *International Journal of Pedagogies and Learning*, *7*(3), 275-283.

Aliakbari, M., & Qasemi, N. (2012). On the relationship between Iranian EFL learners' learning style preference and their gender, proficiency level and achievement score. *International Journal of Pedagogies and Learning*, *7*(3), 275-283.

Almigbal, T. H. (2015). Relationship between the learning style preferences of medical students and academic achievement. *Saudi medical journal*, *36*(3), 349.

Almomani, J. A. (2019). Preferred Cognitive Learning Patterns (VAK) among Secondary Students Admitted to King Saud University and Its Effect on Their Academic Achievement in Physics. *International Education Studies*, *12*(6), 108-119.

Al-Zayed, N. N. (2017). An investigation of learning style preferences on the students' academic achievements of English. *International Journal of English Linguistics*, *7*(5), 176-183.

Azhari, A. M., Hazir, N. S. M., Yee, S. K., Joli, N. S., & Yusof, R. M. (2020). THE EFFECTS OF STUDENT'S LEARNING STYLES TO THE EXAM RESULT AMONG GIFTED AND TALENTED STUDENTS. *International Journal of Education and Pedagogy*, 2(4), 509-517.

Ameen, K. (2007, August). Issues of quality assurance (QA) in LIS higher education in Pakistan. In *World Library and Information Congress* (pp. 19-23).

Among Regular, L. S. P. (2017). Assessment of Gender Difference on Learning Styles Preferences among Regular Undergraduate Students of Mekelle University Collage of Health Science. *Journal of Stem Cell Biology and Transplantation*, *1*(2), 14.

A., McGregor, M., Sabiston, D., & Vriliotis, S. (2014). VARK learning styles and student performance in principles of micro-vs. macro-economics. *Journal of Economics and Economic Education Research*, *15*(3), 113.

Amran, N., Bahry, F. D. S., Yusop, Z. M., & Abdullah, S. (2011). Learning styles of non-science and non-technology students on technical courses in an information management program. *Education for Information*, *28*(2-4), 325-339.

Amran, N., Bahry, F.D.S., Yusop, Z.M. & Abdullah, S. 2011. Learning styles of non science and non-technology students on technical courses in an information management program. *Education for Information,* 28(2):325-339.

Ashour Jhaish, M. (2010). *The relationship among learning styles, language learning strategies, and the academic achievement among the English Majors at Al-Aqsa University* (Doctoral dissertation, Tesis inédita de Maestría, Universidad Islámica Al-Aqsa, Palestina).

Awang, H., Samad, N. A., Mohd Faiz, N. Z., Roddin, R., & Kankia, J. D. (2017). Relationship between the learning styles preferences and academic achievement. *International Research and Innovation Summit*, *226*, 1-5.

Awang, M. M., Ahmad, A. R., Bakar, N. A. A., Ghani, S. A., Yunus, A. N. M., Ibrahim, M. A. H., ... & Rahman, M. J. A. (2013). Students' Attitudes and Their Academic Performance in Nationhood Education. *International Education Studies*, *6*(11), 21-28.

Azevedo, R. E., & Akdere, M. (2010). Measuring the effects of learning styles: Is a little knowledge dangerous for excellence in management education? *Journal of Leadership & Organizational Studies*, *17*(2), 192-200.

Alade, O. M., & Ogbo, A. C. (2014). A COMPARATIVE STUDY OF CHEMISTRY STUDENTS'LEARNING STYLES PREFERENCES IN SELECTED PUBLIC AND PRIVATE SCHOOLS IN LAGOS METROPOLIS. *VOLUME 6, JANUARY, 2014*, *3*, 19.

Anandkumar, A., Michael, N., Tang, A. K., & Swami, A. (2011). Distributed algorithms for learning and cognitive medium access with logarithmic regret. *IEEE Journal on Selected Areas in Communications*, 29(4), 731-745.

Bandura, A., Ross, D., & Ross, S. A. (1963). Imitation of film-mediated aggressive models. *The Journal of Abnormal and Social Psychology*, *66*(1), 3.

Battersby, J., & Gordon, J. (Eds.). (2007). *Preparing to teach: learning from experience*. Routledge.

Bhandari, T. (2014) EXPLORING INNOVATIVE EDUCATIONAL METHODS IN CATERING TO VARYING LEARNING STYLES AMONGST STUDENTS FROM UNDERSERVED COMMUNITIES.

Bhatti, R. U., & Bart, W. M. (2013). On the effect of learning style on scholastic achievement. *Current Issues in Education*, *16*(2).

Bacha, N., Bahous, R., Nabhani, M., & Sabeh, G. (2011). A match or a mismatch between student and teacher learning style preferences.

Bjørnebekk, G., Diseth, Å., & Ulriksen, R. (2013). Achievement motives, self-efficacy, achievement goals, and academic achievement at multiple stages of education: A longitudinal analysis. *Psychological reports*, *112*(3), 771-787.

Bailin, S. (2002). Critical thinking and science education. *Science & Education*, *11*(4), 361-375.

Bhagat, A., Vyas, R., & Singh, T. (2015). Students awareness of learning styles and their perceptions to a mixed method approach for learning. *International Journal of Applied and Basic Medical Research*, *5*(Suppl 1), S58.

Bybee, R. W. (1994). Research on goals for the science curriculum. *Handbook of research on science teaching and learning*, 357-387.

Bosman, A. (2015). *The relationship between student academic achievement and student learning styles in a multicultural senior school* (Doctoral dissertation, University of South Africa).

Barman, A., & Muhamed Yusoff, Y. (2014). Learning style awareness and academic performance of students. *South-East Asian* J*ournal of Medical Education*, 8(1), 47-51.

Boström, L. (2012). Do Ten-Year-Old Children in Sweden Know How They Learn? A Study of How Young Students Believe They Learn Compared to Their Learning Styles Preferences. *International Education Studies*, *5*(6), 11-23.

Brown, T., Zoghi, M., Williams, B., Jaberzadeh, S., Roller, L., Palermo, C., ... & Hewitt, L. (2009). Are learning style preferences of health science students predictive of their attitudes towards e-learning?. *Australasian Journal of Educational Technology*, *25*(4).

Breckler, J., Teoh, C. S., & Role, K. (2011). Academic performance and learning style self-predictions by second language students in an introductory biology course. *Journal of the Scholarship of Teaching and Learning*, 26-43.

Baker, C. (2017). Quantitative research designs: Experimental, quasi-experimental, and descriptive. *Evidence-based practice: An integrative approach to research, administration, and practice*, 155-183.

Bryant, L. C., Vincent, R., Shaqlaih, A., & Moss, G. (2013). Behaviorism and behavioral learning theory.

Breckler, J., Joun, D., & Ngo, H. (2009). Learning styles of physiology students interested in the health professions. *Advances in physiology education*, *33*(1), 30-36.

Barclay, M., Bennett, P., Black, J., Carder, B., Chongwony, L., Fennema, B., ... & Kong, J. (2019). Learning Styles: The Ugly Christmas Sweaters of Education. *Learning*, *2018*, 2017.

Baker, C. (2017). Quantitative research designs: Experimental, quasi-experimental, and descriptive. *Evidence-based practice: An integrative approach to research, administration, and practice*, 155-183.

Barbe, W. B., & Milone, M. N. (1981). What we know about modality strengths. *Educational Leadership*, 38 (5), 378-380.

Barsch, J.R. (1996) Barsch Learning Style Inventory. Academic Therapy Publication. Novato, CA: USA. Retrieved

Bratti, M., & Staffolani, S. (2013). Student time allocation and educational production functions. *Annals of Economics and Statistics/ANNALES D'ÉCONOMIE ET DE STATISTIQUE*, 103-140.

Battersby, J., & Gordon, J. (Eds.). (2007). *Preparing to teach: learning from experience*. Routledge.

Bruner, J. S. (1966). *Toward a theory of instruction* (Vol. 59). Harvard University Press.

Baig, S., & Halai, A. (2006). Learning mathematical rules with reasoning. *Eurasia Journal of Mathematics, Science and Technology Education*, *2*(2), 15-39.

Blosser, P. E., & Helgeson, S. L. (1990). *Selected procedures for improving the science curriculum*. ERIC Clearinghouse.

Brown, J. (2004). Visual learning in science and engineering. *ACM SIGGRAPH Computer Graphics*, *38*(4), 22-23.

Brassard, C. (2004). Are learning patterns different on Mars and Venus. *CDTL Brief*, *7*, 5-6.

Bandura, A., Ross, D., & Ross, S. A. (1963). Imitation of film-mediated aggressive models. *The Journal of Abnormal and Social Psychology*, *66*(1), 3.

Bhat, A. (2018). Stratified random sampling: Definition, method and examples.

Çalışkan, H., & Kılınç, G. (2012). The relationship between the learning styles of students and their attitudes towards social studies course. *Procedia-Social and Behavioral Sciences*, *55*, 47-56.

Cegielski, C. G., Hazen, B. T., & Rainer, R. K. (2011). Teach them how they learn: Learning styles and information systems education. *Journal of Information Systems Education*, *22*(2), 135.

Cheng, A., Rodgers, D. L., Van Der Jagt, É., Eppich, W., & O'Donnell, J. (2012). Evolution of the Pediatric Advanced Life Support course: enhanced learning with a new debriefing tool and Web-based module for Pediatric Advanced Life Support instructors. *Pediatric Critical Care Medicine*, *13*(5), 589-595.

Cant, M. C., Strydom, J. W., & Jooste, C. J. (2001). du Plessis. (2006). *Marketing Management. (5th edn.). Cape Town: Juta*.

Carmo, L., Gomes, A., Pereira, F., & Mendes, A. (2006, September). Learning styles and problem solving strategies. In *3rd E-Learning Conference* (pp. 7-8).

Caprara, G. V., Vecchione, M., Alessandri, G., Gerbino, M., & Barbaranelli, C. (2011). The contribution of personality traits and self-efficacy beliefs to academic achievement: A longitudinal study. *British Journal of Educational Psychology*, *81*(1), 78-96.

Collins Concise Dictionary and Thesaurus of English Language. (2002). London: Harper Collins Publishers

Cerna, M. A., & Pavliushchenko, K. (2015). Influence of Study Habits on Academic Performance of International College Students in Shanghai. *Higher Education Studies*, *5*(4), 42-55.

Chase, P. A., Hilliard, L. J., Geldhof, G. J., Warren, D. J., & Lerner, R. M. (2014). Academic achievement in the high school years: The changing role of school engagement. *Journal of youth and adolescence*, *43*(6), 884-896.

Chaudhary, M. H., Ayub, S., Aftab, A., Faiza, F., Ahmed, U., Khursheed, J., & Ullah, E. (2015). Association of academic performance with learning style preference of medical students: Multi-center study from Pakistan. *J Contemp Med Edu*, *3*(3), 111.

Chaudhary, M. H., Ayub, S., Aftab, A., Faiza, F., Ahmed, U., Khursheed, J., & Ullah, E. (2015). Association of academic performance with learning style preference of medical students: Multi-center study from Pakistan. *J Contemp Med Edu*, *3*(3), 111.

Cheung, C. S., & McBride-Chang, C. (2008). Relations of perceived maternal parenting style, practices, and learning motivation to academic competence in Chinese children. *Merrill-Palmer Quarterly (1982-)*, 1-22.

Chianson, M. M., Aligba, S. O., & Jimin, N. (2015). Prevalent Learning Style among Secondary School Mathematics Students and Its Influence on Gender and Age in Benue State, Nigeria. *International British Journal of Applied Science and Technology*, *8 (4), 38, 399*.

Coffield, F., Moseley, D., Hall, E., Ecclestone, K., Coffield, F., Moseley, D., ... & Ecclestone, K. (2004). Learning styles and pedagogy in post-16 learning: A systematic and critical review.

Cohen, L. A. (1987). BIRTH ORDER AND LEARNING STYLES: AN EXAMINATION OF THE RELATIONSHIP BETWEEN BIRTH ORDER AND MIDDLE SCHOOL STUDENTS'PREFERRED LEARNING STYLE PROFILE.

Cooper, L.Z. 2013. Student reflections on an LIS internship from a service learning perspective supporting multiple learning theories. *Journal of Education for Library and Information Science*, 54(4):286-298.

Crespo, R. M., Najjar, J., Derntl, M., Leony, D., Neumann, S., Oberhuemer, P., ... & Kloos, C. D. (2010, April). Aligning assessment with learning outcomes in outcome-based education. In *IEEE EDUCON 2010 Conference* (pp. 1239-1246). IEEE.

Cutolo, A., & Rochford, R. A. (2007). An Analysis of Freshmen Learning Styles and Their Relationship to Academic Achievement. *College Quarterly*, *10*(2), 1-17.

Cooper, L. Z. (2013). Student reflections on an LIS internship from a service learning perspective supporting multiple learning theories. *Journal of Education for Library and Information Science*, 286-298.

Cheng, G. (2014). A study on learning styles and acceptance of using second life for learning in a visual arts course. *Open Journal of Social Sciences*, *2*(02), 22.

Considine, G., & Zappalà, G. (2002). The influence of social and economic disadvantage in the academic performance of school students in Australia. *Journal of sociology*, 38(2), 129-148.

Castro, O., & Peck, V. (2005). Learning styles and foreign language learning difficulties. *Foreign Language Annals*, 38(3), 401-409.

Cuthbert, P. F. (2005). The student learning process: Learning styles or learning approaches? *Teaching in Higher education*, 10(2), 235-249.

Coffield, F., Moseley, D., Hall, E., Ecclestone, K., Coffield, F., Moseley, D., ... & Ecclestone, K. (2004). Learning styles and pedagogy in post-16 learning: A systematic and critical review.

Curtis, E. A., Comiskey, C., & Dempsey, O. (2016). Importance and use of correlational research. *Nurse researcher*, *23*(6).

Crespo, R. M., Najjar, J., Derntl, M., Leony, D., Neumann, S., Oberhuemer, P., ... & Kloos, C. D. (2010, April). Aligning assessment with learning outcomes in outcome-based education. In *IEEE EDUCON 2010 Conference* (pp. 1239-1246). IEEE.

Cohen, L. A. (1987). BIRTH ORDER AND LEARNING STYLES: AN EXAMINATION OF THE RELATIONSHIP BETWEEN BIRTH ORDER AND MIDDLE SCHOOL STUDENTS'PREFERRED LEARNING STYLE PROFILE.

Creswell, J. W. (2014). The selection of a research approach. Research design: *Qualitative, quantitative, and mixed methods approaches*, 3-24.

Dunn, R., Dunn, K., & Price, G. E. (1989). Learning Style Inventory. Lawrence, KS: Price Systems.

Dunn, R., & Dunn, K. (1978). *Teaching Students through their Individual Learning Styles. A Practical Approach. Prentice* Hall, Reston, VA., ISBN: 10: 0879098082, 336.

Dunn, R. Sanders (1981). Learning style: State of the science. *Theory into practice*, 23(1), 10-19.

DIN, M. (2009). *A STUDY IN INDICES OF DISCREPANCY BETWEEN STUDENTS'LEARNING STYLES AND THEIR ACTUAL GRADE ACHIEVEMENT AT MASTERS'LEVEL* (Doctoral dissertation, NATIONAL UNIVERSITY OF MODERN LANGUAGES (NUML) ISLAMABAD).

DeFreitas, S. C. (2011). Differences between African American and European American first year college students in the relationship between self-efficacy, outcome expectations and academic achievement. *Social Psychology of Education,* 15(1), 109-123.

DALMOLIN, A. C., MACKEIVICZ, G. A. O., POCHAPSKI, M. T., PILATTI, G. L., & SANTOS, F. A. (2018). Learning styles preferences and e-learning experience of undergraduate dental students. *Revista de Odontologia da UNESP, 47*, 175-182.

Dunn, R. S., & Dunn, K. J. (1993). *Teaching secondary students through their individual learning styles: Practical approaches for grades 7-12*. Prentice Hall.

Deary, I. J., Strand, S., Smith, P., & Fernandes, C. (2007). Intelligence and educational achievement. *Intelligence, 35*(1), 13-21.

Damrongpanit, S., & Reungtragul, A. (2013). Matching of learning styles and teaching styles: Advantage and disadvantage on ninth-grade students academic achievements. *Educational Research and Reviews*, *8*(20), 1937-1947.

Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions. *Child development,* 82(1), 405-432.

DALMOLIN, A. C., MACKEIVICZ, G. A. O., POCHAPSKI, M. T., PILATTI, G. L., & SANTOS, F. A. (2018). Learning styles preferences and e-learning experience of undergraduate dental students. *Revista de Odontologia da UNESP,* 47(3), 175-182.

DALMOLIN, A. C., MACKEIVICZ, G. A. O., POCHAPSKI, M. T., PILATTI, G. L., & SANTOS, F. A. (2018). Learning styles preferences and e-learning experience of undergraduate dental students. *Revista de Odontologia da UNESP,* 47(3), 175-182.

Deary, I. J., Strand, S., Smith, P., & Fernandes, C. (2007). Intelligence and educational achievement. *Intelligence, 35*(1), 13-21.

Dennick, R. (2012). Twelve tips for incorporating educational theory into teaching practices. *Medical Teacher*, *34*(8), 618-624.

Davison, C. B., & Dustova, G. (2017). A Quantitative Assessment of Student Performance and Examination Format. *Journal of Instructional Pedagogies*, *18*.

Duman, B. (2010). The Effects of Brain-Based Learning on the Academic Achievement of Students with Different Learning Styles. *Educational Sciences: Theory and Practice*, *10*(4), 2077-2103.

Duman, B. (2010). The Effects of Brain-Based Learning on the Academic Achievement of Students with Different Learning Styles. *Educational Sciences: Theory and Practice*, *10*(4), 2077-2103.

Durrheim, K. (2006). Research design. *Research in practice: Applied methods for the social sciences*, *2*, 33-59.

Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions. *Child development,* 82(1), 405-432.

Durmuşçelebi, M. (2013). Examining candidate teacher's learning styles by some variables. *International Journal of Academic Research*, *5*(3), 210-219.

Dunn, R. S., & Griggs, S. A. (1998). *Learning styles and the nursing profession* (No. 14). Jones & Bartlett Learning.

DALMOLIN, A. C., MACKEIVICZ, G. A. O., POCHAPSKI, M. T., PILATTI, G. L., & SANTOS, F. A. (2018). Learning styles preferences and e-learning experience of undergraduate dental students. *Revista de Odontologia da UNESP*, *47*, 175-182.

El Bachari, E., & El Hassan Abelwahed, M. E. A. (2011). E-LEARNING PERSONALIZATION BASED ON DYNAMIC LEARNERS'PREFERENCE.

Elçi, A. N., Kiliç, D. S., & Alkan, H. (2012). 4MAT MODEL'S IMPACT ON THE LEARNING STYLES, SUCCESS AND ATTITUDES TOWARDS MATHEMATICS. *Journal of Educational & Instructional Studies in the World*, *2*(3).

Ertmer, P.A. & Newby, T.J. 2013. Behaviourism, cognitivism, constructivism: comparing critical features from an instructional design perspective. *Performance Improvement Quarterly*, 26(2):43-71.

Ediger, M. (1999). *Problems in Teaching Science.* (ERIC Document Reproduction Service No. ED 431 625).

Erton, I. (2010). Relations between personality traits, language learning styles and success in foreign language achievement. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, *38*(38), 115-126.

Eilisha, B. (2007). Effectiveness of Working Individually Versus Cooperative Groups: A Classroom-Based Research Project. *University of Pennsylvania http://www. sas. upenn. edu/~ jbryson*.

El Bachari, E., & El Hassan Abelwahed, M. E. A. (2011). E-LEARNING PERSONALIZATION BASED ON DYNAMIC LEARNERS'PREFERENCE.

Felder, R. M., & Spurlin, J. (2005). Applications, reliability and validity of the index of learning styles. *International journal of engineering education*, *21*(1), 103-112.

Farooq, M. S., Chaudhry, A. H., Shafiq, M., & Berhanu, G. (2011). Factors affecting students' quality of academic achievement: a case of Secondary School Level. *Journal of quality and technology management, 7(2), 1-14.*

Fleming ND. (2001). *Teaching and Learning Styles: VAK Strategies.* Honolulu Community College. Retrieved from http://www.how-tostudy.com/LearningStyles.htm.

Fayombo, G. (2015). Learning styles, teaching strategies and academic achievement among some psychology undergraduates in Barbados. *Caribbean Educational Research Journal*, 3(2), 46-61.

Fatt, J. P. T. (2000). Understanding the learning styles of students: Implications for educators. *International journal of sociology and social policy*.

Fiksl, M., & Aberšek, B. (2014). Classroom climate as a part of contemporary didactical approaches. *Problems of Education in the 21st Century*, *61*, 28.

Fleming, N. D. (2001). *Teaching and learning styles: VAK strategies.* IGI global.

Felder, R. M., & Brent, R. (2005). Understanding student differences. *Journal of engineering education*, *94*(1), 57-72.

Faize, F. A. (2011). *Problems and prospects of science education at secondary level in Pakistan* (Doctoral dissertation, INTERNATIONAL ISLAMIC UNIVERSITY, ISLAMABAD).

Faize, F. A., & Dahar, M. A. (2011). Physics Teachers Teaching Competency in Pakistan-Perception of 'O'Level Students. *American Journal of Scientific Research*, *16*.

Galster, G., Santiago, A. M., & Stack, L. (2016). Elementary school difficulties of low-income Latino and African American youth: The role of geographic context. *Journal of Urban Affairs*, *38*(4), 477-502.

Griffiths, C. 2012. 'Learning styles: traversing the quagmire' in S. Mercer, S. Ryan, and M. Williams (eds.). *Psychology for Language Learning:* Insights from Research, Theory and Practice. London: Palgrave Macmillan.

Garner-O'Neale, L. D., & Harrison, S. (2013). An investigation of the learning styles and study habits of chemistry undergraduates in Barbados and their effect as predictors of academic achievement in Chemical group theory. *Journal of Educational and Social Research*, *3*(2), 107-107.

Goodrum, D., Rennie, L. J., & Hackling, M. W. (2001). *The status and quality of teaching and learning of science in Australian schools: A research report*. Canberra: Department of Education, Training and Youth Affairs.

Graf, B., Liu, U., & Kinshuk, F. (2010). The impact of verbal learning style on pupil academic performance in Kenya. International Journal of Education, 5(3), 176-184

Government of Pakistan. (2000). Gazette book of Pakistan. Islamabad: Pakistan Printing Press. Graf, S., Kinshuk, & Liu, T. C. (2009). Supporting teachers in identifying students' learning styles in learning management systems: An automatic student modelling approach. *Journal of Educational Technology & Society*, *12*(4), 3-14.

Gay, M., & Mills, G. E. Airasian (2006). *Educational research. New Jesey: Upper Saddle River*.

Graf, S., Kinshuk, & Liu, T. C. (2009). Supporting teachers in identifying students' learning styles in learning management systems: An automatic student modelling approach. *Journal of Educational Technology & Society, 12*(4), 3-14.

Grasha, A. F., & Yangarber-Hicks, N. (2000). Integrating teaching styles and learning styles with instructional technology. *College teaching*, *48*(1), 2-10.

Graf, S., Liu, T. C., Chen, N. S., & Yang, S. J. (2009). Learning styles and cognitive traits–Their relationship and its benefits in web-based educational systems. *Computers in Human Behavior,* 25(6), 1280-1289.

Gray, C. & Macblain, S. 2012. *Learning theories in childhood.* London: Sage

Gross, R. 2010. *Psychology*: *The science of mind and behaviour*. (6th edition). Oxon: Bookpoint

Gokalp, M. (2013). The effect of students' learning styles to their academic success. *Creative Education*, 4(10), 627.

Gappi, L. L. (2013). Relationships between learning style preferences and academic performance of students. *International Journal of Educational Research and Technology*, 4(2), 70-76.

Galster, G., Santiago, A. M., & Stack, L. (2016). Elementary school difficulties of low-income Latino and African American youth: The role of geographic context. *Journal of Urban Affairs*, *38*(4), 477-502.

Graf, S., Liu, T. C., Chen, N. S., & Yang, S. J. (2009). Learning styles and cognitive traits–Their relationship and its benefits in web-based educational systems. *Computers in Human Behavior,* 25(6), 1280-1289.

Geetha, M. C., & Praveena, K. B. (2017). Learning styles of secondary school students and their interest in biological science. *International Journal of Advanced Educational Research,* 2455-6157.Glen, S. (2014). Cronbach's Alpha: Simple definition, use and interpretation. Statistics How To.

Government of Pakistan. (2000). Gazette book of Pakistan. Islamabad: Pakistan Printing Press.

Hina, K. B., Ajmal, M., Rahman, F., & Jumani, N. B. (2010). Relationship between Multiple Intelligence Categories and Learning Styles of Students in Pakistan. *Language in India,* 10(11).

Huws, N., Reddy, P., & Talcott, J. (2006). Predicting university success in psychology: are subject-specific skills important? *Psychology Learning & Teaching,* 5(2), 133-140.

Hsieh, S. W., Jang, Y. R., Hwang, G. J., & Chen, N. S. (2011). Effects of teaching and learning styles on students' reflection levels for ubiquitous learning. *Computers & Education,* 57(1), 1194-1201.

Hodson, D. (1998). *Teaching and learning science: Towards a personalized approach*. McGraw-Hill Education (UK).

Halai, N., & McNicholl, J. (2004). Teachers' conceptions of the nature of science: A comparative study from Pakistan and UK. *School Science Review*, *86*(314), 93.

Honey, P., & Mumford, A. (1992). The manual of learning styles Maidenhead. *P Honey.*

Holliday, B. G. (1985). Differential effects of children's self-perceptions and teachers' perceptions on black children's academic achievement. *The Journal of Negro Education,* 54(1), 71-81.

Helena, M. T. C. (2017). Styles of Learning Based on the Research of Fernald Keller Orton Gillingham Stillman Montessori and Neil D Fleming. *International Journal for Innovative Research in Multidisciplinary Field*, 3(4), 17-25.

Hartle, R. T., Baviskar, S., & Smith, R. (2012). A field guide to constructivism in the college science classroom: four essential criteria and a guide to their usage. *Bioscene: Journal of College Biology Teaching*, *38*(2), 31-35.

Horner, R. H., Sugai, G., & Anderson, C. M. (2010). Examining the evidence base for school-wide positive behavior support. *Focus on exceptional children*, *42*(8).

Henri, J. F. (2006). Organizational culture and performance measurement systems. *Accounting, organizations and society*, *31*(1), 77-103.

Hirst, P. H. (2010). *Knowledge and the curriculum (International Library of the Philosophy of Education Volume 12): A collection of philosophical papers*. Routledge.

Hassan, N., & Hassan, T. (2016). Female students get more marks as compared to male students: Astatistical study. *J Bus Fin Aff*, *5*, 226.

Hawk, T. F., & Shah, A. J. (2007). Using learning style instruments to enhance student learning. *Decision Sciences Journal of Innovative Education*, *5*(1), 1-19.

Henri, J. F. (2006). Organizational culture and performance measurement systems. *Accounting, organizations and society*, *31*(1), 77-103.

Hirst, P. H. (2010). *Knowledge and the curriculum (International Library of the Philosophy of Education Volume 12): A collection of philosophical papers*. Routledge.

Holton, E. F., & Burnett, M. F. (2005). The basics of quantitative research. *Research in organizations: Foundations and methods of inquiry*, 29-44.

Honey, P., & Mumford, A. (1992). The manual of learning styles Maidenhead. *P Honey*.

Horner, R. H., Sugai, G., & Anderson, C. M. (2010). Examining the evidence base for school-wide positive behavior support. *Focus on exceptional children*, *42*(8).

Hulme, J. A., & Allcock, S. J. (2010). Learning styles in the classroom: Educational benefit or planning exercise? *Psychology Teaching Review*, *16*(2), 67-77.

Holliday, A. (2009). Understanding the Implications Self-Concept and Academic Self-Concept Has on African Americans and Latino's. *Educational Journal of Psychology, 7, 87, 94*.

Ibrahim, R. H., & Hussein, D. A. (2016). Assessment of visual, auditory, and kinesthetic learning style among undergraduate nursing students. *Int J Adv Nurs Stud*, *5*, 1-4.

Ismail, N. A., & Awang, H. (2008). Mathematics achievement among Malaysian students: what can they learn from Singapore.

Illeris, K. 2009. Introduction. In: *Contemporary theories of learning*, edited by K. Illeris. Oxon: Routledge: Sage: 1-6.

Ismail , R. (2010). The implication of learning styles on pupil academic success in Bilkent University. Blkent: Bilkent University Press.

İlçin, N., Tomruk, M., Yeşilyaprak, S. S., Karadibak, D., & Savcı, S. (2018). The relationship between learning styles and academic performance in TURKISH physiotherapy students. *BMC medical education, 18*(1), 1-8.

JilardiDamavandi, A., Mahyuddin, R., Elias, H., Daud, S. M., & Shabani, J. (2011). Academic achievement of students with different learning styles. *International journal of psychological studies, 3(2), 186-192.*

Jaleel, S., & Thomas, A. (2019). Learning Styles Theories and Implications for Teaching Learning.

Janakiraman, B. (2018). Assessment of Visual, Auditory, and kinaesthetic Learning Styles among Postgraduate Management Students. *Asian Journal of Management*, *9*(2), 1031-1037.

Jhangiani, R. S., & Chiang, I. C. A. (2015). Research methods in psychology-2nd Canadian Edition.

Jiraporncharoen, W., Angkurawaranon, C., Chockjamsai, M., Deesomchok, A., & Euathrongchit, J. (2015). Learning styles and academic achievement among undergraduate medical students in Thailand. *Journal of educational evaluation for health professions*, *12*.

Juskeviciene, A. & Kurilovas,E. (2014). On recommending Web 2.0 tools to personalise learning. *Informatics in Education*, *13*, 17-31.

Kahtz, A. W., & Kling, G. J. (1999). Field-dependent and Field-independent Conceptualisations of Various Instructional Methods with an Emphasis on CAI: a qualitative analysis. *Educational Psychology*, *19*(4), 413-428.

Kasirye, I. (2009). Determinants of learning achievement in Uganda. *Economic Policy Research Centre, Uganda*.

Kayalar, F., & Kayalar, F. (2017). The effects of auditory learning strategy on learning skills of language learners (students' views).

Keri, G. (2002). Male and female college students' learning styles differ: An opportunity for instructional diversification. *College Student Journal*, 36(3), 433-442.

Khan, B. B., Nawaz, R., Chaudhry, K. M., Hyder, A. U., & Butt, T. M. (2012). Evaluation of comparative academic performance of undergraduate students at university level. *J Anim Plant Sci*, *22*(3), 798-801.

Kovalik S. J. (2008). *Gender differences and student engagement.* Rexford, NY: Center for Effective Learning. International Center for Leadership in Education.

Khan, S. A., Arif, M. H., & Yousuf, M. I. (2019). A Study of Relationship between Learning Preferences and Academic Achievement. *Bulletin of Education and Research*, *41*(1), 17-32.

Kwesiga, J. C. (2002). Women's access to higher education in Africa: Uganda's experience.

Kumar, A., Singh, N., & Ahuja, N. J. (2017). Learner characteristics based learning style models classification and its implications on teaching. *Int. J. Pure Appl. Math. (IJPAM)*, *118*(20), 175-184.

Khan, S. A., Arif, M. H., & Yousuf, M. I. (2019). A Study of Relationship between Learning Preferences and Academic Achievement. *Bulletin of Education and Research*, *41*(1), 17-32.

Khurshid, F., & Mahmood, N. (2012). Learning styles of natural sciences, social sciences and humanities students at graduate level. *Interdisciplinary journal of contemporary research in business*, *3*(9), 672-678.

Kyoshaba, M. (2009). *Factors affecting academic performance of undergraduate students at Uganda Christian University)* (Doctoral dissertation, Makerere University.

Kwesiga, J. C. (2002). Women's access to higher education in Africa: Uganda's experience.

Krejcie, R.V., & Morgan, D.W., (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement.*

Kinshuk, T. L., & Patel, A. (2010). User exploration based adaptation in adaptive learning systems. *International Journal of Information Systems in Education*, 1(1), 22-31.

Klepac, L. L. (2013). Relationships between learning style preferences and academic performance of students. *International Journal of Educational Research and Technology*, 4(2), 70-76.

Kant, R. (2015). Relationship between learning styles and scientific attitude of secondary school students and their achievement in Science subject. *Journal of Educational Sciences and Psychology*, *67*(1).

Keefe, J. W., & Howard, E. R. (1997). The school as a learning organization. *Nassp Bulletin*, *81*(589), 35-44.

Laxman, K., Sandip, S., & Sarun, K. (2014). Exploration of preferred learning styles in medical education using VARK modal. *Russian Open Medical Journal*, *3*(3).

LePine, J. A. (2005). Adaptation of teams in response to unforeseen change: effects of goal difficulty and team composition in terms of cognitive ability and goal orientation. *Journal of Applied Psychology*, *90*(6), 1153.Leung,

Lynch, A. D., Lerner, R. M., & Leventhal, T. (2013). Adolescent academic achievement and school engagement: An examination of the role of school-wide peer culture. *Journal of youth and adolescence*, *42*(1), 6-19.

Leach, J., & Paulsen, A. (1999). Practical work in science education: Recent research studies.

Loh, C. Y. R., & Teo, T. C. (2017). Understanding Asian students learning styles, cultural influence and learning strategies. *Journal of Education & Social Policy*, *7*(1), 194-210.

Loo, S. P. (2001). Islam, science and science education: Conflict or concord?

Leung, A., McGregor, M., Sabiston, D., & Vriliotis, S. (2014). VARK learning styles and student performance in principles of micro-vs. macro-economics. *Journal of Economics and Economic Education Research*, *15*(3), 113.

Levy, S., & Murray, J. (2005). Tertiary entrance scores need not determine academic success: An analysis of student performance in an equity and access program. *Journal of Higher Education Policy and Management*, *27*(1), 129-141.

Lincoln, F., & Rademacher, B. (2006). Learning styles of ESL students in *community colleges. Community College Journal of Research and Practice*, 30(5-6), 485-500.

L. C. Sarasin, "Learning Style Perspectives-impact in the classroom", Atwood Publishing, Madison, WI, 1999.

Lohri-Posey, B. (2003). Determining learning style preferences of students. *Nurse Educator*, *28*(2), 54.

LePine, J. A. (2005). Adaptation of teams in response to unforeseen change: effects of goal difficulty and team composition in terms of cognitive ability and goal orientation. *Journal of Applied Psychology*, *90*(6), 1153.

Levy, S., & Murray, J. (2005). Tertiary entrance scores need not determine academic success: An analysis of student performance in an equity and access program. *Journal of Higher Education Policy and Management*, *27*(1), 129-141.

Mega, C., Ronconi, L., & De Beni, R. (2014). What makes a good student? How emotions, self-regulated learning, and motivation contribute to academic achievement. *Journal of educational psychology*, *106*(1), 121.

Mestre, L. S. (2010). Matching up learning styles with learning objects: What's effective?. *Journal of Library Administration*, *50*(7-8), 808-829.

Meyers, C., & Jones, T. B. (1993). *Promoting Active Learning. Strategies for the College Classroom*. Jossey-Bass Inc., Publishers, 350 Sansome Street, San Francisco, CA 94104.

Magulod Jr, G. C. (2019). Learning styles, study habits and academic performance of Filipino University students in applied science courses: Implications for instruction. *JOTSE: Journal of Technology and Science Education*, *9*(2), 184-198.

Malik, U. (2007). Exploring science education in Pakistan. *Journals of the American Physical Society*, *16*(9), 34-39.

Memon, G. R. (2007). Education in Pakistan: The key issues, problems and the new challenges. *Journal of Management and Social Sciences*, *3*(1), 47-55.

Mohanty, R. (2004). *Science Education Programme in Secondary Schools*. Deep and Deep Publications.

Murphy, K. L., Cifuentes, L., & Shih, Y. C. D. (2004). Online collaborative documents for research and coursework. *TechTrends*, *48*(3), 40-46.

Meshack, N. M. (2015). A Correlation Study between Learning Style and Academic Achievement among Secondary School Student in Kenya (Master of Education Research, University of Nairobi, Kenya.)

MacBlain, S. (2014). *How children learn*. Sage.

MehrAfza, M. (2004). *The relationship between child-rearing practices, creativity and academic achievement among students in high school's city of Tabriz,* Iran University of Tabriz, Tabriz.

Mujere, N. (2016). Sampling in research. In *Mixed methods research for improved scientific study* (pp. 107-121). IGI Global.

Miles, S. B., & Stipek, D. (2006). Contemporaneous and longitudinal associations between social behavior and literacy achievement in a sample of low-income elementary school children. *Child development*, *77*(1), 103-117.

Miller, P. (2001). Learning styles: The multimedia of the mind. *Educ Resources Inform Center*, *451*(1), 140.

Meshack, N. M. (2015). *A Correlation Study between Learning Style and Academic Achievement among Secondary School Student in Kenya* (Master of Education Research, University of Nairobi, Kenya.)

Mislina, A., & Hazmilah, H. (2017). Gender and faculty relation to VAK learning style preferences among technical students. *Proceedings of Mechanical Engineering Research Day 2017*, *2017*, 227-229.

Manochehri, N. N., & Young, J. I. (2006). The impact of student learning styles with web-based learning or instructor-based learning on student knowledge and satisfaction. *Quarterly Review of Distance Education*, *7*(3), 313.

Mouton, J. (2001). *Basic Concepts in the Methodology of the Social Sciences 5Th edition.* Pretoria: Van Schail.

Moubayed, A., Injadat, M., Nassif, A. B., Lutfiyya, H., & Shami, A. (2018). E-learning: Challenges and research opportunities using machine learning & Data analytics. IEEE Access, 6, 39117-39138.

Muluk, S., Habiburrahim, H., & Rechal, S. R. (2020). STUDENTS'AWARENESS AND PERCEPTION TOWARDS LEARNING STYLES. *JURNAL ILMIAH DIDAKTIKA: Media Ilmiah Pendidikan dan Pengajaran*, *20*(2), 143-164.

Mutua, M. N. (2015). A correlation study between learning styles and academic achievement among secondary school students in Kenya (Doctoral dissertation, University of Nairobi).

Mulalic, A., Shah, P. M., & Ahmad, F. (2009). Perceptual learning styles of ESL students. *European journal of social sciences*, *7*(3), 101-113.

Maxwell, B. E. O. A. E. (2017). Learning Styles and Academic Performance of Junior Secondary School Student in Rivers State: Implications for Counselling.

Magulod Jr, G. (2019). Learning styles, study habits and academic performance of Filipino University students in applied science courses: Implications for instruction. *Journal of Technology and Science Education*, 9(2), 184-198.

Miles, S. B., & Stipek, D. (2006). Contemporaneous and longitudinal associations between social behavior and literacy achievement in a sample of low-income elementary school children. *Child development*, *77*(1), 103-117.

Munir, N., Ahmad, N., Hussain, S., & Ghani, U. (2018). Relationship of learning styles and academic performance of secondary school students. *Rawal Medical Journal*, 43(3), 421-424.

Núñez, J. C., González-Pienda, J. A., González-Pumariega, S., Roces, C., Alvarez, L., González, P., ... & Rodríguez, S. (2005). Subgroups of attributional profiles in students with learning difficulties and their relation to self-concept and academic goals. *Learning Disabilities Research & Practice*, 20(2), 86-97.

Muluk, S., Habiburrahim, H., & Rechal, S. R. (2020). STUDENTS'AWARENESS AND PERCEPTION TOWARDS LEARNING STYLES. *JURNAL ILMIAH DIDAKTIKA: Media Ilmiah Pendidikan dan Pengajaran*, 20(2), 143-164.

Nja, C. O., Umali, C. U. B., Asuquo, E. E., & Orim, R. E. (2019). The influence of learning styles on academic performance among science education undergraduates at the University of Calabar. *Educational Research and Reviews, 14*(17), 618-624.

Naimie, Z., Siraj, S., Piaw, C. Y., Shagholi, R., & Abuzaid, R. A. (2010). Do you think your match is made in heaven? Teaching styles/learning styles match and mismatch revisited. *Procedia-Social and Behavioral Sciences*, *2*(2), 349-353.

Nori, Z. (2002). Gender differences creativity, academic achievement (mathematics, sciences and language of literature) among high school in City of Shiraz, Iran. *Unpublished doctoral dissertation. University of Shiraz, Shiraz, Iran*.

Najike, S. V. (2004). *Learning science in a secondary school in Papua New Guinea* (Doctoral dissertation, Queensland University of Technology).

National Curriculum for Physics for grade IX & X (2006), Ministry of Education, Government of Pakistan.

Njoroge, P.M. & Nyabuto, A.N. 2014. Discipline as a Factor in Academic Performance in Kenya. *Journal of Educational and Social Research,* 4(1):289307.

Naik, B. (2013). INFLUENCE OF CULTURE ON LEARNING STYLES OF BUSINESS STUDENTS. *International Journal of Education Research*, *8*(1).

Nakhleh, M., (1992). Why Some Students Don't Learn Chemistry: Chemical Misconceptions, *Journal of Chemical Education,* 69(3), 191-196

Nzesei, M. (2015). A correlation study between learning styles and academic achievement among secondary school students in kenya. *University of Nairobi.*

Omar, N., Mohamad, M. M., & Paimin, A. N. (2015). Dimension of learning styles and students' academic achievement. *Procedia-Social and Behavioral Sciences*, *204*, 172-182.

Orhun, N. (2007). An investigation into the mathematics achievement and attitude towards mathematics with respect to learning style according to gender. *International Journal of Mathematical Education in Science and Technology*, *38*(3), 321-333.

Ormrod, J. E., Anderman, E. M., & Anderman, L. H. (2006). Educational psychology: Developing learners.

Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles: Concepts and evidence. *Psychological science in the public interest*, *9*(3), 105-119.

Palmer, L. (2013). The relationship between stress, fatigue, and cognitive functioning. *College Student Journal*, *47*(2), 312-325.

Powell, K. (2003). Spare me the lecture.

Park, C. C. (1997). Learning style preferences of Asian American (Chinese, Filipino, Korean, and Vietnamese) students in secondary schools. *Equity and Excellence in Education*, *30*(2), 68-77.

Parsons, R., Hinson, S. L., & Sardo-Brown, D. (2000). Educational psychology: *A practitioner-researcher model of teaching.* Wadsworth Publishing.

Peters, D., Jones, G., & Peters, J. (2008). Preferred 'learning styles' in students studying sports-related programmes in higher education in the United Kingdom. *Studies in Higher Education*, *33*(2), 155-166.

Piaget, J. (1964). Development and Learning. Washington DC: National Science Foundation.

Prajapati, B., Dunne, M., Bartlett, H., & Cubbidge, R. (2011). The influence of learning styles, enrolment status and gender on academic performance of optometry undergraduates. *Ophthalmic and Physiological Optics*, *31*(1), 69-78.

Price, G. E., Dunn, R., & Sanders, W. (1980). Reading achievement and learning style characteristics. *The Clearing House*, 5, 223-226. Publication. ISBN: 975-337-043-1.

Poropat, A. E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological bulletin,* 135(2), 322.

Skinner, B. F. (1936). The verbal summator and a method for the study of latent speech. *The Journal of Psychology*, *2*(1), 71-107.

Pritchard, A. (2009). Ways of learning: Learning theories for the classroom. Routledge.

Poisson, M. (2001). Science Education for Contemporary Society: Problems, Issues and Dilemmas. Final Report of the International Workshop on the Reform in the Teaching of Science and Technology at Primary and Secondary Level in Asia: Comparative References to Europe (Beijing, China, March 27-31, 2000).

Park, C. C. (1997). Learning style preferences of Asian American (Chinese, Filipino, Korean, and Vietnamese) students in secondary schools. *Equity and Excellence in Education*, *30*(2), 68-77.

Parsons, R., Hinson, S. L., & Sardo-Brown, D. (2000). Educational psychology: *A practitioner-researcher model of teaching.* Wadsworth Publishing.

Piaget, J. (1964). Development and Learning. Washington DC: National Science Foundation.

Rahman, A., & Ahmar, A. (2017). Relationship between learning styles and learning achievement in mathematics based on genders. *World Transactions on Engineering and Technology Education*, *15*(1).

Rowe, F. A., & Rafferty, J. A. (2013). Instructional design interventions for supporting self-regulated learning: enhancing academic outcomes in postsecondary e-learning environments. *Journal of Online Learning and Teaching*, *9*(4), 590-601.

Rai, A. K., & Dhakal, M. R. (2017). Learning Stypes of Male and Female Students of Nepal. *Journal of Advanced Academic Research*, *4*(1), 67-81.

Reeve, D. J. (2007). Environmental improvements in the metal finishing industry in Australasia. *Journal of Cleaner production*, *15*(8-9), 756-763.

Ratner, B. (2009). The correlation coefficient: Its values range between+ 1/− 1, or do they? *Journal of targeting, measurement and analysis for marketing*, *17*(2), 139-142.

Ross, G. M. (1990). Science and Philosophy in Comparison to the History of Modern Science.

Robinson, J. B. (2000). New Teaching Assistants Facilitate Active Learning in Chemistry Laboratories: Promoting Teaching Assistant Learning through Formative Assessment and Peer Review. *Journal of Graduate Teaching Assistant Development*, 7(3), 147-62.

Rai, A. K., & Dhakal, M. R. (2017). Learning Stypes of Male and Female Students of Nepal. *Journal of Advanced Academic Research*, *4*(1), 67-81.

Ramayah, M., Sivanandan, P., Nasrijal, N. H., Letchumanan, T., & Leong, L. C. (2009). Preferred learning style: Gender influence on preferred learning style among business students. *Journal of US-China Public Administration*, *6*(4), 65-78.

Raiyn, J. (2016). The Role of Visual Learning in Improving Students' High-Order Thinking Skills. *Journal of Education and Practice*, *7*(24), 115-121.

Rodger, S. H., Hayes, J., Lezin, G., Qin, H., Nelson, D., Tucker, R., ... & Slater, D. (2009, March). Engaging middle school teachers and students with alice in a diverse set of subjects. In *Proceedings of the 40th ACM technical symposium on Computer science education* (pp. 271-275).

Rezaeinejad, M., Azizifar, A., & Gowhary, H. (2015). The study of learning styles and its relationship with educational achievement among Iranian high school students. *Procedía-social and behavioral sciences*, *199*, 218-224.

Rasool, G. R. (2007). Education in Pakistan: The key issues, problems and the new challenges. *IBT JOURNAL OF BUSINESS STUDIES (JBS)*, *3*(1).

Reid, G. (2005). *Learning styles and inclusion.* Sage.

Ren, G. (2013). Which learning style is most effective in learning Chinese as a second language. *Journal of International Education Research (JIER)*, *9*(1), 21-32.

Romanelli, F., Bird, E., & Ryan, M. (2009). Learning Styles: A Review of Theory, Application, and Best Practices. *American Journal of Pharmaceutical Education*, 73(1), 1-5

Rizqi, R. D., & Nugroho, K. Y. (2017, June). The Relationship Between Students' learning Styles and their Academic Achievement. In Proceedings Education and Language *International Conference* (Vol. 1, No. 1).

Rasool, G. R. (2007). Education in Pakistan: The key issues, problems and the new challenges. *IBT JOURNAL OF BUSINESS STUDIES (JBS)*, *3*(1).

Sawrey, B. A. (1990). Concept Learning Versus Problem Solving. *Journal of Chemical Education:* Vol. 67, 253-254.

She, H. C. (2005). Promoting students' learning of air pressure concepts: The interrelationship of teaching approaches and student learning characteristics. *The Journal of experimental education*, *74*(1), 29-52.

Sentamu, N. P. (2003). School's influence of learning: A case of upper primary schools in Kampala & Wakiso Districts. *Uganda Education Journal*, *4*, 25-41.

Seo, S., & Koro-Ljungberg, M. (2005). A hermeneutical study of older Korean graduate students' experiences in American higher education: From Confucianism to western educational values. *Journal of Studies in International Education*, *9*(2), 164-187.

Slavin, R. E., & Davis, N. (2006). Educational psychology: Theory and practice.

Sheve, J., Allen, K., & Nieter, V. (2010). *Understanding learning styles: Making a difference for diverse learners.* Teacher Created Materials.

Seeram, E. (2019). An overview of correlational research. *Radiologic technology*, 91(2), 176-179.

Solutions, S. (2014). Correlational does not imply correlation: correlational research design vs. correlation analysis.

Sara, S. (2010). Effects of learning styles on career preferences of senior secondary school students in Jigawa State, Nigeria. *Edo Journal of Counselling*, *3*(1), 132-143.

Slavin, R. E. (2011). Instruction based on cooperative learning. *Handbook of research on learning and instruction*, *4*.

Spoon, J. C., & Schell, J. W. (1998). Aligning student learning styles with instructor teaching styles. *Ethnicity*, *45*(44), 23-40.

Sternberg, R. J. and E. L. Grigorenko. 1997. 'Are cognitive styles still in style?' *American Psychologist* 52/7: 700–12.

Shaaidi, W., & Raihan, W. (2012). *A study of the preferred learning styles of students taking the English 1119 paper in SMK Tengku Intan Zaharah: are the teachers aware of these learning styles? /Wan Raihan Wan Shaaidi* (Doctoral dissertation, Universiti Teknologi MARA).

Siddique, A., Abbas, A., Riaz, F., & Nazir, R. (2014). An Investigation of Perceptual Learning Style Preferences of Students on The Basis of Gender and Academic Achievements. *Pakistan Journal of Life & Social Sciences*, *12*(1), 26-30.

Saban, A. (2005). Ögrenme-ögretme süreci yeni teori ve yaklaşımlar [New theories and approaches in learning-teaching process]. *Ankara: Nobel Publishing/Nobel Yayın Dağıtım*.

Sims, S. J., & Sims, R. R. (1995). *The importance of learning styles: understanding the implications for learning, course design, and education.* Westport, CT: London.

Saljo, R. 2009. Learning, theories of learning and units of analysis in research. *Educational Psychologist,* 44 (3):202-208

Santrock, J. W. (2008). Educational Psychology. (3rd edition). Boston: McGraw-Hill.

Sentamu, N. P. (2003). School's influence of learning: A case of upper primary schools in Kampala & Wakiso Districts. *Uganda Education Journal*, *4*, 25-41.

Slade, S. & Griffith, D. 2013. A whole child approach to student success. *KEDI Journal of Educational Policy,* 21-35.

Soundariya, K., Deepika, V., & Kalaiselvan, G. (2017). A study on the learning styles and learning approaches among medical students. *National Journal of Physiology, Pharmacy and Pharmacology, 7*(10), 1020.

Sadiq, A. (2003). Evaluation of Scientific Enterprise in Pakistan. *Towards Understanding the State of Science in Pakistan. Karachi, Muizz Process*.

Shami, P. A. (2001). Science Curriculum for the Primary School National Institute of Science and Technical Education. *Islamabad: Ministry of Education, Government of Pakistan*.

Shamos, M. H. (1995). *The myth of scientific literacy*. Rutgers University Press.

Schools, B. C. P. (2010). Key elements of a research proposal: Quantitative design. *Towson, MD*.

Sternberg, R. J. (1997). Thinking Styles Cambridge University Press UK.

Tuan, L. T. (2011). Matching and Stretching Learners' Learning Styles. *Journal of Language Teaching & Research*, *2*(2).

Teevan, C. J., Li, M., & Schlesselman, L. S. (2011). Index of learning styles in a US school of pharmacy. *Pharmacy Practice,* 9(2), 82.

Tanner, K., & Allen, D. (2004). Approaches to biology teaching and learning: learning styles and the problem of instructional selection—engaging all students in science courses. *Cell biology education*, *3*(4), 197-201.

Teng, L. (2007). Collaborating and communicating online: A cross bordered intercultural project between Taiwan and the US. *Journal of Intercultural Communication*, (13).

Tobias, S. (1990). They're Not Dumb. They're Different.: A New “Tier of Talent” for Science. *Change: The Magazine of Higher Learning*, *22*(4), 11-30.

Tahir, A. Q., & Ullah, I. (2010). Reborn curriculum efforts in Pakistan: A comparative analysis of Physics curriculum. *Pakistan Journal of Science, Lahore, 62*(4), 216-223.

Verma, B. P., & Sherma, G. Q. (1987). Learning styles of advantaged and disadvantaged students. *Indian Journal of Psychometry & Education*.

Taherdoost, H. (2016). Validity and reliability of the research instrument; how to test the validation of a questionnaire/survey in a research. *How to test the validation of a questionnaire/survey in a research (August 10, 2016)?*

Verma, B. P. (1997). Learning Processes of Prospective Teachers in Relation to Sex and Academic Achievement. *Journal of Psychological Researches:* Vol. 41(1), 32-37.

Vaishnav, R. S., & Chirayu, K. C. (2013). Learning style and academic achievement of secondary school students. *Voice of Research,* 1(4), 1-4.

Vygotsky, L. S. (1978). Mind in Society: The Development of Higher Psychological Processes. Cambridge, MA: Harvard University Press.

Weiss, S., DeFalco, A., & Weiss, E. (2005). Progressive= Permissive? Not According to John Dewey… Subjects Matter. *Essays in Education,* 14) (Summer).

Wolgast, S. L. (2009). King's Crowns: The History of Academic Dress at King's College and Columbia University'. *Transactions of the Burgon Society*, 9, 80-137.

Ward, C. (2006). *International students: Interpersonal, institutional and community impacts: Update of the 2001 literature review*. Ministry of Education.

Wehrwein, E. A., Lujan, H. L., & DiCarlo, S. E. (2007). Gender differences in learning style preferences among undergraduate physiology students. *Advances in physiology education*.

Wadsworth, L. M., Husman, J., Duggan, M. A., & Pennington, M. N. (2007). Online mathematics achievement: Effects of learning strategies and self-efficacy. *Journal of Developmental Education, 30*(3), 6.

Wang, T. S. (2009). Students' learning style and their academic achievement for Taxation course–A comparison study. *In 2nd International Conference of Teaching and Learning. Retrieved from https://my. laureate. net/Faculty.*

Wang, K. H., Wang, T. H., Wang, W. L., & Huang, S. C. (2006). Learning styles and formative assessment strategy: enhancing student achievement in Web-based learning. *Journal of computer assisted learning*, *22*(3), 207-217.

Wichadee, S. (2013). Facilitating students' learning with hybrid instruction: A comparison among four learning styles. *Electronic Journal of Research in Educational Psychology*, *11*(1), 99-116.

Zais, R. (1976). *Curriculum: Principles and foundations*. New York: Thomas Y. Cromwell

Zain, N. N. M., Tamsir, F., Ibrahim, N. A., Poniran, H., & Ghazali, A. S. M. VARK LEARNING STYLES TOWARDS ACADEMIC PERFORMANCE AMONG STUDENTS OF PRIVATE UNIVERSITY IN SELANGOR. *Sciences*, *2*(10), 01-12.

Zhou, M. (2011). Learning Styles and Teaching Styles in College English Teaching. International Education Studies, 4(1), 73-77

APPENDIX A

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

ML.1-4/2020/Edu Dated: 20-01-2020

To: **Bushra**
1490-MPhil/Edu/S18

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

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

a. **Supervisor's Name & Designation**
Dr. Shazia Zamir,
Assistant Professor, Department of Education
NUML, Islamabad.

b. **Co-Supervisor's Name & Designation**
Dr. Farkhanda Tabbassum
Contract Assistant Professor, Department of Education
NUML, Islamabad.

c. **Topic of Thesis**

Relationship of Learning Styles and Academic Achievement of Students at Secondary School Level

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

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

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

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

Dr. Hukam Dad Malik
Head,
Department of Education

Cc to:
Dr. Shazia Zamir
Dr. Farkhanda Tabbassum

APPENDIX B

Informed consent

Dear Participant!

I am student of MPhil Education in National University of Modern Languages (NUML). I am doing a research on the **Relationship of learning Styles and Academic Achievement of Students at Secondary School Level.** I am requested to fill the questionnaire and it is ensured that the information provided by you will be kept confidential and will only be used for research purpose. However, you can withdraw from the at any stage, if you do not wish to continue. Your cooperation is requested in this regard. If you agree to participate then please sign the informed consent. Thank you.

Bushrakhalid278@gmail.com

Research student: Bushra

_____

Participant's Signature

APPENDIX C

(Part A)

Demographics Information:

Gender: **1.Male** **2. Female**

Name of Institution: _____

Marks obtained (Scores in last Exam): _____

Total Marks: _____

Operational Definition

Learning style according to the VAK model is based on [Visual (V), Auditory (A), or Kinesthetic (K)]. Visual learners (seeing and reading) with the help of pictures, models, charts, poster, diagrams, graphs, images, videos and reading books, etc. Auditory learners are being focused on listening and more of what they hear and then say, (lectures, sounds, discussion, words). Kinesthetic learner (learn through doing). They prefer physical activities. These types of learners learn best through experiments, creative activities, classroom projects, and field trips etc.

(Part B)

Questionnaire

S #	Statements	Strongly Disagree (1)	Disagree (2)	Not sure (3)	Agree (4)	Strongly Agree (5)
Visual (Seeing and Reading)						

بصری(دیکھنا اور پڑھنا)						
1.	I prefer to get information through visual aids. میں بصری ذرائع سے معلومات اکٹھا کرنے کو ترجیح دیتا / دیتی ہوں۔	1	2	3	4	5
2.	I prefer getting information about an interesting subject by reading about it. میں کسی دلچسپ موضوع کا مطالعہ کرکے معلومات لینے کو ترجیح دیتا/ دیتی ہوں۔	1	2	3	4	5
3.	I like to take notes for visual review. مجھے بصری مواد کےاہم نکات کوتحریر کرنا پسند ہے	1	2	3	4	5
4.	I understand better when teacher explains a lesson through a poster. جب استاد کسی پوسٹر/ خاکہ کی مدد سے موضوع کی وضاحت کرتا ہے تو مجھے اچھی طرح سمجھ آتا ہے۔	1	2	3	4	5

5.	I understand better when teacher explains a lesson through a model. جب استادکسی مثالی نمونے / ماڈل کے ذریعے وضاحت کرے تو میں زیادہ بہتر طور پر سمجھ پاتا/ پاتی ہوں۔	1	2	3	4	5
6.	I like to make a graph for the explanation of my subject work. مجھے اپنے مضمون کو پیش کرنے میں گراف/ترسیم اشکال سے مدد لینا اچھا لگتا ہے۔	1	2	3	4	5
7.	I like to make charts for the explanation of my subject work. مجھے اپنے موضوع کو بیان کرنے کے لیے چارٹس بنانا پسند ہے۔	1	2	3	4	5
8.	I learn better when I make a drawing during study پڑھائی کے دوران خاکہ نویسی کی مددسے میں بہتر طور پر سیکھتا/ سیکھتی ہوں۔	1	2	3	4	5

9.	I learn better by reading than listening to someone. کسی کو سننے کی بجائے مجھے خود مطالعہ کرنا ذیادہ بہتر لگتا ہے۔	1	2	3	4	5
10.	I prefer to read the textbook material for the understanding of my lesson. میں اپنے سبق کو سمجھنے کے لئے درسی کتاب کا مواد پڑھنے کو ترجیح دیتا/ دیتی ہوں--	1	2	3	4	5
11.	I like to follow the written directions for learning. سیکھنے کے لیے میں لکھی ہوئی ہدایات پر عمل کرنا پسند کرتا /کرتی ہوں۔	1	2	3	4	5
12.	I do my task better when the teacher guides us through images or videos. جب معلم کسی ویڈیو یا تصویر کی مدد سے رہنمائی کرتاہے تو مجھے اپنا کام سمجھنے میں آسانی ہوتی ہے	1	2	3	4	5

13.	I do my task better when the teacher guides us by using a chalkboard. جب معلم تختہ سیاہ کے استعمال سے رہنمائی کرتاہے تو مجھے اپنا کام سمجھنے میں آسانی ہوتی ہے۔	1	2	3	4	5
14.	I can remember best by writing things down several times. ۔میں بار بار لکھنے کی مشق سے چیزیں زیادہ بہتر طور پر یاد کرسکتاہوں /کرسکتی ہوں ۔	1	2	3	4	5
15.	I memorize things by seeing them on paper. کسی بھی بات کو کاغذ پر دیکھنے سے وہ مجھے یاد رہ جاتی ہے یا کسی تحریر کو دیکھنے سے وہ مجھے یا د ہو جاتی ہے۔	1	2	3	4	5
Auditory ((Listening and Speaking) **سمعی (سننے اور بولنے)**						
16.	I learn better when I write my key points after listening the teacher.	1	2	3	4	5

	استاد کی بات سن کر اہم نکات کو لکھ لینے سے مجھے اچھا سمجھ میں آتا ہے/میں بہتر سیکھ سکتا / سکتی ہوں۔					
17.	I memorize things I heard in class better than things I have read. کلاس میں جو بات میں سنتا/ سنتی ہو وہ مجھے پڑھی جانے والی چیزوں سے ذیادہ یاد رہتی ہے۔	1	2	3	4	5
18.	I can learn better about a subject by listening to a lecture. میں لیکچر سن کر کسی مضمون کے بارے میں بہتر طور پر سیکھ سکتا / سکتی ہوں۔	1	2	3	4	5
19.	I prefer to get information through the discussion method. معلومات کے حصول کے میں بحث مباحثہ کے طریقے کو ترجیح دیتا /دیتی ہوں ۔	1	2	3	4	5
20.	I learn better when I discuss my ideas. جب میں اپنے خیالات پر گفتگو کرتا ہوں تو میں بہتر طور پر سیکھتا/ سیکھتی ہوں	1	2	3	4	5

21.	I enjoy listening to narrative descriptions of past stories. میں ماضی کی کہانیوں کو بیان کرنے کے طریقے سے محظوظ ہوتا/ ہوتی ہوں ۔	1	2	3	4	5
22.	I learn better by reading aloud than writing on paper. پرچے پر تحریر کرنے کی نسبت میں بلند خوانی سے زیادہ زیادہ سیکھتا/سیکھتی ہوں	1	2	3	4	5
23.	I like to listen music while doing homework. میں ہوم ورک کے دوران موسیقی سننا پسند کرتا/ کرتی ہوں۔	1	2	3	4	5
24.	I like to follow the oral directions for learning. میں سیکھنے کے لئے زبانی ہدایات پر عمل کرنا پسند کرتا/ کرتی ہوں۔	1	2	3	4	5
25.	I enjoy oral communication with my class fellows for learning.	1	2	3	4	5

	کچھ سیکھنے کے لیے اپنے ہم جماعت ساتھیوں سے زبانی بات چیت کرنا مجھے اچھا لگتا ہے					
26.	I understand better when the teacher teaches verbally. جب استاد کچھ زبانی سمجھاتا ہے تو میں بہتر سمجھ لیتا/لیتی ہوں۔	1	2	3	4	5
27.	I learn better in class when I listen to my class fellows. میں ہم جماعت ساتھیوں کو سن کر زیادہ بہتر طور پر سبق یاد کرسکتا/ سکتی ہوں ۔	1	2	3	4	5
28.	I understand better when other students read aloud. ۔ جب دوسرے ہم جماعت بآواز بلند پڑھتے ہیں تو میں انہیں سن کر زیادہ بہتر طور پر سبق یاد کرسکتا/ سکتی ہوں۔	1	2	3	4	5
29.	I pay attention to learn new things in class. جماعت میں جب کوئی نئی بات سکھائی جاتی ہےتو میں توجہ دیتا/ دیتی ہوں	1	2	3	4	5

Kinesthetic (learn through doing) کچھ کر کے سیکھنا (عملی)						
30.	I enjoy learning by myself in the class. میں جماعت میں خود سے کام کرکے سیکھنا پسند کرتا/کرتی ہوں۔	1	2	3	4	5
31.	I enjoy working with tools and equipment. میں مختلف چیزوں اور سامان کے ذریعے کام کرنے سے لطف اندوز ہوتا/ہوتی ہوں۔	1	2	3	4	5
32.	I am good at solving puzzles. مجھے پزل کو حل کرنے میں مزہ آتا ہے۔	1	2	3	4	5
33.	When I make things in class, I learn better. جب کلاس میں کوئی چیز بناتا ہوں تو زیادہ اچھے سے سیکھتا/ سیکھتی ہوں،	1	2	3	4	5
34.	I enjoy participating in experimental (related to the lab) activities.	1	2	3	4	5

	میں تجرباتی (لیب سے متعلق) سرگرمیوں میں حصہ لینے سے لطف اندوز ہوتا /ہوتی ہوں۔					
35.	I understand things better in class when I participate in role-playing. جب جماعت میں کسی کردارکے ذریعے کسی سرگرمی کا حصہ بنوں تو زیادہ بہتر طور پر سیکھتا/ سیکھتی ہوں۔	1	2	3	4	5
36.	I enjoy activity-based learning (in which the teacher engaged the students in particular). میں عملی بنیاد پر پر ہونے والی چیزیں سیکھ کر لطف اندوز ہوتا/ہوتی ہوں (جس میں اساتذہ نے خاص طور پر طالب علموں کو مشغول کیا ہو)۔	1	2	3	4	5
37.	I like to participate in class projects. مجھے جماعتی منصوبوں میں حصہ لینا اچھا لگتا ہے۔	1	2	3	4	5
38.	I prefer outdoor activities for learning.	1	2	3	4	5

	میں جماعت سے باہر کی جانے سرگرمیوں کے ذریعے سیکھنے کو ترجیح دیتا/دیتی ہوں۔					
39.	I learn better through field trips. میں مطا لعاتی دوروں کے ذریعے سیکھنے کو پسند کرتا/ کرتی ہوں۔	1	2	3	4	5
40.	I like to describe things by performing them practically instead of speaking verbally. میں چیزوں کو عملی طور پربیان کرنے کو پسند کرتا ہوں۔ میں چیزوں کو زبانی طور پر بولنےکی بجائے عملی طور پربیان کرنے کو پسند کرتا/ کرتی ہوں -	1	2	3	4	5
41.	I like to work skillfully with my hands to make or repair things. چیزوں کو بنانے یا مرمت کرنے کے لئے میں اپنے ہاتھوں کامہارت کےساتھ استعمال کرنا پسند کرتا/ کرتی ہوں۔	1	2	3	4	5
42.	I like to actively participate in an activity to learn how to do it.	1	2	3	4	5

	مجھے کسی سرگرمی میں فعال طور پر حصہ لیتے ہوئے کام سیکھنا پسند ہے۔					
43.	I enjoy and do well in sports. میں کھیل میں عمدہ کارکردگی کا مظاہرہ کرتا ہوں اور لطف اندوز ہوتا /ہوتی ہوں۔	1	2	3	4	5
44.	I use a trial and error approach (doing and learning from mistakes) to problem-solving. میں کسی بھی مسئلے کو حل کرنے میں بار بار کوشش کرنے اور غلطی سے سیکھنے کا طریقہ استعمال کرتا/ کرتی ہوں۔	1	2	3	4	5

APPENDIX D

Letter of Request for Validity

RELATIONSHIP OF LEARNING STYLES AND ACADEMIC ACHIEVEMENT OF STUDENTS AT SECONDARY SCHOOL LEVEL

Subject: Request for Validity Certificate

Respected Sir/ Madam

I am Bushra, scholar of M.Phil. Education at National University of Modern Languages, Islamabad and conducting a research on **"RELATIONSHIP OF LEARNING STYLES AND ACADEMIC ACHIEVEMENT OF STUDENTS AT SECONDARY SCHOOL LEVEL".**

Objectives of the study:

1. To explore the learning styles of students at Secondary School Level.
2. To identify the academic achievements of the students at Secondary School Level.
3. To identify the relationship of learning styles (visual, auditory, kinesthetic) and academic achievements of the students at Secondary School Level.
4. To find the gender-based difference regarding learning styles (visual, auditory, kinesthetic) of the students at Secondary School Level.
5. To find the gender-based difference regarding academic achievements of the students at Secondary School Level.

This questionnaire of Barsch Learning Style Inventory by Jeffrey R. Barsch (1996) has been adapted by the researcher, having two sections, one is consisted of demographic data and other includes statements relevant to learning styles of the students. Kindly check my questionnaire, its content and construction, and provide your valuable suggestions for its improvement. It is requested to certify its validity by filling the certificate attached at the end of the document.

Bushra
M.Phil. Scholar
National University of Modern Languages, Islamabad

APPENDIX E

Letter of Request for Validity of Urdu Version Questionnaire

RELATIONSHIP OF LEARNING STYLES AND ACADEMIC ACHIEVEMENT OF STUDENTS AT SECONDARY SCHOOL LEVEL

Subject: Request for Validity Certificate

Respected Sir/ Madam

I am Bushra, scholar of M.Phil. Education at National University of Modern Languages, Islamabad and conducting a research on **"RELATIONSHIP OF LEARNING STYLES AND ACADEMIC ACHIEVEMENT OF STUDENTS AT SECONDARY SCHOOL LEVEL".**

Objectives of the study:

1. To explore the learning styles of students at Secondary School Level.
2. To identify the academic achievements of the students at Secondary School Level.
3. To identify the relationship of learning styles (visual, auditory, kinesthetic) and academic achievements of the students at Secondary School Level.
4. To find the gender-based difference regarding learning styles (visual, auditory, kinesthetic) of the students at Secondary School Level.
5. To find the gender-based difference regarding academic achievements of the students at Secondary School Level.

This questionnaire of Barsch Learning Style Inventory by Jeffrey R. Barsch (1996) has been adapted by the researcher, having two sections, one is consisted of demographic data and other includes statements relevant to learning styles of the students. Kindly check my questionnaire, its content and construction, and provide your valuable suggestions for its improvement. It is requested to certify its validity by filling the certificate attached at the end of the document.

Bushra
M.Phil. Scholar
National University of Modern Languages, Islamabad

APPENDIX F

Certificate of Validity

Certificate of Validity

RELATIONSHIP OF LEARNING STYLES AND ACADEMIC ACHIEVEMENT OF STUDENTS AT SECONDARY SCHOOL LEVEL

By Ms Bushra

M.Phil. Scholar, faculty of Social Sciences, National University of Modern Languages, H-9, Islamabad, Pakistan.

This is to clarify that the questionnaire adapted by the scholar towards her thesis has been assessed by me and I found that it is designed adequately tocheck learning styles of the students according to the VAK Model. The questionnaire has been organized in two major parts exploring respondent's demographic data andthree dimensions of VAK model Visual, Auditory and Kinesthetic learning styles.

It is considered that the research instrument, developed for title "RELATIONSHIP OF LEARNING STYLES AND ACADEMIC ACHIEVEMENT OF STUDENTS AT SECONDARY SCHOOL LEVEL" is according to the objectives of the research and can be used for data collection by the researcher with fair amount of confidence.

Name Dr. Saira Nudrat

Designation AP

Institute NUML

Signature

APPENDIX G

Certificate of Validity

Certificate of Validity

RELATIONSHIP OF LEARNING STYLES AND ACADEMIC ACHIEVEMENT OF STUDENTS AT SECONDARY SCHOOL LEVEL

By Ms Bushra

M.Phil. Scholar, faculty of Social Sciences, National University of Modern Languages, H-9, Islamabad, Pakistan.

This is to clarify that the questionnaire adapted by the scholar towards her thesis has been assessed by me and I found that it is designed adequately tocheck learning styles of the students according to the VAK Model. The questionnaire has been organized in two major parts exploring respondent's demographic data andthree dimensions of VAK model Visual, Auditory and Kinesthetic learning styles.

It is considered that the research instrument, developed for title "RELATIONSHIP OF LEARNING STYLES AND ACADEMIC ACHIEVEMENT OF STUDENTS AT SECONDARY SCHOOL LEVEL" is according to the objectives of the research and can be used for data collection by the researcher with fair amount of confidence.

Name Dr. Aisha.

Designation Assistant Professor.

Institute NUML, Islamabad

Signature Aisha

APPENDIX H

Certificate of Validity

Certificate of Validity

RELATIONSHIP OF LEARNING STYLES AND ACADEMIC ACHIEVEMENT OF STUDENTS AT SECONDARY SCHOOL LEVEL

By Ms Bushra

M.Phil. Scholar, faculty of Social Sciences, National University of Modern Languages, H-9, Islamabad, Pakistan.

This is to clarify that the questionnaire adapted by the scholar towards her thesis has been assessed by me and I found that it is designed adequately tocheck learning styles of the students according to the VAK Model. The questionnaire has been organized in two major parts exploring respondent's demographic data andthree dimensions of VAK model Visual, Auditory and Kinesthetic learning styles.

It is considered that the research instrument, developed for title "RELATIONSHIP OF LEARNING STYLES AND ACADEMIC ACHIEVEMENT OF STUDENTS AT SECONDARY SCHOOL LEVEL" is according to the objectives of the research and can be used for data collection by the researcher with fair amount of confidence.

Name DR. SHABANA

Designation Principal

Institute GDCW Zafarul Haq road RWP

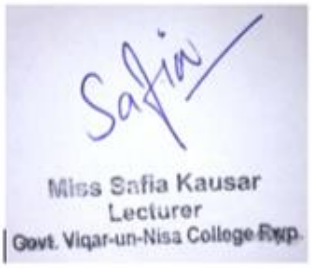
Signature

APPENDIX I

سرٹیفکیٹ

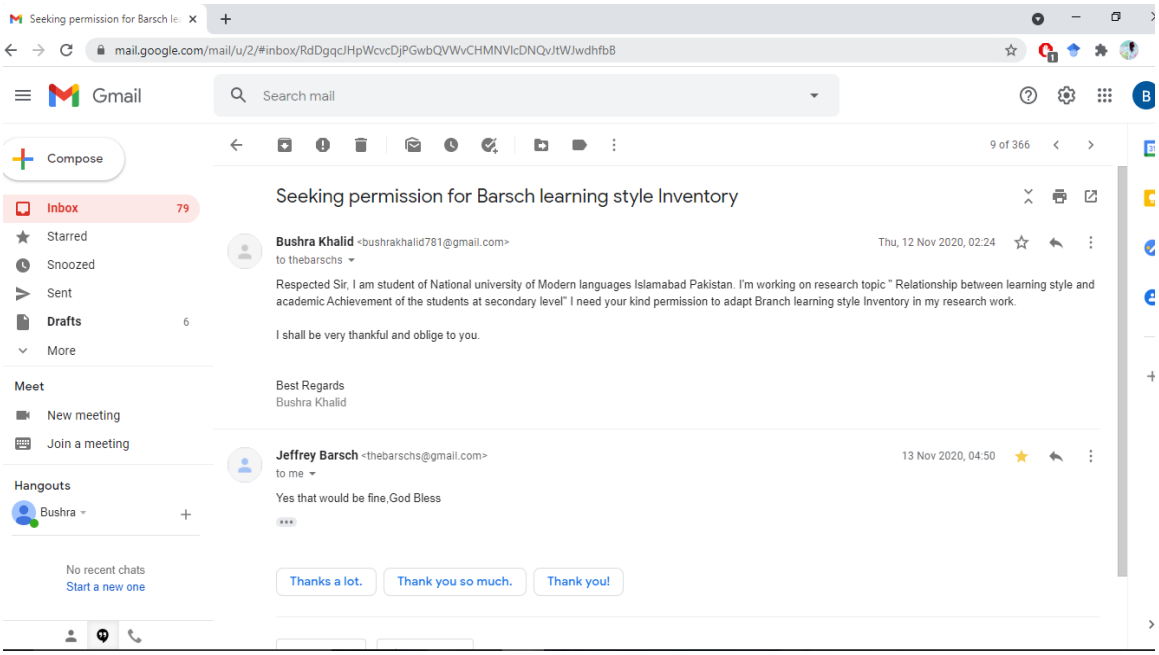
تصدیق کی جاتی ہے کہ منسلکہ سوالنامہ کا میں نے بغور مطالعہ کیا اور اس میں کوئی املاء یا گرامر کی غلطی نہیں پائی – منسلکہ سوالنامہ زبان کے مطلوبہ معیار کے عین مطابق ہے-

دستخط



APPENDIX J

Permission Letter for Branch Learning Style Inventory



APPENDIX K

Kerjcie & Morgan Sample Size

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

APPENDIX L

General Rules for Examination

Placement in Grades A candidate, who has qualified for the grant of Secondary/ Higher Secondary School Certificate, shall be placed in one of the following grades:

S. No.	Percentage of Marks	Grade	Remarks	Criteria
1.	33% and above but below 40%	E	Satisfactory	Low Achiever
2.	40% and above but below 50%	D	Fair	Low Achiever
3.	50% and above but below 60%	C	Good	Average Achiever
4.	60% and above but below 70%	B	Very good	Average Achiever
5.	70% and above but below 80%	A	Excellent	High Achiever
6.	80% and above	A+	Distinction	High Achiever

APPENDIX M

List of Population