Ph.D Research Thesis

ASSESSMENT OF PRIMARY SCHOOL STUDENTS' 21st CENTURY SKILLS DEVELOPED THROUGH CURRICULUM

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APPROVAL SHEET

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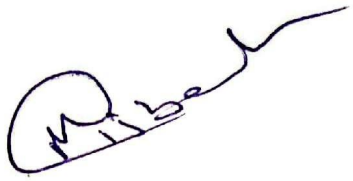
AUTHOR'S DECLARATION

It is hereby declared that author of the study has completed the entire requirement for submitting this research work in partial fulfillment for the degree of PhD Education. This thesis is in its present form is the original work of the author except those which are acknowledged in the text. The material included in the thesis has not been submitted wholly or partially for award of any other academic certification than for which it is being presented.



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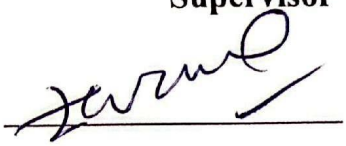
SUPERVISOR'S CERTIFICATE

The thesis titled "ASSESSMENT OF PRIMARY SCHOOL STUDENTS' 21st CENTURY SKILLS DEVELOPED THROUGH CURRICULUM" submitted by Ms. Misbah Muzaffar Regd. No.178-FSS/PHDEDU/F20 is partial fulfillment of PhD degree in Education, has been completed under my guidance and supervision. I am satisfied with the quality of student's research work and allow her to submit this for further process as per IIUI rules and regulations.

Dr. Zarina Akhtar

Supervisor



Dedication

This thesis is dedicated to my loved ones, who have been my constant source of support and inspiration throughout my academic journey.

To my parents, Muzaffar Khan and Abida Sultana, who have always believed in me and encouraged me to pursue my dreams. Your unwavering support and guidance have meant the world to me.

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LIST OF ABBREVIATIONS

FDE	Federal Directorate of Education
ICT	Information Communication Technology
PBL	Problem Based Learning
ANOVA	Analysis of Variance
SD	Standard Deviation
CASEL	Cognitive, Affective, Social, Emotional & Leadership
FAID	Focus, Analyse, Infer & Decide
TTCT	Torrance Test of Creative Thinking
SME	Subject Matter Expert
IDEAL	Identify, Define, Explore, Act & Look

ABSTRACT

This study was conducted on primary school students enrolled in schools under the administration of the Federal Directorate of Education. The main purpose of the study was to analyze the extent to which intended 21st century skills were developed in students. The objectives of the study were: to examine students' communication skills developed through the curriculum, to assess students' critical thinking skills developed through the curriculum, to investigate students' social skills developed through the curriculum, to assess students' problem-solving skills developed through the curriculum, and to measure students' critical thinking skills developed through the curriculum. The population of the study included male and female students from grades 3 to 5. Data were collected from students attending primary schools administered by the Federal Directorate of Education. The population specifically consisted of primary level students from the Islamabad sector. A multi-stage sampling technique was used to select the sample for the study. This study employed a descriptive research design and was cross-sectional in nature. Self-constructed, criterion-referenced tests were developed for the students. Descriptive statistics were applied to analyze the students' test data. The analysis across multiple skills among students from three grades revealed significant differences in skills among the grades, except for social skills where no significant differences were found. Significant positive correlations were found between each skill across all grades, suggesting that stronger proficiency in one skill is associated with higher levels in others. The study concluded that there were significant differences in skills across grades 3, 4, and 5, with Grade 5 generally outperforming the others. Additionally, strong positive correlations were found between various skills across all grades, indicating that proficiency in one skill is often linked to higher levels in others. Social skills showed minimal variation across the grades but were strongly interconnected with other competencies. This study emphasizes aligning assessments with curriculum outcomes, providing teachers with rubrics and professional development on skills-based assessments, and integrating technology to effectively assess 21st century skills.

Keywords: Assessment Skills, 21st Century skills, Problem solving, Critical thinking, Creativity, Communication skills, Digital literacy, Social skills

CHAPTER 1

INTRODUCTION

21st century has introduced new paradigms of education. There is rapid spread of information due to technology. Trends of education have been changed in 21st century. It is the need of every individual to be equipped with certain skills in this digital era. Presence of these skills will enable the individuals to cope up with the challenges of modern era. Therefore, government of Pakistan has introduced new curriculum initially at primary level. This curriculum claimed that it will develop on certain skills which will enable the students to meet the challenges of 21st century. Major purpose of this curriculum is to ensure one system of education for all and meet the challenges of 21st century. The skills which are mainly focused in the curriculum are critical thinking, problem solving, social skills, creativity, and communication skills. Major purpose of this research was to assess the extent these skills have been developed in the primary level students.

Although 21st century skills such as critical thinking, problem-solving, communication, creativity, and social interaction have been increasingly emphasized in global education reforms, there is limited empirical evidence from Pakistan particularly at the primary level regarding the actual development of these skills through the implemented curriculum**.** While the Government of Pakistan has introduced a revised curriculum that claims to promote these competencies**,** few studies have systematically assessed whether these intended outcomes are being achieved among students in grades 3 to 5**.** Moreover, existing research in Pakistan has primarily focused on secondary or higher education**,** leaving a critical gap in understanding how younger students are responding to curriculum changes designed to equip them for the 21st century. The lack of comprehensive, skills-based evaluation at the primary level hinders informed curriculum development and policy decisions. This study addresses that gap by evaluating the extent to which the intended 21st century skills are being developed in primary students, using subject-specific assessments and focusing on a defined demographic within the Islamabad sector.

1.1 Background of the Study

In recent times, many countries have initiated curriculum reforms. There is a growing emphasis on equipping students with skills that enable them to thrive in a complex, interconnected world. Curricula across the globe are being restructured to integrate these essential skills, aiming to prepare students not just for academic success but also for their future roles as active and capable citizens in a rapidly changing world. There are many examples of countries who adopted 21st century skills in their curriculum. For instance, in 2017, Zambia incorporated 21st century competencies such as cooperation, problem solving & critical thinking in their curriculum (Ministry of General Education, 2017). Similarly, in 2019, Norwegian education system integrated life skills in their curriculum in order to meet the challenges of modern times (Norwegian Directorate for Education and Training, 2019). Main purpose is to make a shift from narrow educational perspectives to application-based education. Pakistani government has also focused on certain skills in curriculum which are considered necessary to meet the challenges of modern times.

Moreover, in this digital era, curriculum should be consisting of critical thinking, innovation, creativity and real-life experiences. Students should be taught in a way that they learn certain competencies in order to meet the demands of 21st century. Therefore, it is highly needed to assess the extent to which intended 21st century skills have been developed among the students. This research seeks to explore the effectiveness of current curriculum in developing 21st century skills.

1.2 Problem Statement

The concept of 21st century skills encompasses a set of essential competencies such as critical thinking, communication, creativity, social interaction, and digital literacy that are increasingly recognized as vital for navigating the complexities of the modern world. Recognizing this need, the Ministry of Education and Professional Training has introduced a curriculum in 2021, aimed at standardizing education while embedding these skills from the primary level onward. The curriculum aspires to equip students with the capabilities required to address contemporary challenges and to thrive in an evolving global workforce.

However, while the curriculum claims to foster these competencies, the actual extent to which students develop such skills remains a matter for empirical investigation. Accordingly, this study critically examines the degree to which 21st century skills are effectively cultivated through the current educational framework.

1.3 Objectives of the Study

Objectives of the study were to:

1. Examine students' communication skills developed through curriculum at primary level
2. Assess students' critical thinking skills developed through curriculum at primary level
3. Investigate students' social skills developed through curriculum at primary level
4. Assess students' problem-solving skills developed through curriculum at primary level
5. Measure the creativity skill of students developed through curriculum at primary level
6. Compare the students' skills developed at primary level
7. Find out relationship among developed skills of students at primary level

1.4 Research Questions

RQ.1 How effectively has the curriculum contributed to the development of students' communication skills?

RQ.2 How much curriculum enhanced the critical thinking skills of students?

RQ.3 What social skills students' have learned through curriculum?

RQ.4 How well does the curriculum support the development of students' problem solving skills?

RQ.5 What is the extent of students' creativity skills developed through curriculum?

RQ.6 What are class wise differences among students' developed skills?

RQ.7 What is the relationship among developed skills of students at different grades?

1.5. Significance of the Study

It is very important for students to learn certain skills and competencies which will enable them to survive in digital era. This need has been increased particularly in 21st century. Therefore, it is the dire need to investigate the extent at which intended 21st century skills have been developed among students. However, this study may be significant from two perspectives. Theoretically, it added in the existing body of knowledge related to the development of 21st century skills through curriculum. Practically, this study may be useful for students, teachers, curriculum developers and educationists. Particularly, this study may be highly beneficial for curriculum developers as they can get feedback that either curriculum is developing intended 21st century skills in students or not. It may also give useful information to teachers and educationist about students learning in relation to 21st century skills. By identifying gaps in skill development, the research informs improvements in curriculum design, ensuring that educational outcomes align with the needs of today's society and future job markets.

It may also provide in-depth insight to the personnel's who are responsible for curriculum reforms. By focusing on the assessment of 21st century skills, this research underscores the importance of lifelong learning. As the skills needed for success continue to evolve, the study's findings can help to ensure that educational systems are not only preparing students for immediate challenges but also equipping them with the ability to learn and adapt throughout their lives. This study may inform curriculum experts about areas where emphasis should be increased or modified to ensure that students are developing the necessary 21st century skills progressively throughout their primary education. Ultimately, these insights can help shape more cohesive and effective curriculum reforms that better prepare students for the demands of the future.

1.6. Delimitations of the Study

Due to time and resources constraints, this study was delimited at following:

1. The research was confined to schools located in the Islamabad sector (G & I), administered by the Federal Directorate of Education.
2. The target population was students of grades 3, 4, and 5.

3. The study focused on a 21st century skills namely, creativity, critical thinking, problem-solving, communication, and social skills.

4. The analysis was restricted to four core subjects: Social Studies, Science, English, and Mathematics. These subjects were chosen for their comprehensive role in cognitive and interpersonal skill development.

5. This study focused on the reading and writing aspects of communication skills.

1.7. Operational Definitions

1.7.1. Creativity Skills

It is the capacity of individual to produce new idea out of past experience, learning or using previous ideas for producing new one. Its indicators include originality (create something different from teacher's instruction) and elaboration (explanation in one's own words).

1.7.2. Critical Thinking Skills

It is the intellectual process which requires a person to actively apply, analyze, synthesize and evaluate the information gained through observation, experience or reasoning. It requires a person to reason, analyze synthesis and draw new meanings. Its indicators include to: identifying problem, analyzing problem, offering solution and evaluating the final solution.

1.7.3. Problem-Solving Skills

It is the ability of individual to identify problem, analyze it, finding alternate solution, selecting best solution and analyzing the consequence. Its indicators include: identifying problem, explaining problem, finding solutions, choosing best solution and evaluation of solution.

1.7.4. Communication Skills

It is the meaningful way of receiving, understanding and expressing factual information through recognized symbols. Its important components include listening, speaking, writing and reading. This research focused only at reading (Skimming, scanning& summarizing) and writing aspect (introduction, body & conclusion) of

communication.

1.7.5. Social Skills

Social skills include the ways people used to control their verbal and nonverbal actions in order to make better relationships. There are number of skills which come under social skill domain. However, this research will be dealing with teamwork, effective listening and following instructions.

1.8. Conceptual Framework

This study's conceptual framework is structured around the examination of five 21st century skills: communication, critical thinking, social skills, problem-solving, and creativity, developed through the curriculum. The framework proposes that the curriculum, encompassing content, teaching methods, and learning activities, serves as the primary vehicle for skill development. It posits that each skill is nurtured through specific curricular strategies and learning experiences, which are then, assessed using a combination of assessment tools. The effectiveness of these assessments in measuring the targeted skills provided feedback for refining curriculum design and instructional practices, ultimately aiming to enhance students' readiness for future challenges.

CHAPTER 2

LITERATURE REVIEW

This chapter deals with related literature about assessment of 21st century skills developed through curriculum. It is also providing theoretical background of this research study. Moreover, it is also covering related researches and theories of the research topic.

2.1. Review of Related Literature

In the field of knowledge, human beings have seen lots of challenges particularly in last two decades. Digital era made numerous changing in our society. Due to globalization, electronic development, scientific innovation and changed market demands, there is an enormous change in labor market. Trends of market have been changed. There is a major shift from static market industries towards fast and flexible production industries. In this challenging and demanding era, it is a big challenge that what and how to teach to the individuals so that they can cope up with the challenges of modern era. Now, students need to produce and develop rather than just memorize and be passive learners. They need innovative, critical thinking, problem solving and digital literacy skills in order to be successful in current scenario. Therefore, it is necessary for individual to be equipped with certain skills and competencies to meet the challenges of 21st century. In fact, these skills and competencies are called 21st century skills which are consisting of certain knowledge and competencies domains which are important for individuals' survival. Primary education has major role in future education of a child.

It is necessary to incorporate 21st century skills from primary education stage so that child can become effective member of the society. According to Wagner (2019), there are seven skills which students must possess. He called them as survival skills. These skills are critical thinking, problem solving, effective communication skills, creativity, social skills, collaboration and digital literacy skills. These skills will enable the child to be successful in future and successfully survive in the job market as well. Several countries around the world have implemented curriculum reforms at the primary level to better prepare children for 21st century challenges.

These reforms often focus on critical thinking, creativity, communication, collaboration**,** and the integration of digital skills. Finland, Singapore, Canada, UK & Australia Government of Pakistan has launched curriculum from grade1 to grade5. Major purpose of this curriculum is one education system for all and bringing innovation in the education system to cope up with challenges of 21st century. Efforts have been made to align curriculum with Sustainable Development Goals (SDG's) and international standards of education. Certain skills and competencies have been focused at all stage like problem solving, creativity, social skills, critical thinking, communication skills and digital literacy (Ahsan, 2021).

Countries like Zambia, Norway, and Pakistan have recognized this shift and initiated steps to integrate these competencies into their education systems, especially at the primary level. For example, Zambia revised its primary school curriculum in 2017 to incorporate 21st century competencies such as cooperation, problem-solving, and critical thinking (Ministry of General Education, 2017). The emphasis was on holistic development and nurturing skills essential for lifelong learning. Similarly, Norway introduced life skills into its national curriculum in 2019 through a reform aimed at enabling students to meet the social, emotional, and intellectual challenges of the modern world (Norwegian Directorate for Education and Training, 2019). The Norwegian approach integrates life skills across subjects and emphasizes interdisciplinary learning, student autonomy, and real-world application. In Pakistan, while curriculum reform is ongoing, efforts have been made to include elements of 21st century learning, particularly through the Single National Curriculum initiative. Key areas such as critical thinking, creativity, civic responsibility, and digital awareness are being gradually introduced at the primary level. However, the pace and consistency of implementation vary across provinces and schools. This comparative analysis reveals that while Norway's approach is more structured and system-wide, and Zambia has taken definitive steps toward competency-based learning, Pakistan is still in the early stages of fully embedding these skills at the primary level. Therefore, it becomes essential to assess the effectiveness of the current curriculum in Pakistan in fostering 21st century skills among students.

2.1.1. 21st Century Skills

21st century skills are the set of skills and competencies which are necessary to survive in the 21st century. Many countries have reformed their education systems to incorporate necessary skills in their education systems. This fact is globally recognized that traditional educational systems are not enabling the students to meet the challenges of modern times. Moreover, sustainable development goals and education agenda 2030 convinced the countries to impart such knowledge and skills which enable the individuals to be creative, critical thinker and problem solver rather than just becoming passive thinkers (Abdullah & Osman, 2019).

There are different models of 21st century skills. All have agreement on certain set of 21st century skills. Calisici (2020) concluded that student's imagination, critical thinking and problem-solving skills are improved with the assistance of digital technologies. 21st century skills are the list of skills which are basic requirements of modern trends. These are the pre-requisites for the students to meet the challenges of modern times. Several researches have provided a long list of 21st century skills which are necessary for students to learn. Most prominent 21st century skills are creativity, communication skills, cooperation, critical thinking, digital knowledge and social skills (Zuniga, 2017). Shalabi (2014) argues that 21st century skills are the set of skills which are necessary for ensuring instructor and learner' motivation, learning readiness, creativity, critical thinking and optimal usage of digital knowledge.

Scott (2015) argued that 21st century skills are set of competencies which are compulsory for life and workplace success. He mentioned communication, creativity, critical thinking and cooperation in context of 21st century skills. Kayange and Msiska (2016) narrated that 21st century are the skills which are compulsory for students to learn. Students have to learn creativity, communication and digital skill in order to be a successful person. Metz (2011) included these skills in 21st century skills e.g. critical thinking, flexibility, creativity, innovative problem solving, communication skills, collaboration, social and culture based skills.

Rotherham and Willingham (2009), 21st century skills are self-control, critical thinking, digital knowledge and problem solving. Higgins (2008) griped them as electronic skills, creativity skills, communication and productivity skills. Moreover, Honfy (2015) classified 21st century skills into learning skills, knowledge skills and life skills. Likewise, many organization have also classifies 21st century skills. For instance, The Educational Laboratory North Central Regional (NCREL, 2003) classified 21st century skills in 4 groups which are as digital skills, creative thinking and good communication. Digital skills included aspects like global awareness and scientific outlook. Creative thinking included handling complex problems, creativity, curiosity and higher order thinking skills while good communication included team work, cooperation and effective interaction. In addition, European Union conducted field researches in order to explore these 21st competencies and skills.

One more innovative classification has been proposed by Jerald (2009) which is as emotional category, cognitive category and meta cognitive category. He put learning motivation and learning attitude in emotional category, usage of mental skills in cognitive category while problem solving and Meta cognition in Meta cognitive category. Likewise Arab League Educational, Cultural and Scientific Organization (ALECSO, 2014) classified 21st century skills in 3 main categories. These categories are: advance thinking skills, personal and information communication technology. Advanced thinking skills included critical thinking, problem solving and creativity. Personal skills included communication skills, teamwork, collaboration with others, leadership skills and adaptability. Lastly, information communication skills included digital skills, usage of internet and MS office skills. Moreover, Organization for Economic Co-operation and Development (OECD) has also developed a framework of 21st century skills. Hence, all above frameworks developed by different organizations showed a strong commitment with 21st century skills (Shalabi, 2014). 21st century skills have prime importance in current era. It has been the major focus of current research studies.

Shalabi (2014) commented that several definitions of 21st century skills are available, provided by different organizations such as Organization for Economic Cooperation and Development, the North Central Regional Educational Laboratory, and the Partnership for 21st Century Skills P21. Originally, 21st century skills movement started in 2002. Purpose of this movement was to enhance students, support and motivation. There was a partnership on 21st century skills between Microsoft Corporation and National Education Association. Five manuals were developed to enhance the quality of education. These manual were: standards, evaluation, continuous professional development, curriculum and improving students, cognitive psychological and other personality domains in order to develop 21st century skills among students (Albaz, 2013). Several studies reinforced the need of teachers' skillful training and sound educational policies for successful inclusion of 21st century skills in education system.

Researches have stressed the need of strong educational policies for implementing 21st century skills in the curriculum. There are many educational institutions which have developed proper framework for inclusion of 21st century skills in education. Framework provided by European union tried to focus on life learning skills while partnership for 21st century skills (2006) tries to promote skills like creativity, entrepreneurship and responding to job market (Aleid, 2019). Several countries took initiatives in reforming their educational systems by inculcating 21st century skills in their educational systems. For instance, Saudi Arabia has many similar projects. Their government have firm faith that competent and trained teachers' can reform curricula, teaching methodologies and over all learning environment. Hence, they are struggling for teacher training in this aspect as well (Albalawy & Albalawy, 2019). Similarly, there are many examples of other countries present in available literature which is showing the increasing trend of 21st century skills inclusion in curriculum (Ministry of Education, 2012).

2.1.1.1. Creativity Skills

Creativity is the skill which is globally accepted as important 21st century skill. Creativity is the ability to produce something new. It offers unique solutions to the problems. According to Gardner, it is the novel way of solving the problem. It involves producing ideas which are new and useful to the society.

Rhodes (2012) has divided creativity into 4 areas which are person, product, Process and environment. However, along with discussing creativity, it is also important to discuss the factors which effect individual's creativity. These are motivation, intelligence and environment. Important techniques for measuring creativity are psycho metric technique, bio metric and experimental approach. Thomsons and Jones (2011) used requirement model to measure students' creativity. Silton (2016) used taxonomy of creative design for measuring student's creative skills. All of above components are aligned with Dewey's experiential learning. Dewey's philosophy encourages creativity skills in several ways like freedom to explore, real word problem solving and promoting innovation.

A Torrance test of creative thinking (TTCT) is widely used for measuring students' creativity. TTCT recommends game like environment while administering creativity test. It is offering two types of tests which are: TTCT Figural and TTCT Verbal. TTCT figural includes the tasks like picture construction, picture completion and making shapes. TTCT verbal includes the tasks like questioning, guessing, predicting and improving product (Ilnak, 2020). Creativity is a complex phenomenon. There is no single definition of creativity. Creativity has been defined differently in literature. It has been defined as Process, end product, individual being creative and as a set of creative qualities. It has been defined as the desire or effort of a person to find something new or original.

However, most of the definitions of creativity agreed on this concept of creativity which is as newness or innovation of product, process or set of established conditions for the person. Torrance is considered as one the author of creativity. He has defined creativity as the process of becoming alert to difficulties, shortcomings, knowledge gaps, missing pieces, identifying the difficulty, searching for answers, generating guesses, or creating hypotheses regarding the shortcomings, testing and retesting these ideas. In this definition, Torrance has defined the natural process which has been involved in creativity. Ribot (2014) argued that man has the ability of being creative due to involvement in motor activities, natural tendencies and desires of doing something new and creative imagination. Warren's dictionary of psychology (2015) narrated creativity as trait of a person to produce something new.

Bartlet (2010) considered creativity as adventures thinking of a person. This adventurous thinking enables the person to move away from normal routine thinking, experimenting with the environment and producing one thing from another thing. Simpson (2016) argued that creativity involves novel thinking patterns rather than just following the routine thinking patterns. Creativity occurs as a result of thinking process and there are no age restrictions in the process of creativity. School is considered as one of the basic institution for promoting creativity and this creative process enhance under the supervision of a creative teacher.

Rossman (2009) argued that creativity involves the conversion of old ideas into new ones. He also stressed the significance of background knowledge in creative process. Guilford has presented a theory of creativity which focused on the traits of human and dimensions of personality beings involved in creative process. Moss (2004) explained the concept of creativity as when a learner organize his/her past knowledge and experiences in order a find a novel solution to current problem, it is called creativity. Creative end product is developed when he present his novel idea. Besides above definitions, several concepts have been associated with creativity like imagination, novelty, curiosity and developing novel products. In nutshell, we can say that creativity as the ability of an individual to develop new ideas/products based on their prior knowledge and experiences.

Creativity is a complex phenomenon and it can be presented in many ways. Usually, it is presented in the form of process, product or novel idea. Creativity assessment usually involves two aspects. One aspect is assessment of creative ability and other one is measuring creative performance of an individual. There are multiple methods for measuring these two aspects. Mostly this assessment has been conducted in experimental environment. Previously, Kilpatrick used ink blot tests for measuring creativity and Colvin measured creativity with the help of imaginative skills, end product and process. Researchers have used multiple methods for measuring creativity skills of students. However, Guilford identified sixty traits of creativity. He termed these traits as creativity traits (Lai, 2011). He derived these creativity traits through factor analysis. Further, he grouped these creativity traits in 3 domains which are: fluency of ideas, flexibility in the process and elaboration which means providing detailed information of an idea. There is variety of tests available today for measuring students'' creative abilities.

Widely used tests are: The AC test of creativity, Burkhart divergent question test, Mednick remote association test and the runner studies of attitude pattern. Teachers can better assess the creative skills of students if they know the multiple expressions of creativity. There are some non test ways for measuring learners' creativity. These are: students' curiosity, imagination in work, learning behavior, readiness for experimentation, never give up skill and working beyond given assignments. There is no one best method for measuring students' creativity. Instead of this teachers can develop creativity assessment according to student's needs, abilities and cognition. There are ways by which teacher can promote students' creativity skill. These are as promoting creative behavior of students, appreciating original work of students', independent learning, conducive learning environment, purposeful creative writing, novel ideas, freedom of thoughts and expressions, rewarding students for creative efforts and students' curiosity. There are few factors which hinder the creativity skill of students. These are: punishment base style of discipline, rigid environment of the classroom, teacher centeredness, cramming based classroom teaching learning practices, over emphasizing prescribed curriculum, lecture based method of teaching, over reliance on textbooks and teacher strict behavior (Lai, 2011). The Jordanous and Keller (2016) model of creativity is a comprehensive framework that identifies key components of creative thinking. These components are as fluency (the ability to generate a large number of ideas), flexibility (the ability to switch between different mental sets or categories), originality (the ability to produce unique and novel ideas), elaboration (the ability to build upon and expand existing ideas) and analysis (the ability to break down complex information into component parts).

2.1.1.2. Critical Thinking Skills

Critical thinking is the mental ability to learn things, make decisions and offer unique solution to the problems. According to Paul (2017), it is the organized way of human thinking. Critical thinking has 2000 years back history when Socrates worked on learning through dialogue. Dewy called critical thinking as reflective ability in his book "How We Think". However, psychometric techniques are used globally for measuring critical thinking.

Zakariya (2016) investigated the critical thinking skills of students of primary and secondary level. He concluded that students at secondary level have better critical thinking skills than students at primary level (Sahin, 2009). According to Abrami et al. (2008), critical thinking is important for individual's life. He argued that one cannot argue asses and make decisions without critical thinking skill (Abrami et al., 2015). Edward Glaser is considered as the father of critical thinking. Edward argued that critical thinking skill is very essential skill of progressive society as critical thinkers can logically think argument and can reform the societies. Literature of critical thinking skills is divided in three areas: education, psychology and philosophy. These three areas have defined critical thinking in different perspectives. Psychological area stressed on expertise of skills and dispositions in multiple areas. It focuses on analysis, interpretation, logical thinking and assessment skills (Galder, 2005). Psychological area focus on the process of critical thinking. Paul and Elder (2007) asserted that philosophical area focus on personal qualities of individuals rather than outer behavior. It focuses on the rules of knowledge which are involved in critical thinking process.

Bailin and Siegel (2003) argued that critical thinking are not fixed and specific but varies according to subject areas. In the educational area, Benjamin Bloom has contributed a lot in critical thinking. Blooms have offered a very comprehensive hierarchy of cognitive thinking skills which have been excessively used by educators. Higher order cognitive skills like analysis, synthesis and evaluation constitute the critical thinking skills (Lai, 2011). There are varieties of definitions available on critical thinking. All definition agreed on that critical thinking is something related to cognitive processes. However, there is disagreement on that to which degree it is related to both cognition and dispositions (Ennis, 2011). Lai (2011) argued that mostly mentioned critical thinking dispositions in literature are openness, being flexible, being up to date, fairness and being respectful to others. American philosophical Association addressed the definition and conceptualization of critical thinking skill. This association prepared a Delphi report. Critical thinking is defined as Purposeful, self-regulatory judgment that leads to interpretation, analysis, evaluation, and inference, as well as explication of the evidentiary, conceptual, methodological, criteriological, or contextual considerations that underpin that judgment.

The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider and persistent in seeking results that are as precise as the subject and circumstances of inquiry allow (Facione, 2015). Delphi report defined critical thinking as purposeful activity which ultimately results in evaluation, interpretation and self-control. Delphi report identified six cognition skills and to behavioral skills which provide a framework for comprehensive understanding of critical thinking skill. In 2012, national research council reinforced the idea of Delphi report. Paul and Elder (2007) argued that creativity and critical thinking are the two side of same coin. Both are dependent on each other. Both need each other for occurrence. Creativity skill is essential for becoming an effective critical thinker and critical thinking enhances creative skills as well. Silva (2008) argued that there is no specific age for developing critical thinking.

In nutshell, majority of researchers agreed that critical thinking involve two aspects which are cognitive and dispositions. Assessing critical thinking skill is a complex process. However majority of researches have recommended standardized tests and performance tests. Varieties of standardized tests are available for measuring critical thinking skill such as Watson-Glaser Critical Thinking Appraisal test and California Critical Thinking Skills Test. Similarly varieties of inventories are available for measuring critical thinking dispositions.

Moreover, computer based critical thinking tests are also available for measuring grade wise critical thinking skill of students. However, these tests are available mostly in multiple choice questions pattern. Ku (2009) argued that MCQs based critical thinking test only assess the students' recall and memorization skills but inner skills of students' reasoning cannot be explored. Performance based tests include such types of tasks in which students have to apply their knowledge and skills to new situations. Students have to experiments, produce some product or have to prepare some report. Rubrics are developed and students' performance is assessed according to that rubric. There are many organizations that have developed rubrics for performance based tests (Belanger & Becker, 2012).

Focus, Analyze, Infer and Decide (FAID) model of critical thinking, developed by Paul and Elder (2006), is a comprehensive framework that identifies four core skills essential for critical thinking. These skills are as focusing question (the ability to identify and clarify the central issue or problem, asking relevant and insightful questions to frame the inquiry), analysis (the ability to break down complex information into component parts, identifying patterns, relationships, and causes, as well as evaluating evidence and arguments), inference (the ability to draw logical conclusions based on the analysis, making sound judgments and recognizing implications) and deciding on an action (the ability to select a course of action based on the conclusions drawn, considering multiple perspectives, evaluating consequences, and making a decision that is well-reasoned and ethical). However, various challenges are associated with measurement of critical thinking skill. Wilson et al. (2012) argued that there are various steps involved in constructing critical thinking test.

These steps include: defining the test construct, selecting test items, determining the test scores, considering the test administration issues, selecting targeted sample, administering test, analyzing scores and preparing test result reports. However, Ku (2009) argued that define the construct of test is very complex task and need the special attention of test developer. Care et al., (2018) argued that there are certain things which should be considered at the time of constructing critical thinking test. These include: task authenticity, ill-defined tasks, including open ended questions, using prompts and measurable test objectives.

2.1.1.3. Problem Solving Skills

Problem solving is the process of identifying the issue, analyzing the alternatives and selecting the best solution for the problem. It has steps to follow like identification of problem, finding alternatives, analyzing alternatives, choosing best alternatives, applying and analyzing the results. Problem solving is the ability which is important from kindergarten till whole life (Creswell, 2005). Angelo (2005) has discussed multiple ways for measuring problem solving skills like pros and cons grid, memo cards, analytical cards and concept maps.

Today's 21st century based education requires students to have multiple skills to be successful in the modern world (Hughes, 2016). Mayer (2004) defined problem as hurdles, obstacles or issues. Problem is something which is ill structured or ill-defined and multiple solutions are applied for solution of that problem. It is a situation which confuses the learner when he/ she try to solve it. Hence, he uses his previous knowledge and skills in solving it (Merisa et al., 2020). John Dewey has identified five stages of problem solving skill. These stages are: identification of problem, explaining the problem, finding the possible solutions, applying the best solution and acceptance or rejection of an experiment. Radulovic and Stancic (2017) argued that students need higher order cognitive skills to solve the challenges of modern world. Martyn et al. (2014) asserted that they should possess critical thinking skills, logical and reasoning skills in order to meet the challenging of modern world. Ayu et al. (2021) argued that current teaching learning system should be planned in a way that it promotes 21st century skills in the classroom. Blackburn (2017) found that if technological dimension is added in education system then it would be more beneficial for inculcating 21st century skills in teaching learning process. Merisa et al. (2020) further added that 21st century education system demands such knowledge and technology based learning system which provides challenging problem based learning scenarios to students, where they can apply innovative solutions to the problems.

Eguchi (2014) argued that problem solving skill is very essential skill among 21st century skills. Okoli (2015) found that students with good problem skills are successful in general life as well. Martaningsih et al. (2022) concluded that it involve identification of problem, collection of relevant data and applying unique solution based on their prior knowledge and skills. Problem solving ability is needed for all individuals without any age restrictions (Marshall et al., 2016). Due to its increased significance, it is highly needed and can be taught through interactive teaching methodologies (Dewi et al., 2017). There are multiple learning models which are available for students. One of famous learning model is problem based learning model in which students are practically taught problems solving skills (Martaningsih et al., 2022). In PBL, students are provided with small practical tasks and students are asked to apply solutions for solving those problems.

Due to increased effectiveness and leaner centeredness of problem based method, it is widely used in education systems of many countries (Prahani et al., 2022). Further, it improves students' critical thinking skills, logical reasoning, communication skills and self-control (Juandi & Tamur, 2021). This learning model enables students to solve real life problems (Kladchuen & Srisomphan, 2021). Moreover, Wright et al. (2014) argued that it enable students to connect their learned knowledge with real life situations. Due to increased significance of problem solving skill, various methods of assessment and teaching for problem solving skill have been used. Problem solving skills is a cognitive operation. Hence, it cannot be measured or observed directly. However, there is need to find such behaviors of students which are measurable and observable in terms of problem solving skill. Indicators of problem solving skill can be identifies like students attention towards explanation of problem, student behavior towards solution of problem, usage of strategies, frequency of making mistakes and frequency of demanding teachers' help. Arslan (2007) argued that teacher can identify students' problem solving and can teach them the problem solving process. However, Kim and Kee (2013) found that identification of students' problem solving skill is a complex phenomenon. In this context, effective assessment framework for problem solving skill is crucial.

Standardized assessments are widely used in assessment of problem solving skill. Moreover, performance based and paper pencil tests are also widely used for assessing students 'problem solving skills. Vendlinksi and Stevens (2002) found that many performance based tests have constraints of cost, validity, time related and pedagogical issues. Aydın, Geçici and Bayram (2017) found teacher made assessments useful for measuring students' problem solving skill. For instance, Spanish education system is heavily based on teacher based assessments as teachers have best understanding of students leaning abilities, skills, age and other needs (Marcenaro & Vignoles, 2015). There are some scales for measuring problem solving skills of students as well (Altun, 2019). Riyadi and Usodo (2020) argued that various factors should be considered, at the time designing assessment of problem solving, like gender, academic achievement, age, grade and learning abilities. There is a dire need to develop comprehensive and systematic teacher based assessment tool for measuring students' problem solving skills.

Teachers can use their observational skills along with above assessment tools for measuring students' problem solving skills. In this way, teacher will be better able to find students' weaknesses in problem solving skill (Lester, 2013). Wiliam and Thompson (2008) found a formative assessment framework for problem solving skill. He found it very effective for measuring students' problem solving skills. The IDEAL (identify, define, explore, act & look) model of problem solving developed by Paul and Elder (2006), is a comprehensive framework that identifies four core skills essential for effective problem solving. These skills are as identifying and Understanding the Problem (the ability to accurately define the problem, recognizing its key components, constraints, and complexities. This involves clarifying the problem's scope, identifying relevant information, and recognizing assumptions and biases), devising a Solution Plan (the ability to generate and evaluate potential solutions, considering multiple perspectives, resources, and constraints. This involves creating a clear plan, setting goals, and identifying potential obstacles and contingencies), executing the Solution Plan (the ability to implement the chosen solution, taking deliberate action, and adapting to changing circumstances), assessing and Evaluating the Outcome (the ability to review the outcome, evaluate the effectiveness of the solution, and identify areas for improvement). This involves reflecting on the results, considering feedback, and refining the problem-solving approach for future challenges.

2.1.1.4. Communication Skills

Communication involves effective sharing of ideas and information. Literature showed that communication is one of the important 21st century skills. Communication process involves reading, writing, speaking and listening. Effective communication skills enable the person to understand others and give self confidence that others understand you. Literature showed many ways for assessing communication skills. Similarly, rubrics can also be designed to assess communication skills (Bell, Morrison, Wooff &McLain, 2017). The word communication came from the Latin word "communi" which means same or something alike. Hence, communication means transferring intended information form one person to another but this transfer should be in the way that it should be understandable to receiver (Brown, 2016).

Communication process involves a sender and receiver. Sender wants to send a message to receiver. So, communication is the process of sending message form sender to receiver. According to (McMillan & Hearn, 2008), communication is then process of sending and receiving the message between sender and receiver. Miller (2016) argued that communication involves the sending and receiving the information in order to influence each other behavior. Burgoon (2016) argued that communication is the thoughtful process of sending a stimulus in order to receive a response. Tubbs (2016) argued that communication is the process of exchanging one arguments and point if views with others. Partnership for 21st century have defined communication skill as developing ideas and through using verbal and nonverbal communication ways, effective listening skills, using communication for multiple purposes, usage of technologies in communication process and considering environmental factors in communication process. Creswell et al. (2017) have proposed few elements which are the important elements of communication process. These elements are: source of information, medium of information, receiver and sender, feedback and environmental factors. Moreover, communication process has three significant elements.

These are: flow of information either one way or two ways, involves interaction among individuals, verbal and nonverbal feedback mechanism and giving and receiving the information. Hayden (2019) identified few ways for ensuring effective communication. First is to maintain good eye contact. Maintaining effective eye contact leaves a very good impression on receiver. Secondly, facial expressions enhance the importance of information. Facial expressions include body gestures, verbal and nonverbal clues and body language. Thirdly, showing concern and respect is important factor in communication process. Fourthly, language barriers should be considered and avoided for ensuring effective communication. Lastly, use of empathy also has significant effect on the effectiveness of communication process. Communication skill is considered as one of the important 21st century skill. This skill has been originated from communication theory in context of 21st century skill. Communication skills usually involve reading, writing, listening and speaking. There are several communication theories which define the communication skill in different perspective.

Rhetorical theory explains the communication process as discourse which is used for motivating and persuading the listeners. Semiotic theory considers the communication skill as language which consists of symbols and signs. These symbols and signs are useful for transfer of information. Phenomenological theory considers the communication skill as dialogue and discussion among individuals. Cybernetic explains the communication skill as interpersonal experience in which whole society interacts with each other. Socio psychological theory considers the communication as the process of interaction and influencing each other. According to sociocultural theory, communication is a symbolic process which involves interaction and influence among individuals. Last but not least, critical theory considers communication skill as a mean of provoking critical thinking through dialogues, questioning, exchanging point of view and argumentation. Communication domains include reading, writing, listening and speaking in context of 21st century skill (Metusalem et al., 2017). Casner and Barrington (2006) argued that basic skills are usually learned through the teaching of core subjects. These core subjects include reading, writing, speaking and listening. There are certain skills which are essential for successful communication.

First is the production skill. Production skill include: considering the result of communication, articulating the clear message which convey the intended desire, considering others level of knowledge, skills, emotions and thoughts, following specific norms and rules, considering cultural differences and using appropriate medium. Second one is receiving skills. Receiving skills include listening actively without being judgmental and critical analysis of verbal, nonverbal or written text or speech. Graham and Hebert (2010) argued that communication skill can be taught to students through teaching the domains of communication. Reading is the essential aspect of communication. Effective communication will happen when students will understand the in-depth principles of construct (NRC, 2012). Readers and authors adopt distinct communication styles. Instruction can help students develop deep and critical thinking skills by combining the perspectives of text analysts and critics, eventually leading to the ability to create texts for others to read.

Teachers sometimes overlook the instruction, process, and intended consequences of student communication, despite ample opportunities for both listening and speaking (Spies & Xu, 2018). For strengthening writing skills, students should write whatever they read. According to Graham and Hebert (2010), reading, understanding, and writing all involve the ability to organize information and create knowledge. Students can practice writing their personal thoughts on reading. Graham and Herbert suggest writing summaries and notes, responding questions in writing, or using Reciprocal Teaching (Palinscar & Brown, 2012).

Writing about information in a science text can help students gain insights into reading, leading to better comprehension of the text they read. Additionally, teaching writing skills and processes, such as text structures, paragraph or sentence construction, and spelling, can help students improve their writing abilities. Assessment of communication skill is a complex process. However, Metusalem et al. (2019) presented several methods for assessing communication skills. Observation skill can be used for assessing speaking skill. Topic can be given to students and their responses can be recorded and observed later on.

Students can listen taped information and can respond to the questions at the end. This method can assess the students' listening skills. There are certain elements which can be considered for assessment of reading skill. These elements include pronunciation, word recognition, accuracy, fluency and reading comprehension. Writing skill can be assessed through taking students' writing samples on the given topics. Metusalem et al., (2019) presented model of reading and writing for constructing communication skill test. This model breaks down reading skill into three areas which are vocabulary, fluency and comprehension. Vocabulary area focuses on the reader's ability to understand and interpret words, phrases, and idioms. It encompasses various aspects, such as word recognition (the ability to recognize and read words accurately), word meaning (understanding the meanings of words, including connotations and nuances) and word relationships (recognizing relationships between words, such as synonyms, antonyms, and analogies). Fluency area concerns the reader's ability to read with ease, accuracy, and expression.

It involves reading rate (the ability to read at an appropriate pace, neither too fast nor too slow), accuracy (reading words correctly, including attention to punctuation and syntax) and expression (conveying meaning and emotion through reading, using factors like tone, pitch, and volume). However, Ercikan and Oliveri (2016) argued that these traditional methods cannot measure the complex constructs of students' communication skills. Hence, we should move beyond these traditional methods of assessment. In this context, detailed case studies can give in depth assessment data. Besides, performance based tests, students' portfolios and observations in natural settings can be used for in-depth assessment (NRC, 2012). Communication as a 21st century skill aligns closely with Dewey's experiential learning theory because Dewey emphasized learning through active participation, collaboration, and reflection in real-world contexts. In his view, education is inherently social, and students develop communication skills by engaging in group discussions, problem-solving tasks, and reflective activities where they express ideas, listen to others, and share feedback. These interactive and practical experiences naturally build the speaking, listening, and interpersonal skills essential for success in modern life and work.

2.1.1.5. Social Skills

Wagner (2008) argued that social skills are the knowledge and natural tendency of person's interaction with others. It is the ability to effectively work with live people belonging to multiple socio-economic backgrounds. These skills are highly significant in building and maintain personal and professional relations. Social skills include empathy, collaboration, teamwork, active listening, respect for others, adjustment and soon. Rubrics, performance tasks and multiple tasks can be used for assessing student's social skills (Eguchi, 2014). Social skills are a collection of socially acceptable taught behaviors which assist individuals in avoiding bad social encounters and additional obstacles. The research has proven efficiency of social skills developed at different periods of life as one of the most important. Today's world demands the skill based education and inculcate modern skills to students. These modern skills can be classified into two areas. One is personal skills and other is social skills. First is concerned with individual character and other is concerned with social character of individual (Caballo, 2007).

King (2010) argued that education is a social process and its main objective is transformation of society. Hence, socialization is considered major objective of education. Walker et al. (2002) argued that social skill consist of certain behaviors. It helps individuals to learn social clues and respond to them appropriately. Elksnin and Elksnin (2000) asserted that social skills can be exhibited in verbal and nonverbal behaviors of individuals. Canney and Byrne (2006) classified social skills in areas like foundation, interaction, emotional and cognitive skills. Foundation skills include maintaining eye contact and gestures.

Interaction skills include resolving conflicts, respecting other point of views and taking conversation initiatives. Emotional skills include sympathy for others feelings, sense of empathy and showing respectful body language. Cognitive skills include knowledge and understanding of societal norms and values, self-analysis and perceiving social values. Variety of assessment methods have been used for assessing students social skills. Most commonly used technique is evaluation of peers, teachers and parents. Rating scale is the comprehensive way of collective social skill data of child in natural settings (Sheridan & Walker, 2010). Teachers and parents are requested to rate students on given criteria. Theses scales are usually standardized scale which not measure individual behavior of child but also measure the child behavior in comparison with other children's of same group. One model of social skill assessment is the CASEL (Cognitive, Affective, Social, Emotional & Leadership) model provides a comprehensive framework for social skills assessment and development. Each skill is interconnected and essential for building strong relationships, achieving personal and professional goals, and contributing positively to society. By focusing on these skills, individuals can develop the social competence necessary to succeed in various aspects of life. Components of model includes helping others, being fair with others (the ability to treat others with justice and equality, recognizing and respecting their rights and dignity), communication skills (the ability to effectively convey thoughts, ideas, and feelings through verbal and non-verbal means, actively listening to others and clarifying expectations), ethical behavior (the ability to act with integrity, honesty, and morality, considering the consequences of one's actions on others and the environment) and sense of responsibility.

Another assessment technique is ranking and nomination by teacher. Teacher are asked to provide students list who perform the specific social behaviors to least and greatest extent. In this, specific social behavior of child is compared with classmates. Another useful assessment method for social skill is self-reports by students. Students are asked to write reports of their social skills. Children openly express their social behaviors and skills. Direct observation of students' social behavior is also important. It is conducted in natural setting which allows in depth understanding of child social skills. All of above methods provide unique data of social behavior of child.

2.2. Theoretical Review

2.2.1. Need of 21st Century Skills

Educational Literature revealed that 21st century skills are prominent concept all around the world. A strong reason for this rapid trend is increasingly demanding and complex changing nature of society as well. Erstad (2009) argued that flexibility, effective communication, information communication technology, team work, collaboration and problem solving skills are crucial to learn in order to effectively respond to the changing world. Emerging social and economic trends have significant demand from educational systems. In response to these rapid social, economical and technological changing, different countries have initiated multiple projects at national and international level in order to meet the modern challenges. For instance, The Assessment and Teaching of 21st Century Skills (ATC21S) was initiated by CISCO, Intel and Microsoft Company in 2009. It was a joint venture with educational researches. Its purpose was to develop the assessment framework of 21st century skills (Erstad, 2009). This project tried to develop a common understanding of 21st century skills in order to smoothly implement the concept in education system. ATC21S reviewed the related researches and national curriculum of different countries. After a rigorous effort and research, this organization has developed ten skills which were grouped in four categories like ways of thinking, working ways, working tools and living on earth.

There is widespread agreement that skillful population is highly required in order to meet the emerging challenging not only in the field of education, but economy, health and overall society. Various researchers concluded that educational systems of many countries failed to develop 21st century skills among students which are highly needed for a successful life. In this context, United States of America explored that their education system is weak due to many reasons. USA education system has two achievement groups of students. In recent past, USA education system has tried to minimize this gap of high achiever and low achieving students. Less attention have been paid towards achieving global gaps which exists among students of different nations. Rapid changing in the USA economy have also caught their attention towards skill based education system. Now organizations have changed their working styles and demanding more innovation, productivity, critical thinking, team work and digital skills. Now, the fundamental changing in the job structures are also demanding critical skills. Therefore, it is vital to provide support to teachers, along with students, in order to enable them to work on inculcating 21st century skills in over all school policies.

2.2.2. Assessment of 21st Century Skills

Lai and Viering (2012) have developed ways of assessing 21st century skills. They have suggested particularly learning environments, teachings strategies and assessment techniques for 21st century skills. They recommended self-reports, rating scales, observations, situational judgmental tests, computer simulations and performance assessments (Cho, 2012). They recommended asking following questions when selecting assessment technique for measuring 21st skills:

1. Whether assessment technique is culturally, contextually and content wise appropriate?
2. Whether it will be for formative or summative purpose?
3. Will it provide actionable feedback to teacher about students learning?
4. Is it easy to administer?
5. Is it valid and reliable?

Today, educational systems of different countries are trying to make efforts to move beyond the instructional practices they were using in 20th century. Previously, instructional approaches were subject centered and assessments were merely focused on the measuring the memorization of facts and knowledge. Students were just recalling information and producing cramming based data in exams. Currently, there is paradigm shift in assessment methods from traditional assessment methods to performance and concepts based assessment methods. New assessment methods demand new forms of formative and summative assessment which can actually check the students' learning. In this context, Intel Corporation has been involved in many educational projects and initiatives. One of their major initiatives is assessment and teaching of 21st century skills. This initiative involves developing new methods of assessment and standards of tests.

Intel Corporation has collaboration with various educational ministries and has helped teachers of many developing countries in learning new methods of assessment and incorporation of technological dimensions in their classroom based teaching practices. Professional development training have been provided to teachers where they have learned the new ways of formative and summative assessment, designing test rubrics and development of performance based tests. Intel is offering variety of online programs for teachers which are useful for preparing test rubrics and designing multiple students' assessments. There are multiple ways of students' assessment that can play vital and key role in assessing students 21st century skills.

2.2.3. Fostering 21st Century Skills through Classroom Based Assessment

Students' learning has been always tested through typical teacher made tests where purpose of test is to either check students' memory or collection of knowledge. However, different researches have supported conceptual and skill based assessment technique where actual learning of students can be assessed through multiple ways (Popham, 2008). Teachers should be provided with professional development trainings on innovative ways of assessment in order to inculcate 21st century skills in their teaching practices. National Research Council (2012) argued that properly developed and designed assessments enable teachers to reflect on their teaching practices. There are multiple benefits of well designed assessment for students.

First of all, they provide useful data on students learning. Teachers can modify their teaching practices on the basis of this students' assessment data. Mostly classroom assessments are formative in nature. Therefore, they provide quick and timely data to teacher for diagnosing problems and adjusting their teaching practices according to student's needs. One example can be portfolio assessment as it will provide immediate data about learning. Students' portfolio can also be useful for promoting students reflective practices. Hence, it is providing useful data to students and teachers at the same time. Ross (2006) argued that peer assessment is also one of effective formative assessment tool in class as students and teacher will assess a student in a different way. This different assessment of a student will open a dialogue for diagnosing student's learning needs.

Hence, teachers should be better aware of students' needs, problems and psychology in order to customize their teaching practices for better learning of students. Secondly, assessments measure the students' abilities and skills. Typical formats of assessments like multiple choice questions, true, false and fill in the blanks only measures low level students cognition (Dikli, 2003). New forms of assessment like performance based assessments; portfolio and standardized based assessments produce more authentic results rather than traditional assessment techniques. Similarly, rubrics, self and peer assessments measures multiple dimensions of students learning rather than just checking students' recall ability. Thirdly, well designed assessment techniques assign new roles to students for assessing their own learning. Such assessment forms involve students in assessment process.

Students are involved in designing of assessments, diagnosing their problems and needs, establishing assessment criteria and monitoring their own learning. McMillan and Hearn (2008) asserts that this type of assessment enhance students involvement in learning process which is very beneficial for teaching learning process. Barootchi and Keshavarz, (2002) argued that in peer assessment, students conduct actual assessment and provide useful feedback for their peers' improvement.

2.2.4. Assessment Strategies for Measuring 21st Century Skills

There are some assessment tools and strategies which are useful for students teaching assessment and enable teachers to foster 21st century skills in their classroom teaching practices. These assessment strategies are rubrics, performance based tests, portfolios, self-assessment, peer assessments and response systems of students. First assessment strategy is rubric. Rubrics can assess students' knowledge and skills. There are certain skills and knowledge which are not measured through standardized testing. Such certain knowledge and skills can be measured through rubrics. Rubrics measure the certain discrete knowledge at certain time (Reeves & Stanford, 2009). Rubrics are also used as the part of other assessment strategies as well. Rezaei and Lovorn (2010) argued that rubric is a set of standards which describes the degree of quality along with the continuum.

Mostly it is used in summative assessment but along with summative assessment, it can be used in overall learning process. It can be used as a formative assessment tool throughout the learning experience as well. Andrade et al. (2008) argues that rubrics can be used as self-assessment strategy and provide a structure for end product assessment. Lee and Lee (2009) considered rubrics as inclusive assessment tools which can be used at all levels of learning and enable students to make progress towards achievement of learning goals. Andrade et al. (2010) found that students showed better learning performances who were actively engaged in three aspects of rubric assessment. These three aspects were reading a sample of writing, making assessment criteria and usage of rubric for self-assessment. Moreover, Palm (2008) found that students, who have access and knowledge and access of assessment criteria, had better performance at project than the students who did not know evaluation criteria. Similarly, Skillings (2000) found that students' knowledge was best depicted though rubric. Andrade et al. (2008) concluded that a rubric serves as teaching and assessment tool. Wiggins and McTighe (2005) found that good quality assessment criteria for rubric is essential for enhancing its effectiveness as instructional and assessment strategy. However, Lee and Lee (2009) found that collaborative rubric development by students and teacher is very beneficial as it will increase student level of comfort and ownership of learning process.

Andrade et al. (2008) found that this collaborative process can promote students' sense of responsibility and critical thinking as well. Lee and Lee (2009) further added that this rubric development collaborative effort can promote students' meta cognitive abilities as well. Performance based assessment is considered as project based. This type of assessment is usually used as summative type assessment and it particularly measure the application skills of students learning. Hence, it does not only check the students' current knowledge but also assess its practicality as well. Palm (2008) argued that it particularly focus at end product of students' learning that how well they can create something by applying their theoretical knowledge. Hence, it is related to application skills of students' learning. Its examples can be designing and developing some model, data collection, conducting scientific research and report writings.

Wiggins and McTighe (2005) argued that performance based assessment focus on performing such tasks which are relevant to real life experiences. This assessment strategy have been used extensively by many countries and offered many advantages which were not achieved previously through typical assessment strategies like paper pencil tests or other memorization based assessments. Wiggins and McTighe (2005) asserted that reliable assessment techniques should perform more than just a students' learning test. They must teach the students how to perform in the real life challenges. Shepard (2009) asserted that performance based tests can be coupled with other assessment strategies as well.

For instance, it can be collectively used with rubrics for enhancing its effectiveness as it will further answer the questions like how, why and what. It can also be used as formative assessment tool as it will provide timely feedback about students' learning. Hammond and Pecheone (2009) asserted that other traditional tests can take long time in producing authentic results but Performance Based Assessment has the capability that it can provide quick feedback about students' learning and allows teacher to customize their teaching practices according to students' learning. Wren (2009) argued that Performance Based Assessment is highly learner centered and asses higher order cognitive skills of students. Hence, it can be very useful in measuring students' 21st century skills.

Wood et al. (2007) found that students are more engaged and interested in performance based tasks. Darling(2009) found that performance based assessment also has the worth to differentiate the students according to their special education needs. Fcaione (2015) found that this paradigm shift from traditional assessment approaches to 21st century skills based approach is not free from challenges. It demands sound professional development training of the teachers. Portfolio assessment involves collection of students' work collected over long period of time. It is considered as summative type of assessment. It has the potential to demonstrate the students' learning efforts, developments and learning achievements over different periods of time. Moreover, it has ability to depict students' application skills. Keshavarz (2002) argued that portfolio assessment is considered as reliable and authentic assessment tool.

It is learner centered in nature. It is more flexible in nature as it can be customized and modified according to class level, local conditions and students' special educational needs. There are different types of portfolios. Some portfolio includes only end product while other includes process documents like formative assessments etc. few portfolios are prepared according to instructions of teachers while others are learner centered. Portfolio assessment can be easily incorporated in classroom instructional practices.it is considered collection work assigned over the academic year.

National Research Council (2002) concluded that students' portfolio is a type of assessment which is highly adjusted with classroom instruction. If applied properly, they can enhance the effectiveness of classroom instruction. Çakan, Mihladiz, and Taskin (2010) commented that properly utilized portfolios can enhance the effectiveness of teachers' instruction. Çakan, Mihladiz, and Taskin (2010) asserted that effectively integrated portfolio can enhance the effectiveness of instructions over different subject areas. Sweet (2010) argued that portfolio can also foster students' self-reflection skills as well. It enables students to compare their current learning tasks with previous learning tasks and find their strengths and deficiencies by themselves. Barootchi and Keshavarz (2002) found portfolio useful in making students as independent learners. Tezci and Dikici (2006) found that portfolio can also promote collaboration among students.

Nune (2004) found one development rule for portfolio that it should be designed in a way which promotes interaction among teacher, student and peers. Technology has added new dimension in portfolio. Previously, paper and file based portfolios were used but now paper based portfolios have been replaced with electronic portfolios. Chang (2009) concluded that portfolio has created ease of storage, presentation and showing creativity. All above mentioned assessment strategies are generally considered as summative assessment but self-assessment report is perceived as formative assessment strategy. Andrade (2008) viewed it as opportunity for students to diagnose their own strength and weaknesses instead of merely relying on teachers' assessment. Mcmillan and Hearn (2008) asserted that self-assessment means students own judgment of their work and improving their performance by identifying their weaknesses by themselves.

Hence, it can be said that self-report assessment provides benchmarks for setting targets of students' learning. According to Andrade and Valtcheva (2009), it promotes self-monitoring as students monitor their work by themselves. Ross (2006) proposed four conditions for effective implementation of self-assessment. These are: assessment criteria should be developed through teacher students' collaboration, students' knowledge about application of criteria, students must receive feedback on their assessment reports and students should be developing action plan with the help of teacher. McMillan & Hearn (2008) found favorable results of self-report assessments on students' academic achievement, motivation to learn and classroom behavior.

McDonald and Boud (2003) noted the better learning performance of students who were better trained in self-assessment reports than those students who were untrained in self-assessment reports. Andrade and Valtcheva (2009) found positive relation with self-report assessment and students' classroom behavior, classroom participation, communication skills and classroom involvement. McDonald and Boud (2003) argued that it is general life skill which is essential for everyone and not only confined within the walls of classroom. Andrade and Valtcheva (2009) argued that self-assessment reports being a formative assessment tool offer an opportunity of self-monitoring to students where students have to less rely on teacher.

Moreover, it also decreases the teachers' burden as students are taking the responsibility of their own learning. Self-assessment reports can also be combined with other instruments like rubric, journals, interviews and questionnaires. Ross (2006) stresses the importance positive classroom environment where students' can comfortably assess their work. Teachers should teach students that in self-assessment reports students should focus on learning goals rather performance goals and targets. Topping (2005) viewed peer assessment as formative assessment strategy which has a significant role in the area of assessment.

Peer assessment is the process of giving feedback on classmates' learning. Peer assessment can be used for evaluation of multiple assignments like presentations, papers, projects and behavior assessments. Its major purpose is to give feedback to students. This strategy can be really useful in overcrowded classrooms where teachers are more stuffed with multiple tasks. Hence, students' time and energies can be positively used for giving feedback to peers' learning. Researches showed that peer assessment has the power of improving students' learning. McDaniels, and Sledge (2009) argued that peer assessment can be used in all subject areas like from literature to mathematics. There is no subject or grade restriction. Peer assessments have many cognitive and performance advantages for students who give and get feedback (Bryant & Carless, 2010). Topping (2009) asserted that peer assessment can improve the quality of students' learning. Providing feedback to others work can also improves one owns' work and learning performance. This happens when students learn the benchmarks of excellence.

Li et al. (2010) argued that peer assessment can also improve skills like team work, interpersonal skills, leadership skills and negotiation. Students can also conduct peer assessment in group format. Peer assessment can also be used with other assessment techniques.in peer assessment; students are usually of same grade and studied same content areas. Elder students can conduct younger students' evaluation. Topping (2009) argued that peer assessment is more effective when students provide formative feedback rather than just scoring peer work. One more assessment strategy for measuring 21st century skill is response system of students. It is also known as classroom response system and audience response system as well.

Technology is widely involved in this type of assessment. A combination of hard ware and software technologies are being used in this assessment. Teacher asks multiple questions to students and students have to respond immediately to teachers. Student remains anonymous in this system. Teacher check and display students'' data graphically when she/he receives data from students. Beatty and Gerace (2009) asserted that teachers can quickly diagnose students learning problems with the help of technology and starts working on it. Salend (2009) argued that teacher can effectively modify their pedagogical practices according to students' needs with the help of this student response system (SRS). It has one main quality, which differentiate it from other assessment methods, that it can instantly collect students' data and analyze it. Bruff (2007) found it useful across all grade levels and subject areas.

This assessment technology can be used to ask multiple questions like recall questions, true false, MCQs, critical thinking, creativity, conceptual and short answer questions. Teachers do not have to wait for days to interpret result but results can be displayed instantly. Teachers can ask questions to the students according to lesson objectives. Moreover, teacher can also conduct a detailed discussion among students. Few examples of SRS can be: matching, labeling, give your point of view and apply certain knowledge into practical situation (Salend, 2009). Caldwell (2007) argued that one of the distinct qualities of SRS is that it promotes peer collaboration. It promotes peer learning by engaging students in peer discussions and peer problem solving. Students can be asked such questions in which they multiple opinions.

Beatty and Gerace (2009) found peer learning as effective strategy which promoted students metacognitive abilities, enhanced learning, discussion skills and motivation for learning. Johnson and McLeod (2004) reported many advantages of student response system. These include: increased involvement of students in learning process, enhances critical thinking skills, improved decision making skills, promoting classroom discussion, increased attendance rate of student, and friendly environment of the classroom. Beatty and Gerace (2009) found that SRS is also useful for monitoring classroom environment besides enhancing the instructional quality. Moreover, it also facilitates the students' homework as well (Beatty & Gerace, 2009).

2.2.5. Framework for 21st Century Skills

Partnership for 21st century skills were formulated with the help of all educational stakeholders including necessary knowledge, attitudes and skills which are needed by the students to cope up with the challenges of 21st century. These 21st century skills have been used by many educators in the USA to enhance students learning. P21's is known as a collective vision for students learning. It focuses that student must learn in a way that they become critical thinker, problem solver, good communicator and have logical argumentation (Wagner, 2019). 21st century framework offers teachers with necessary learning standards, assessment techniques and updated curriculum which support teachers to teach 21st century skills effectively to the students. P21's dividing the 21st century skills in 3 major skills which are life and career skill, learning and innovation skills, information, media and technology skills. Major goal of P21's framework is to inculcate 21st century skills in all-academic subjects (Bell, 2010).

2.2.6. Theoretical Ground of 21st Century Skills

John Dewey's pragmatism philosophy is applicable in modern era. With the increased shift towards skills based education, there is dire need to visit Dewey's philosophy of education. 21st century skills such as communication, problem-solving, creativity,critical thinking and social skills are closely connected with John Dewey's theory of experiential learning. Dewey believed that education should be grounded in real-life experiences and that students learn best through active engagement**,** reflection, and interaction with their environment. In order to respond to the urgency of 21st century skills in educational system, many countries are reorganizing their educational systems. For instance, Malaysia has launched two major 21st century skills based projects which are aimed at nurturing students' cognitive skills. Many countries are integrating research, education and creativity in order to foster application based education rather than just memorizing facts and acquiring information. In fact, new educational economy demanded transform educational systems, structures and institutional cultures (Liew, 2005).

Fullen (2005) argued that this implementation still dependent on teachers active role and competency. Beck (2010) argued that schools needs to revisit their pedagogical approach in order to bring educational reforms. Students should not only be memorizing facts but learning interactively and collaboratively. Pedagogical approaches should be revolving around problem solving, critical thinking, discussion, creativity and activity based learning. These pedagogical approaches will enable the learners to meet the challenges of changing knowledge economy. Role of learners have also been changed like wise. Learner should be active, critical thinker, problem solver, creative and responsible person instead of always relying on teacher in context of what to do, why to do, how to do and when to do. They must be independent in order to meet the global challenges. Moreover, there is also need to revisit curriculum in order to cater for learner's needs. Teachers' mindset and dynamic curriculum is needed for new knowledge trends. Philosophical roots of 21st century skills are deeply rooted in Dewey's philosophy of education. It is offering a very comprehensive framework for inclusion of 21st century skills in the educational systems.

Dewey is considered as the pioneer of experimental education. He became famous due to his educational works such as the school and society, the child and the curriculum, how we think and Democracy and education. He is considered as an educational reformist due to his comprehensive educational work. New paradigm of education was presented by him from traditional education towards progressive education. He considered the school as mini society and mirror of societal trends. Main concepts of his philosophy are experience, activity, creativity, critical thinking and learner centered experimental classrooms. His educational philosophy has the capacity to prepare individuals who have the power of independent thinking and reforming society. His philosophy is highly aligned with 21st century skill and has worth of revisiting. There is dire need to revisit and re-organize educational systems in the light of pragmatism philosophy (Tan, 2006).

2.2.7. 21st Century Skills and Primary Education

New millennium has been started since 23 years but education in Pakistan is still evolving. Literacy rate has been always low since independence. British government has left sub-continent and Pakistan has achieved literacy rate bit better but still it's very far behind the developed countries. There is much more in education which needs to be achieved. However, Pakistan is struggling hard and initiated many efforts for enhancing literacy rate and providing primary education to everyone. When Pakistan is struggling with basic education and rest of world is achieving their 21st century goals. The changed knowledge economy and demanding skilled based work places put extra pressure on Pakistani educational system. It is a big challenge for Pakistani government to inculcate 21st century skills in education system along with handling many other educational issues. This situation is posing a challenging situation for Pakistan. Current education system is just focusing on memorization, cramming, received knowledge and assessment system is also concerned with assessing memorization.

Skills like critical thinking, communication skills, collaboration, social skills, creativity and critical thinking skills are missing in curriculum. However, national educational policy 2009 acknowledged these skills for education system. It stressed the need of 21st century skills to be the part of national curriculum. In spite of many challenges, government of Pakistan has launched revised curriculum which has special focus on inculcating 21st century skills among students. However, very first time, 21st century skills based curriculum has been developed and implemented in Pakistan. This revised curriculum has benchmark based system for all the subjects. It's a very good initiative by the government of Pakistan. These benchmarks and standards were not developed for the curriculum developed in 2006. Curriculum contents of Science and mathematics subjects have been alignment with content framework of TIMSS.

In particular at primary level, all curriculum contents have deeper focus on developing students' creativity, communication, critical thinking, reasoning ability and problem solving skills. Curriculum of 2006 was implemented only in government schools but this revised curriculum has been launched in all schools and deeni madaras as well. After pandemic, country has realized the significance of skills rather than just cramming facts and receiving information.

Children have to learn 21st century skills in order to meet the demands of modern era. At primary level curriculum has been revised by considering local, cultural and international trends. International commitments on SDG 4 have also been considered. Learning contents for early childhood education included areas like: personal grooming, language ability, basic arithmetic concepts, manners, ethics, health issues and safety. Special focus has been given on inculcation of 21st century skills like problem solving, reasoning, communication and collaboration skills. For grade 1 to 5, subject wise skills have been identifies. For instance, for science subject, skills like scientific observation, critical thinking, creativity and hypothesis making have been stressed. For Urdu subject, skills like creative writing, listening, reading, writing, expression skills and creative expressions have been fostered. For mathematics, problem solving, reasoning, critical thinking, relation with real life, rationalization and ordering of the contents have been focused. For social studies, such skills have been focused such as digital citizenship, respect, tolerance, cultural awareness, environmental compatibility, peace and harmony. For English subject, skills such as listening, reading, creative writing, speaking and communication skills have been focused (Hodboy, 2019).

2.2.8. Models of 21st Century Skills

According to glossary of reforms, 21st century skills are the set of skills, knowledge and attitudes which are important to be successful in the current scenario. These skills are significant for today's workplace, knowledge economy and meeting the demands of global world. 21st century skills demand that students must be taught these universally accepted skills. School curriculum should be designed in the light of 21st century skills. Moreover, teachers should also change their pedagogical approaches according to global trends. Educators should realize that education of 21st century is different than the education of 20th century. Therefore, whole educational scenario must be changed in this context. There are different institutes and organizations who have classified these skills differently. Their three models of 21st century skills which are very prominent in literature.

These models have gained popularity among educators, researchers, curriculum designers and policy makers because they offer unique framework for the implementation of 21st century skills in the curriculum Details of these models have been mentioned below:

2.2.8.1 21st Century Learning Model

This model was proposed by partnership for 21st century learning initiatives. Specific skills have been described by these models which are compulsory for students to master in order to compete in this modern world. This model has presented a p21 frame work which has two dimensions: 21st century students' outcomes and support system. All the components of 21st century skills are incorporated in this model. This model is offering core subjects which students' have to master. These core subjects are aligned with 21st century skills. These core subjects are considered as basic requirement for students' success. These core subjects are language, arts, International languages, social and natural sciences.

Schools are required to incorporate the concepts of above mentioned subjects in students learning. Besides the core subjects, this model has also presented the innovative skills. These skills are called 4Cs: Critical Thinking, Communication, Collaboration and Creativity Skills. These 4Cs are prerequisites for students to be successful in this ever changing world. This model has also touched upon digital skills. In digital literacy, it has identified media awareness, media technology and information communication technology. Students should have access to variety of information and should be able to evaluate the information. They should be able to access the information effectively and with efficiency, critically analyze the information, managing the information, effective usage of information and have ethical consideration regarding the use of information. Similarly, students' should also be able to use information communication technology effectively. They can use multiple technologies to access information, research information, assess information and effectively communicate the information. It has proposed life skills like adaptability, flexibility, respect for diversity, positive attitude, taking initiatives, innovation, self-management skills, independent learning, interpersonal skills, global peace and harmony, social and cultural adjustment.

This model recommends that a working support system is highly needed to inculcate 21st century skills among students. This model is offering five types of supports systems to ensure smooth mastery of students'' 21st century skills. First is a 21st century standard which is focusing on identifying that what students should be able to know regarding contents and skills. These standards also identify the level of students' mastery in particular standard. Second support system is 21st century skills assessment. It focuses on providing guidelines, identifying deficiencies in learning and providing timely feedback on students' learning. This aspect ensures the quality in teaching and students' learning. Next is curriculum and instruction. It emphasized the 21st century skills based curriculum and instruction that promotes students' cognition, life skills and ICT skills. These skills will be fostered with the support of core subjects and interdisciplinary themes. Moreover, it is also proposing instructional methods which are creativity, thinking and technology based. Curriculum and instruction are considered as the heart of any educational system as whole educational activities revolve around them.

Teachers' professional development in the light of 21st century skills is also considered as support system in context of effective implementation of 21st century skills in schools. Teachers' academic and pedagogical knowledge should be updated in the context of 21st century skills. Teachers' training programme should be highly aligned with 21st century skills. Teachers are the important pillars of educational system so they must be provided with sufficient support in term of knowledge, skills and technology. This will facilitate them to be effective 21st century teachers. Usage of technological tools is also important support system. It should also be highly considered. Last support system is creating conducive learning environment. Typical environment of learning only focuses on time and space but in contrast, effective learning environment is free of time and space but it focuses on the methods that how students learn best.

2.2.8.2 **Seven Survival Skill Model**

This model was developed by the combined efforts of Tony Wagner and leadership group at Harvard school of education. They conducted a diagnostic research for developing learning standards which will be strongly integrated with 21st century skills.

They have identified seven survival skills which are compulsory for learners to survive in the competitive workplace. First one is critical thinking and problem solving skills. These sills are highly needed in current job market. Such employee are highly needed who can critical think that how performance and productivity can be improved. Educators should provide such opportunities to students in which students can think critically and apply innovative solution to multiple problems. Second survival skill is collaboration. Students should be provided with the situations where they can learn cooperation, collaboration, team work, task distribution, leading, controlling and monitoring work. A third survival skill is adaptability. One of the major functions of education is to teach adjustment and adaptability skills to students (Lohr, 2020). Wagnor (2008) argued that we have such school systems which teach the students the idea of right answers. Students are taught that you will be rewarded if you will give right answers. However, practical life is changing rapidly. Students should be taught to accept multiple answers and to adapt and adjust in this changing world.

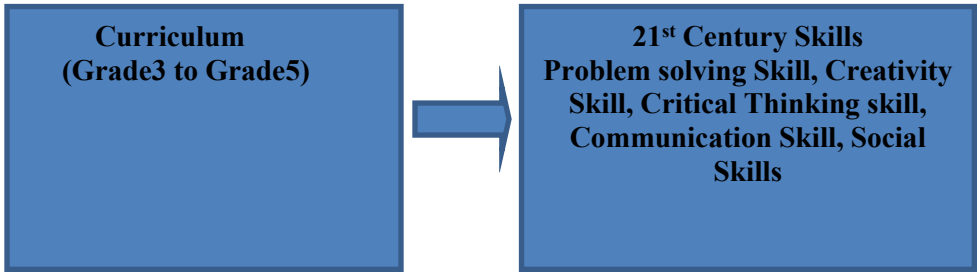
Rigidity and conservativeness should be decreased in the education system. Students should be able to think openly, look outside the box and be flexible. Next survival skill is taking initiatives. Toady's workplaces need such individuals who can take initiatives. Students should be appreciated to try new ideas, apply them and evaluate the consequences. Educators should teach them that if idea is fail then it does not mean their cognitive approach was wrong. Instead of this thinking, students can be taught to look at the weaknesses of idea critically. One more survival skill is effective communication. This communication can be written and oral. Students should be taught how talk effectively and express their ideas and thoughts. Formal and informal writings should be introduces. Students can be orientated about emerging technologies for effective communication skills. Next survival skill is accessibility and analysis of information. Students must know about information literacy skills like easy access to the information, critical evaluation of the information, effective usage of information and knowledge about ethical and legal issue of information. Last, but not least, survival skill is curiosity and imaginary skill. Today's workplace demands such workers who can see them work differently and can initiate creative ideas.

Schools should provide such opportunities to students in which their curiosity and imagination skills are enhances as it is the demand of today's workplace. (Foshay & Kirkly, 2003).

2.2.9 Theoretical Framework

Figure 1

Theoretical Framework



Professional Training under Government of Pakistan has implemented curriculum at primary stage. Major purpose of this curriculum is integrating 21st century skills in the curriculum so that students can meet the challenges of modern world. For this study, grade 3, grade 4 and grade 5 were chosen. 21st century skills have been identified from curriculum document. Students' tests were constructed for measuring 21st century skills developed through curriculum.

2.3. Empirical Review

The primary level curriculum plays a crucial role in developing students' foundational skills, including 21st century skills such as critical thinking, creativity, collaboration, communication, and problem-solving. As the world becomes increasingly complex and interconnected, these skills are essential for students' future success. This review synthesizes findings from relevant studies that investigated the assessment of students' 21st century skills developed through primary level curriculum.

A study by Koh et al. (2015) found that primary school students who received explicit instruction in critical thinking and problem-solving demonstrated significant improvements in these skills compared to those who did not receive such instruction. Research by Wang et al. (2017) discovered that integrating creativity and collaboration into primary level science curriculum significantly enhanced students' scientific literacy and creativity skills.

A study by Zhang et al. (2018) found that primary school students who participated in project-based learning activities demonstrated improved communication and collaboration skills compared to those who received traditional instruction. Lee et al. (2019) revealed that primary level students who received explicit instruction in problem-solving and critical thinking demonstrated improved math achievement and problem-solving skills. Chen et al. (2020) found that integrating technology into primary level language arts curriculum significantly enhanced students' communication and collaboration skills. Patel et al. (2015) discovered that primary school students who participated in inquiry-based science activities demonstrated improved critical thinking and problem-solving skills. Suh et al. (2017) found that primary level students who received explicit instruction in creativity and collaboration demonstrated improved social skills and creativity.

Chai et al. (2019), Koh et al. (2019), and Lee et al. (2020) explored the role of teacher professional development and support in implementing 21st-century skills curriculum and assessing student learning outcomes. A study by Hynes (2016) found that students who received explicit instruction in communication skills showed significant improvement in their ability to communicate effectively. Another study by Dignath, Buettner, and Langfeldt (2016) found that students who were taught communication skills as part of a broader social-emotional learning program showed improved communication skills and social skills. Another study by Kim (2017) found that students who received explicit instruction in creativity skills showed improved creative thinking skills and problem-solving skills. A study by Abrami et al. (2015) found that students who received explicit instruction in critical thinking skills showed significant improvement in their critical thinking skills and problem-solving skills.

Another study by Halpern (2014) found that students who were taught critical thinking skills as part of a broader critical thinking program showed improved critical thinking skills and problem solving skills. A study by Mayer and Wittrock (2006) found that students who received explicit instruction in problem-solving skills showed significant improvement in their problem-solving skills and critical thinking skills. Another study by Jonassen (2011) found that students who were taught problem solving skills as part of a broader problem-based learning program showed improved problem solving skills and critical thinking skills. A study by Durlak et al. (2011) found that students who received explicit instruction in social skills as part of a broader social emotional learning program showed significant improvement in their social skills and academic performance. Another study by Zins et al. (2004) found that students who were taught social skills as part of a broader social-emotional learning program showed improved social skills and academic performance. Ho et al. (2020), Ng et al. (2019), and Yuen et al. (2018) investigated the effectiveness of curriculum-based interventions in developing primary level students' 21st century skills, including critical thinking, problem-solving, and collaboration. Results indicate that such interventions can be effective. Overall, these studies provide valuable insights into the assessment of primary level students' 21st century skills developed through curriculum.

They suggest that explicit instruction, project based learning, technology integration, and inquiry-based activities can enhance these skills. Additionally, teacher support and professional development are crucial for effective implementation and assessment. These studies elaborate on the significance of primary level curriculum in developing students' 21st century skills, including critical thinking, creativity, collaboration, communication, and problem solving. They highlight the effectiveness of explicit instruction, project-based learning, technology integration, and inquiry-based activities in enhancing these skills. Additionally, they emphasize the crucial role of teacher support and professional development in ensuring effective implementation and assessment of 21st century skills curriculum. The studies also investigate the impact of curriculum-based interventions on developing primary level students' 21st century skills, revealing that such interventions can be effective.

2.4. Critical Summary of Literature Review

The review of related literature emphasized the need of 21st century abilities in modern education, highlighting that old educational institutions are insufficient to meet the problems of the present. Countries have modified their education systems in response to the Sustainable Development Goals and Education Agenda 2030, which emphasize the importance of teaching skills such as creativity, critical thinking, and problem solving, social and communication skills. Various models and research point to a consensus on vital 21st century abilities such as creativity, communication, cooperation, critical thinking, digital expertise, and social skills. Creativity is regarded as a critical 21st century skill, defined as the ability to develop new and meaningful ideas, with characteristics such as motivation, intelligence, and environment influencing personal creativity. Another vital skill is critical thinking, which is defined as the mental ability to make decisions and propose novel solutions to issues. Overall, literature advocates for an education system that prioritizes the development of 21st century skills to prepare students for the complexities of the modern world.

It highlights the need for a shift from traditional education models to those that foster creativity, critical thinking, problem-solving, and social interaction, with a strong emphasis on the role of technology in enhancing these skills. Models of 21st century skills emphasized a collective vision that emphasizes the need for students to develop critical thinking, problem-solving, communication, and logical argumentation abilities. These models categorize these skills into three major areas: life and career skills, learning and innovation skills, and information, media, and technology skills. The framework aims to integrate 21st century skills across all academic subjects, providing teachers with updated curriculum standards and assessment techniques. The theoretical foundation of 21st century skills is deeply rooted in John Dewey's philosophy of pragmatism. Dewey's emphasis on experiential learning, critical thinking, and learner-centered education aligns closely with the goals of 21st century education. The text suggests that revisiting Dewey's ideas is essential in today's skills-based education landscape.

Countries like Malaysia are highlighted as examples of how educational systems are being reorganized to foster cognitive skills through research, creativity, and application-based learning, moving away from traditional rote learning. Multiple challenges are being faced by Pakistan's education system in adopting 21st century skills, given its ongoing struggle with low literacy rates and an education system focused on memorization. Despite these challenges, Pakistan has made strides by revising its curriculum to include benchmarks and standards that emphasize skills like creativity, critical thinking, communication, and problem-solving. The revised curriculum, implemented across government schools, madrasas, and private institutions, is seen as a significant step forward in aligning Pakistan's education with global trends and the demands of the modern knowledge economy. However, several critical gaps and limitations emerge upon deeper evaluation. First, while the literature provides broad conceptual frameworks, it often lacks empirical evidence on the effectiveness of curriculum reforms in achieving desired skill outcomes, particularly in developing countries. There is limited research on how such skills are being practically assessed, taught, and reinforced within classroom settings, especially at the primary level.

Additionally, while technology is frequently cited as a catalyst for 21st century learning, the digital divide especially prevalent in low income and rural areas is insufficiently addressed in the literature, raising concerns about equitable access to skill-building opportunities. In the context of Pakistan, the literature acknowledges recent efforts to revise the national curriculum with the inclusion of skill-based benchmarks across public, private, and religious educational institutions. Yet, the actual implementation remains under explored. The literature often lacks classroom-level analysis and neglects to evaluate whether teachers possess the training and resources needed to translate curriculum goals into effective practice. Additionally, the reliance on textbooks as the primary medium of instruction, particularly in under-resourced schools, limits the potential for fostering creativity, problem-solving, and communication skills in meaningful ways. More empirical research is needed to assess how these skills are being cultivated in real classroom environments and to identify the structural and pedagogical changes required for their successful implementation.

CHAPTER 3
RESEARCH METHODOLOGY

Research methodology refers to a systematic way of carrying out research in order to get reliable and valid results. Therefore, researcher has tried to design a systematic research methodology in order to get authentic results. This chapter contains details of research methodology under different headings. Details have been mentioned below:

3.1 Research Design

Researcher used pragmatist paradigm of research. According to Griffin, McGraw and Care (2012), it is the paradigm of research which is flexible in nature. It is not focusing on one way of exploring research problem but uses mixed methods to explore research phenomenon. In social science research, this research paradigm is widely used. By purpose, it is applied research. Applied research is a type of research which is focusing on some societal issue or phenomenon. By method it is descriptive research. Descriptive research focus on what question rather than why questions. Under descriptive research, this is cross sectional type of research. Cross sectional research focus on population data across the different section at same time. Hence, the pragmatist paradigm was chosen for its flexibility, allowing the use of both qualitative and quantitative methods to get a complete picture. Since the focus was on understanding the current state of skill development (what is happening), a descriptive approach was suitable. The study was also applied in nature, aiming to improve educational practices. A cross-sectional design helped gather data from different sections of the population at one point in time, making it efficient for comparing and analyzing trends across various groups.

3.2. Population of the Study

All students from grade 3 to grade 5 were the population of study. Data were collected from primary schools under the administration of Federal Directorate of Education. Researcher choose Federal Directorate of Education (FDE) schools because it serves as a central governing body overseeing public educational institutions in the federal capital, ensuring standardized policies, curricula, and teacher training.

Moreover, FDE provided official records and access permissions, making it a credible and efficient source for educational data. Grade 3, 4 and 5 students from Islamabad sector(G& I) were the population of study. 50 primary schools are working in sector G and Sector I. According to FDE, total number of students (grade 3 to grade 5) in 50 schools was 7050. Therefore, population size was 7050 students.

3.3. Sample and Sampling Technique

Researcher used Cluster Sampling technique. Cluster sampling technique is the type of probability sampling. Researcher divides the whole population in to clusters/groups. Researcher used multi stage sampling to reach the clusters for selecting samples. Multistage sampling technique was used for selecting sample of the study. In multi stage sampling, whole population is divided into small groups for getting accurate and fair data. It makes the larger population manageable (Lohr, 2020).The researcher used multistage cluster sampling to select a manageable and representative sample from a large population. This technique allowed the researcher to first select specific areas and schools, and then select students within those schools, ensuring fair representation, reduced cost, and efficient data collection while maintaining the accuracy of results. Sample size of 10% was selected from targeted population. Therefore, a simple size of 700 was selected for data collection. At first stage, schools were selected for data collection. Schools of Islamabad (sector G and I) were selected for data collection. Islamabad, the capital city of Pakistan, is divided into eight zones, each further subdivided into sectors. The Islamabad Sector system is a well-planned and organized way of categorizing the city into manageable parts. Each sector is identified by a letter (B, C, D, E,F,G,H,I.) and is designed to provide a unique identity to each area. This system helps in efficient urban planning, administration, and navigation. The sectors are typically self-contained, with their own commercial and residential areas, parks, mosques, and other amenities. 3 schools from sector G and 3 schools from sector I were selected. At second stage, students were selected from these schools. Students of grade3, 4 and 5 were considered for data collection. Details of students in each class is as here: in school#1, there were 40 students in class 3, 38 students in class 4 and 38 students in class 5. In School#2, there were 40 students in class 3, 37 in class 4 and 40 students in class 5.

In school#3, there were 42 students in class 3, 37 students in class 4 and 37 students in class 5. In school#4, there were 37 in class 3, 40 in class 4 and 40 in class 5. In school#5, there were 36 students in class 3, 43 students in class 4 and 38 students in class 5. In school #6, there were 40 students in class 3, 38 students in class 4 and 39 students in class 5. Overall, total number of class 3 students in all schools is 235. Total number of students in class 4,in all schools, is 234 and total number of students in class 5 was 231.

Table 3.1

Table of Sample

Sector	School	No. Of students
G	Islamabad Model School (I-V) G-7/1	116
	Islamabad Model school for girls (I-VIII) G-7/3-4	117
	Islamabad Model school for Girls (I-X). G-5, Islamabad.	116
I	Islamabad Model School, I-9/1, Islamabad.	117
	Islamabad Model School, I-9/4, Islamabad.	117
	IMS (I-V)No.2 I-9/4	117
		700

3.4. Instruments

Self-constructed criterion referenced tests were developed for students. Separate criterion referenced tests were constructed for measuring each skill. For creativity skill, English subject was considered for constructing the test. For critical thinking and problem solving skill, science, mathematics and English language subjects were considered. English subject was selected for assessing communication skills. Social studies and general knowledge subjects were used for assessing social skills.These tests have been developed in the light of theoretical framework. One way table of specifications was developed for developing student's tests for measuring each skill. Task and performance-based tests were constructed for assessing above mentioned skills. Pilot testing of all students' tests was carried out.

In this study, a common set of tests was developed to assess five key 21st century skills (creativity, communication, social skills, critical thinking, and problem-solving)among students in Grades 3, 4, and 5. While it is recognized that students at different grade levels have varying cognitive abilities and developmental stages, the decision to use the same assessments across all three grades was intentional and grounded in both practical and theoretical considerations. One of the primary goals of the research was to compare the development of these skills across grade levels. Using separate tests for each grade would have introduced variations in structure and difficulty, making direct comparison unreliable. By employing a standardized assessment, the study ensured that all students were evaluated under the same conditions, enhancing the validity and reliability of cross-grade comparisons.

Moreover, the assessments were not based on curriculum content but were designed to measure broader, cross-disciplinary skills. As such, the tasks were carefully constructed using age-appropriate language and scenarios that were engaging and accessible to students across the targeted age group. This allowed for a fair opportunity for all students to demonstrate their skill levels, regardless of grade. The skills being assessed such as creativity or problem-solving are inherently open-ended and developmental, allowing students at different cognitive stages to engage with the tasks in varying ways. From a practical standpoint, creating three distinct versions of each skill test would have significantly increased the complexity of the study in terms of piloting, validation, and analysis, and could have introduced inconsistencies in test quality. Using a single test format reduced these risks and ensured ethical and equitable administration.

3.4.1. Procedure for Construction of Students' Tests

At beginning, researcher considered few things like purpose of the tests, intended audience, content areas to be covered in the tests, length of the test, human and material resources required for the test's construction. Formats of the tests was also decided at beginning. Researcher used objective type items for constructing each test. For content selection, researcher reviewed the curricula of grade 3, 4 and 5. Tests' Contents were selected according to research objectives.

Sequence of tests development consisted of development of table of specification, determining validity of each test, conducting pilot testing of each test, carrying out item analysis of each test and determining the reliability of each test. First of all, initial draft was prepared. It was reviewed by subject specialists and educational experts before finalizing the tests content. Educational experts (assistant professors) from Allama Iqbal Open University (AIOU) and Federal College of Education were requested to validate the tests. Moreover, subject specialists from Federal Directorate of Education(FDE) were requested to validate the tests. One way table of specifications were developed for constructing each test. Item analysis was carried out for each test. Reliability and validity of tests was also determined by researcher. Reliability of the test is defined as the extent to which results of test are considered stable and consistent. Reliability of student's tests was estimated by calculating Pearson coefficient. Criterion and content validity was determined for student's tests. Researcher also got expert opinion for determining tests validity. Subject specialists were requested to review the drafts of tests for ensuring content validity of each test.

For determining cut off scores, Angoff method was employed. A panel of Subject Matter Experts (SMEs) was assembled and provided with the test questions, which they reviewed carefully. The final cut-off score was validated through review with additional experts. Through this systematic approach, a defensible cut-off score was established, ensuring the validity and reliability of the student skill test. Rubric for each test have also been developed. Indicators, scoring areas and proficiency levels (low, moderate and proficient) were identified in each test rubric. For communication skills test indicators were identified as content and organization, comprehension, structure, fluency and vocabulary. For creativity test, test indicators were identified as fluency, flexibility and originality. For problem solving test, indicators were: understanding the problem, devising the solution plan and applying the solution plan. For social skill test, indicators were: being fair with others, resolving conflict, helping others, communication skills, ethical behavior and sense of responsibility. For critical thinking test, indicators were as focusing on question, analysis, inferences and deciding on action. Answer keys were also developed for each test. Brief detail of each student's test has been mentioned below:

3.4.2. Communication skill test

The process of communication skill test development involved four major components. First, test development began with an attempt to define the construct of communication skill test. Second, a blueprint of communication skill components was developed. Third, test development continued with the writing of specific items or questions. The two skills of communication have been considered like reading (vocabulary, fluency & comprehension) and writing (structure, content & organization). Metusalem et al. (2019) model of reading and writing has been considered for constructing communication skill test. This model breaks down reading skill into three areas which are vocabulary, fluency and comprehension. Vocabulary is described as understanding the meaning of words and phrases. Fluency component include accuracy while comprehension includes understanding and interpreting the meaning of texts. Hence, test items were developed by considered above components of reading and writing.

3.4.2.1. Table of Specification for Communication skill

One way table of specification was developed for communication skill test. Detail has been mentioned below:

Table 3.2

Table of specification for communication skill

	Level of skills	No. of items	Total Marks
Reading Skills	Vocabulary	1	2
	Fluency	1	2
	Comprehension	1	2
Writing Skills	Structure	1	2
	Content	1	2
	Organization	1	2
	Total	06	12

The table of Specification for Communication Skill outlines the framework for assessing communication skills in reading and writing. The table specifies six items, each carrying two marks, totaling 12 marks. In reading skills, vocabulary, fluency, and comprehension are assessed, with one item each. Similarly, in writing skills, structure, content, and organization are evaluated, with one item each.

This table ensures a comprehensive assessment of communication skills, covering both reading and writing abilities, and provides a clear outline for test development and evaluation.

3.4.2.2. Item Analysis for Communication Skill Test

Item analysis is a statistical method used to evaluate the quality and effectiveness of individual test items or questions**.** Hence, item difficulty and item discrimination was calculated for communication skill test. Details have been mentioned below:

3.4.2.2.1. Item Difficulty

Item difficulty refers to the proportion of students who answer a test item correctly. It's a measure of how easy or complex an item is for students. Formula for calculating item difficulty was as F= NR /NT*100 where NR total number of students who got the item correct, NT means total number of students and F is acceptable when it ranges between 30% to 70%).

Table 3.3

Item difficulty for communication skill test

Question#	NR	NT	F Value	Decision
1	47	70	67	Moderate difficult to moderate easy
2	42	70	60	moderately difficult to moderately easy
3	45	70	64	moderately difficult to moderately easy
4	43	70	61	moderately difficult to moderately easy
5	41	70	58	moderately difficult to moderately easy

The item difficulty analysis reveals that all five test items have a moderate level of difficulty, ranging from moderately difficult to moderately easy. Items 1, 2, and 3 have item difficulty values of 67%, 60%, and 64%, respectively, indicating that between 60-67% of students answered these items correctly. These values fall within the acceptable range of 30-70%, suggesting that these items are appropriately challenging for the students. Items 4 and 5 have slightly lower item difficulty values of 61% and 58%, respectively, but still fall within the moderate range. Overall, the analysis indicates that the test items are neither too easy nor too hard, making them suitable for assessing student learning outcomes. The moderate level of difficulty suggests that the test is able to effectively discriminate between students who have mastered the material and those who require additional support.

3.4.2.2.2. Item Discrimination

Item discrimination refers to the ability of a test item to differentiate between students who have mastered the material and those who have not. It was calculated through item discrimination index which is a standardized measure of item discrimination, ranging from -1 to 1.

Table 3.4

Item Discrimination for Communication Skill Test

Questions	DI	Decision
1	0.43	good
2	0.40	good
3	0.39	good
4	0.37	good
5	0.38	good

The item discrimination analysis reveals that all five test items have reasonably good discrimination indices, ranging from 0.37 to 0.43. This indicates that these items are effective in differentiating between students who have mastered the material and those who have not. The discrimination indices are all positive, suggesting that students who know the material are more likely to answer the items correctly. The similar values across the five items suggest that they are consistently able to discriminate between students with different levels of knowledge.

Overall, these results suggest that the test items are effective in measuring student learning and are suitable for assessing student outcomes.

3.4.3. Creativity Test

The process of creativity test development involved four major components. First, test development began with an attempt to define the construct of creativity. Second, a blueprint of creativity skill components was developed. Third, test development continued with the writing of specific items or questions. Jordanous and Keller (2016) model of creativity has been considered for construction of creativity test. The core skills of creativity skill have been considered like: Fluency (quantity or the ability to produce a large number of ideas), flexibility (changed viewing angle) and originality (generating innovative ideas). Fluency is the ability to generate a large number of ideas, responses, or solutions to a given problem or prompt. Fluency is about quantity, and it involves producing a high volume of ideas. Flexibility involves generating ideas that are diverse, varied, and covers multiple perspectives. Originality is the ability to generate unique, novel, and valuable ideas, responses, or solutions. Originality involves producing ideas that are uncommon and innovative.

3.4.3.1. Table of Specification for Creativity Skill Test

One way table of specification was developed for creativity skill test. Detail has been mentioned below:

Table 3.5

Table of specification for creativity skill test

Level of Skills	No of items	Total Marks
Fluency	1	1
Flexibility	1	1
Originality	1	1
Total	3	3

The Table of Specification for Creativity Skill Test outlines the assessment framework for creativity skills. The table specifies three items, each carrying one mark, totaling three marks. The skills assessed are Fluency, Flexibility, and Originality, with one item each. This table provides a concise and focused framework for evaluating creativity skills, allowing educators to assess students' ability to generate ideas, think flexibly, and produce original work.

3.4.3.2. Item Analysis for Creativity Skill Test

Item analysis is a statistical method used to evaluate the quality and effectiveness of individual test items or questions**.** Hence, item difficulty and item discrimination was calculated for creativity skill test. Details have been mentioned below:

3.4.3.2.1. Item Difficulty

Item difficulty refers to the proportion of students who answer a test item correctly. It's a measure of how easy or complex an item is for students. Formula for calculating item difficulty was as F= NR /NT*100 where NR total number of students who got the item correct, NT means total number of students and F is acceptable when it ranges between 30% to 70%).

Table 3.6

Item Difficulty Table for Creativity Skill Test

Question#	NR	NT	F Value	Decision
1	45	70	64	Moderate difficult to moderate easy
2	46	70	65	moderately difficult to moderately easy
3	48	70	68	moderately difficult to moderately easy

The item difficulty analysis reveals that all three test items have moderate difficulty levels, ranging from 64% to 68%. This indicates that between 64% and 68% of students answered each item correctly, suggesting that the items are neither too easy nor too hard. The moderate difficulty level suggests that the items are appropriately challenging for the students, and the test is able to effectively assess their knowledge and skills. The similar values across the three items indicate that they are consistently moderately difficult, which is within the acceptable range of 30% to 70%. This suggests that the test items are well-designed and are able to effectively discriminate between students who have mastered the material and those who require additional support.

3.4.3.2.2. Item Discrimination

Item discrimination refers to the ability of a test item to differentiate between students who have mastered the material and those who have not. It was calculated through item discrimination index which is a standardized measure of item discrimination, ranging from -1 to 1.

Table 3.7

Item Discrimination Table for Creativity Skill Test

Questions	DI	Decision
1	0.40	good
2	0.39	good
3	0.40	good

The item discrimination analysis reveals that all three test items have reasonably good discrimination indices, ranging from 0.39 to 0.40. This indicates that these items are effective in differentiating between students who have mastered the material and those who have not. The similar values across the three items suggest that they are consistently able to discriminate between students with different levels of knowledge. The reasonably good discrimination indices suggest that the test items are able to effectively assess student learning outcomes and are suitable for use in the test.

3.4.4. Critical Thinking Test

Construction of critical thinking test considered the steps like defining the test construct, selecting test items, determining the test scores and considering the test administration. FAID (Focus, Analyze, Infer & Decide) model of critical thinking (Paul & Elder, 2006) was considered for construction of this test. The four core skills of critical thinking have been considered like focusing question, analysis, inference and deciding on an action. Focusing question involved identifying the problem and understanding the context, analysis involved breaking down information into its component parts to understand it better, inference involved drawing conclusions based on the analysis and deciding on an action meant making a decision that is well-reasoned.

3.4.4.1. Table of Specification for Critical Thinking Test

One way table of specification was developed for critical thinking test. Detail has been mentioned below:

Table 3.8

Table of Specification for Critical Thinking Test

Level of Skills	No. of Items	Total Marks
Focusing on question	1	1
Analysis	1	1
Inference	1	1
Deciding on Action	1	1
Total	4	4

The Table of Specification for Critical Thinking Test outlines the assessment framework for critical thinking skills. The table specifies four items, each carrying one mark, totaling four marks. The skills assessed are Focusing on the question, Analysis, Inference, and Deciding on Action, with one item each. This table provides a clear and structured framework for evaluating critical thinking skills, allowing educators to assess students' ability to focus on the question, analyze information, make inferences, and decide on appropriate actions.

3.4.4.2. Item Analysis for Critical Thinking Skill Test

Item analysis is a statistical method used to evaluate the quality and effectiveness of individual test items or questions**.** Hence, item difficulty and item discrimination was calculated for critical thinking skill test. Details have been mentioned below:

3.4.4.2.1. Item Difficulty

Item difficulty refers to the proportion of students who answer a test item correctly. It's a measure of how easy or complex an item is for students. Formula for calculating item difficulty was as F= NR /NT*100 where NR total number of students who got the item correct, NT means total number of students and F is acceptable when it ranges between 30% to 70%).

Table 3.9

Item Difficulty Table for Critical Thinking Skill Test

Question#	NR	NT	F Value	Decision
1	48	70	66	Moderate difficult to moderate easy
2	39	70	55	moderately difficult to moderately easy
3	43	70	61	moderately difficult to moderately easy
4	41	70	61	moderately difficult to moderately easy

The item difficulty analysis reveals that all four test items have moderate difficulty levels, ranging from 55% to 66%. This indicates that between 55% and 66% of students answered each item correctly, suggesting that the items are neither too easy nor too hard. Items 1 and 3 have slightly higher difficulty levels (66% and 61%, respectively), while Items 2 and 4 have slightly lower difficulty levels (55% and 61%, respectively). However, all items fall within the acceptable range of 30% to 70%, indicating that they are appropriately challenging for the students.

3.4.4.2.2. Item Discrimination

Item discrimination refers to the ability of a test item to differentiate between students who have mastered the material and those who have not. It was calculated through item discrimination index which is a standardized measure of item discrimination, ranging from -1 to 1.

Table 3.10

Table of item discrimination for critical thinking test

Questions	DI	Decision
1	0.45	good
2	0.40	good
3	0.39	good
4	0.35	

The item discrimination analysis reveals that all four test items have reasonably good discrimination indices, ranging from 0.35 to 0.45. This indicates that these items are effective in differentiating between students who have mastered the material and those who have not. Item 1 has the highest discrimination index (0.45), followed closely by Item 2 (0.40), and then Items 3 and 4 (0.39 and 0.35, respectively). All items have positive discrimination indices, indicating that students who know the material are more likely to answer the items correctly.

3.4.5. Problem Solving Test

Paul and Elder (2006) IDEAL (Identify, Define, Explore, Act & Look) model has been considered for construction of problem solving test. The four core skills of problem solving have been considered like understanding the problem, devising the solution plan and applying the solution plan. The process of problem solving test development involved four major components. First, test development began with an attempt to define the construct of critical thinking. Second, a blueprint of problem solving components was developed. Third, brief scenario or short story was created. Fourth, test development continued with the writing of specific items or questions. English mathematics & science subjects have considered for the construction of test.

3.4.5.1. Table of Specification for Problem Solving Test

One way table of specification has been developed for problem solving test. Detail has been mentioned below:

Table 3.11

Table of Specification for Problem Solving Skill Test

Level of skills	No. of Items	Total Marks
Understanding the problem	2	2
Devising the solution plan	2	2
Applying the solution plan	2	2
Total	6	6

The Table of Specification for Problem Solving Test outlines the assessment framework for problem solving skills. The table specifies six items, with two items each for Understanding the problem, Devising the solution plan, and Applying the solution plan, totaling six marks. This table provides a comprehensive and structured framework for evaluating problem solving skills, allowing educators to assess students' ability to understand problems, devise effective solution plans, and apply those plans to achieve solutions.

3.4.5.2. Item Analysis for Problem Solving Skill Test

Item analysis is a statistical method used to evaluate the quality and effectiveness of individual test items or questions**.** Hence, item difficulty and item discrimination was calculated for critical thinking skill test. Details have been mentioned below:

3.4.5.2.1. Item Difficulty

Item difficulty refers to the proportion of students who answer a test item correctly. It's a measure of how easy or complex an item is for students. Formula for calculating item difficulty was as F= NR /NT*100 where NR total number of students who got the item correct, NT means total number of students and F is acceptable when it ranges between 30% to 70%).

Table 3.12

Table of Item Difficulty for Problem Solving Test

Question#	NR	NT	F Value	Decision
1	48	70	66	Moderate difficult to moderate easy
2	48	70	66	moderately difficult to moderately easy
3	48	70	66	moderately difficult to moderately easy
4	45	70	64	moderately difficult to moderately easy

The item difficulty analysis reveals that all four test items have consistent moderate difficulty levels, with Item Difficulty values of 66% for Items 1-3 and 64% for Item 4. This indicates that approximately 64-66% of students answered each item correctly, suggesting that the items are neither too easy nor too hard. The consistent difficulty levels across the four items suggest that they are well-designed and appropriate for assessing student learning outcomes. The moderate difficulty level also indicates that the items are suitable for discriminating between students who have mastered the material and those who require additional support.

3.4.5.2.2. Item Discrimination

Item discrimination refers to the ability of a test item to differentiate between students who have mastered the material and those who have not. It was calculated through item discrimination index which is a standardized measure of item discrimination, ranging from -1 to 1.

Table 3.13

Table of Item Discrimination for Problem Solving Skill Test

Questions	DI	Decision
1	0.43	Good
2	0.40	Good
3	0.39	Good
4	0.37	Good

The item discrimination analysis reveals that all four test items have reasonably good discrimination indices, ranging from 0.37 to 0.43. This indicates that these items are effective in differentiating between students who have mastered the material and those who have not. The discrimination indices are consistent across the four items, with Item 1 having the highest index (0.43) and Item 4 having the lowest (0.37). All indices are positive, indicating that students who know the material are more likely to answer the items correctly.

3.4.6. Social Skill Test

The process of social skill test development involved four major components. First, test development began with an attempt to define the construct of social skill. Second, a blueprint of social skill components was developed. Third, test development continued with the writing of specific items or questions. The core skills of social skill have been considered like: resolving conflicts, helping others, being fair with others, communication skills, ethical behavior and sense of responsibility. The core skills of social skills model encompasses six essential components that enable individuals to effectively interact and navigate social situations. Resolving conflicts involve managing disagreements and disputes in a constructive manner, while helping others entails assisting that in need and demonstrating empathy. Being fair with others requires treating individuals with justice and equality, ensuring equal opportunities and respect for all. Communication skills involve effectively conveying thoughts, ideas, and feelings through verbal and non-verbal means. Ethical behavior involves acting with integrity, honesty, and morality, while sense of responsibility entails taking ownership of one's actions and their consequences.

Social skills test item have been prepared by keeping in mind each component of Cognitive, Affective, Social, Emotional & Leadership (CASEL) model of social learning (2020).

3.4.6.1. Table of Specification for Social Skill Test

One way table of specification has been developed for social skill test. Detail has been mentioned below:

Table 3.14

Table of Specification for Social Skill Test

Level of skills	No of Items	Total Marks
Resolving Conflicts	1	1
Helping others	1	1
Being fair with others	1	1
Communication skills	1	1
Ethical Behavior	1	1
Sense of Responsibility	1	1
Total	6	6

The Table of Specification for Social Skill Test outlines the assessment framework for social skills. The table specifies six items, each carrying one mark, totaling six marks. The skills assessed are resolving conflicts, helping others, being fair with others, communication skills, ethical behavior, and sense of responsibility, with one item each. This table provides a comprehensive and structured framework for evaluating social skills, allowing educators to assess students' ability to resolve conflicts, show empathy and fairness, communicate effectively, demonstrate ethical behavior, and take responsibility for their actions.

3.4.6.2. Item Analysis for Social Skill Test

Item analysis is a statistical method used to evaluate the quality and effectiveness of individual test items or questions**.** Hence, item difficulty and item discrimination was calculated for critical thinking skill test. Details have been mentioned below:

3.4.6.2.1. Item Difficulty

Item difficulty refers to the proportion of students who answer a test item correctly. It's a measure of how easy or complex an item is for students. Formula for calculating item difficulty was as F= NR /NT*100 where NR total number of students who got the item correct, NT means total number of students and F is acceptable when it ranges between 30% to 70%).

Table 3.15

Table of Item Difficulty for Social Skill Test

Question#	NR	NT	F Value	Decision
1	43	70	61	Moderate difficulty level
2	43	70	61	Moderate difficulty level
3	39	70	55	moderately difficult to moderately easy
4	38	70	54	moderately difficult to moderately easy
5	48	70	66	Moderate difficult to moderate easy
6	43	70	61	Moderate difficult to moderate easy

The item difficulty analysis reveals that all six test items have moderate difficulty levels, ranging from 54% to 66%. This indicates that between 54% and 66% of students answered each item correctly, suggesting that the items are neither too easy nor too hard. Items 1, 2, 6 have consistent moderate difficulty levels (61%), while Items 3 and 4 have slightly lower difficulty levels (55% and 54%, respectively). Item 5 have a slightly higher difficulty level (66%). All items fall within the acceptable range of 30% to 70%, indicating that they are appropriately challenging for the students.

3.4.6.2.2. Item Discrimination

Item discrimination refers to the ability of a test item to differentiate between students who have mastered the material and those who have not. It was calculated through item discrimination index which is a standardized measure of item discrimination, ranging from -1 to 1.

Table 3.16

Table of Item Discrimination for Social Skill Test

Questions	DI	Decision
1	0.40	Good
2	0.34	Good
3	0.36	Good
4	0.39	Good
5	0.40	Good
6	0.41	Good

The item discrimination analysis reveals that all six test items have reasonably good discrimination indices, ranging from 0.34 to 0.41. This indicates that these items are effective in differentiating between students who have mastered the material and those who have not. The discrimination indices are consistent across the six items, with Item 6 having the highest index (0.41) and Item 2 having the lowest (0.34). All indices are positive, indicating that students who know the material are more likely to answer the items correctly.

3.5 Validity of Instruments

Content and face validity of each test was determined. Face validity was determined by ensuring either each test measure what it is supposed to measure. Content validity was determined through expert opinion and feedback from subject specialists. Each test was revised after feedback from educational experts and subject specialists. They recommended few changes in question statements, number of test items, difficulty level and scoring of test items.

Moreover, for determining content validity, task analysis of each test was carried out and alignment of test items was checked with each test objective. For ensuring face validity of each test, test questions were examined. They were aligned with assessment objectives. Tests items relevancy were also checked according to age and cognitive level of students. It was ensured that tests items language should be clear, concise and easy to comprehend. Format of the test was also considered according to nature and objectives of each test. All tests were pilot tested and modified according to feedback.

3.6 Pilot Testing of Tests

Pilot testing was conducted with a group of 75 students, comprising 25 from Grade 3, 25 from Grade 4 and 25 from grade 5. The students were selected through convenience sampling, ensuring a diverse range of students in terms of gender, ethnicity, and academic achievement. Prior to the pilot test, informed consent was obtained from the students, school principle and teachers. They were briefed about the purpose, benefits, and confidentiality of the study. The 21st Century Skills Assessment tests were administered to the students. The tests were provided in a clear and concise manner and students were given instructions on how to complete it. The time limit for completion was set at 30 minutes, and students were monitored to ensure they understood the questions and were able to complete the questionnaire within the allotted time.During the administration of the tests, observations were made to identify any issues, areas of confusion, or technical problems. Additionally, a brief debriefing session was conducted after the tests administration to gather feedback and insights from the students. The pilot test data were then analyzed to identify any unclear or ambiguous questions, questions that were difficult for students to answer, and technical issues. Based on the findings from the pilot test, revisions were made to the tests to improve its clarity, effectiveness, and feasibility. The evaluation criteria for the pilot test included the clarity and understanding of questions, relevance and coverage of 21st century skills, time required for completion, participant engagement and motivation, and technical issues.

3.7 Reliability of Instruments

Reliability of each students test was determined by using Test re-test method. Pilot testing of all students tests were carried out. Students were selected for pilot testing other than the sample. Sample size of 70 students was selected from I.8 school for carrying out pilot testing. The tests were administered to a group of 70 students. The participants were familiarized with the test format and instructions to minimize any learning effects. The same tests were re-administered to the same group of participants after the interval of one week. The tests were administered in a consistent and standardized manner, identical to first test. The results of both tests were scored and recorded. Pearson's (correlation coefficient) was used to evaluate the consistency of the test scores over time. The Pearson correlation coefficient was calculated between the scores from test 1 and test 2. The correlation coefficient was analyzed to determine the test-retest reliability.

Table 3.17

Table of Instruments Reliability

S.No	Tests	No. of Items	Pearson (r)
1	Creativity test	3	0.7
2	Critical thinking test	4	0.7
3	Communication skill test	5	0.8
4	Social skill test	6	0.8
5	Problem solving skill test	4	0.7

3.8 Data Collection

Data were collected from primary level students (grade 3 to grade 5). Researcher first got official permission from relevant authorities. Schools principals were informed about purpose of research and requested for data collection. Purpose of research was shared with students, concerned teachers and school principals. After seeking their permission, self-constructed tests were administered once to the students from grade 3 to grade 5. Test administration was carefully managed to ensure consistency and fairness across all participants. The researcher followed a standardized procedure, providing clear instructions, maintaining a quiet and distraction-free environment, and ensuring equal time for all respondents.

To address any unforeseen challenges, contingency planning was implemented, including having extra copies of test materials, backup venues, and flexible scheduling options in case of participant absence. These measures helped maintain the integrity and reliability of the data collection process. It took about a month in data collection. Paper pencil tests were administered once with selected sample. After getting their consent, researcher collected data. Response rate was 94%. There was no missing data. There was no missing data because tests' questions were objective type and students attempted all questions.

3.9 Data Analysis

Mean score, Analysis of Variance (ANOVA) and correlation analyses have been carried out for analysis of data. Mean scores were calculated for an overall understanding of the skill development across the entire student population. ANOVA analysis was carried out for comparing students skills developed at different grades. Correlation Analysis was carried out to find the relationship among developed skills of students at different grades.

3.10 Ethical Consideration

Research ethics are very important to consider. Researcher got official permission from relevant authorities for data collection. Research purpose was shared with teachers and students for getting authentic data. They were assured that their data will be used only for research purpose. Prior to data collection, official permission was obtained from the relevant educational authorities, including school administrations under the Federal Directorate of Education. The purpose of the study was clearly communicated to school principals, teachers, and students to ensure transparency and informed participation. Five assessment tests were administered. To ensure ethical compliance, informed consent was secured from teachers and school authorities, and where applicable, verbal assent was obtained from students in a child friendly manner appropriate for their age group. Students were assured that their participation was voluntary and that they could opt out at any point without any consequences. All collected data were treated with strict confidentiality and anonymity, no personal identifiers were recorded or disclosed.

Data were used solely for the purpose of this academic study and was stored securely to protect participant privacy. The researcher ensured a supportive and respectful environment during testing, taking care to avoid any pressure or discomfort for the children involved.

CHAPTER 4
DATA ANALYSIS AND INTERPRETATIONS

This chapter contains analysis and interpretations of collected data. This study was cross sectional study. Data were collected once from students. Criterion referenced tests were developed for measuring students' 21st century skills developed through national curriculum at primary level. Students of grade 3, 4 and 5 were considered for collection of data. 21st century skills were dependent variable and national curriculum was independent variable. Collected data were analyzed in the light of research objectives. Data were analyzed by using Mean scores, ANOVA analysis and correlation analysis. Details of data analyses have been mentioned below:

4.1. Mean Score Analysis of Skills

This section presents the mean score analysis of 21st century skills: communication skill, creativity skill, problem solving skill, critical thinking skill and social skill.

Table 4.1

Comparison of mean score on Communication Skill

Classes	N	Mean	Standard deviation
3	228	13.17	1.76
4	228	13.70	1.52
5	228	13.44	1.58

The data in table 4.1 represents the characteristics of three different classes, with each class having a distinct number of observations. In Class 3, there were 228 observations with a mean score of 13.17 and a standard deviation of 1.76. Class 4 also had 228 observations, but with a slightly higher mean score of 13.7018 and a standard deviation of 1.52. Similarly, Class 5, with 228 observations as well, had a mean score of 13.4474 and a standard deviation of 1.58. These statistics provide insights into the distribution and variation of scores within each class, indicating the central tendency and spread of the data points.

Grade 4 has the lowest standard deviation (1.52), indicating that the scores in this class tend to be more tightly clustered around the mean, whereas grade 3 has the highest standard deviation (1.76), suggesting more variability in scores. The values of mean scores show that mean score of grade 4 is higher than grade 3 and grade 4. Overall, grade 4 exhibits higher average performance, the greater variability in scores within grade 3 implies that some students may perform exceptionally well or poorly compared to the rest of the grade.

Table 4.2

Comparison of mean score on Creativity Skill

Classes	N	Mean	Standard deviation
3	228	7.27	1.52
4	228	7.72	1.44
5	228	7.48	1.51

The values in table 4.2 presents the distribution characteristics of a variable across three distinct classes. Each class is represented by an equal number of observations, 228. Upon analysis, it's evident that there are variations in the means and standard deviations across the classes. In Class 4, the mean value is the highest at 7.7237, indicating a tendency towards higher values of the variable compared to the other classes. However, Class 3 exhibits the lowest mean value at 7.27. Interestingly, despite Class 5 having a mean value between Classes 3 and 4, its standard deviation (1.51) closely resembles that of Class 3 (1.52). This suggests that while Class 5 may have a similar central tendency to Class 3, its data points are less dispersed than those in Class 4.The values of mean scores show that mean score of grade 4 is higher than grade 3 and grade 4.

Table 4.3

Comparison of mean score on Critical Thinking Skill

Classes	N	Mean	Standard deviation
3	228	11.18	1.56
4	228	11.06	1.64
5	228	11.27	1.45

Table 4.3 provides a comprehensive insight into the distribution characteristics of a variable across three distinct classes. Each class comprises 228 observations, ensuring a robust comparison. Upon analysis, it becomes evident that there are subtle differences in the mean scores across the classes. Class 5 emerges with the highest mean score of 11.27, indicating that, on average, this class exhibits the highest values of the skills development among the three. Conversely, Class 4 demonstrates the lowest mean score at 11.06, suggesting a slightly lower average value compared to the other classes. Notably, Class 3 falls between Classes 4 and 5 in terms of mean score, with a value of 11.18. However, the standard deviation within each class adds nuance to the interpretation. Class 5 exhibits the lowest standard deviation of 1.45, indicating a relatively tighter spread of data points around the mean compared to the other classes. Conversely, Class 4 displays the highest standard deviation of 1.64, signifying a greater variability in the data within that class. This implies that while Class 5 has the highest mean score, its data points are more tightly clustered around the mean, potentially indicating a more consistent performance or outcome within that class. In contrast, Class 4, despite having a lower mean score, shows a wider dispersion of data points, suggesting a greater variability in the observed variable.

Table 4.4

Comparison of mean score on Problem Solving Skill

Classes	N	Mean	Standard deviation
3	228	11.25	1.73
4	228	11.02	1.74
5	228	11.26	1.50

Table 4.4 presents a detailed analysis of the distribution characteristics of a variable across three distinct classes, each comprising 228 observations. Delving into the specifics, Class 3 emerges with a mean score of 11.25, suggesting a relatively high average value of the variable within this class. However, this elevated mean is accompanied by a notable standard deviation of 1.73, indicating a considerable dispersion of data points around the mean. In contrast, Class 4 exhibits a slightly lower mean score of 11.02, implying a somewhat diminished average value compared to Class 3. Remarkably, despite this lower mean, Class 4 displays a standard deviation of 1.74, parallel to that of Class 3, suggesting a comparable level of variability in the data. Meanwhile, Class 5 demonstrates a mean score of 11.26, marginally higher than both Class 3 and Class 4. Notably, with a standard deviation of 1.50, Class 5 showcases a tighter clustering of data points around the mean compared to the other classes, indicative of a more consistent performance or outcome within this class. Consequently, while Class 5 boasts the highest mean score, its lower standard deviation suggests a more dependable and less variable distribution of the variable, potentially signifying a more stable performance within that class. Hence, the values of mean scores show that mean score of grade 5 is higher than grade 3 and grade 4.

Table 4.5

Comparison of mean score on Social Skill

Classes	N	Mean	Standard deviation
3	228	15.25	1.85
4	228	15.27	1.81
5	228	15.56	1.90

Above table 4.5 indicates a comprehensive examination of the distribution of a variable across three distinct classes, each comprising 228 observations. Beginning with Class 3, it is evident that this class exhibits a mean score of 15.25, indicating a relatively high average value of the variable within this group. However, this elevated mean is accompanied by a notable standard deviation of 1.85, suggesting a considerable dispersion of data points around the mean.

Moving on to Class 4, we observe a slightly higher mean score of 15.27, implying a marginally elevated average value compared to Class 3. Interestingly, despite this higher mean, Class 4 displays a standard deviation of 1.817, parallel to that of Class 3, indicate a comparable level of variability in the data. Class 5 has the highest mean score among the three classes, with a value of 15.56. This indicates a further increase in the average value of the variable within this class. However, it is noteworthy that Class 5 also exhibits the highest standard deviation of 1.90541, suggesting a wider dispersion of data points around the mean compared to the other classes. Hence, the values of mean scores show that mean score of grade 5 is higher than grade 3 and grade 4.

4.2: ANOVA Analyses of 21st century skills

This section presents the ANOVA analysis of 21st century skills: communication skill, creativity skill, problem solving skill, critical thinking skill and social skills. Details of analyses have been mentioned below

Table 4.6

ANOVA analyses on Communication skill

There is no difference on communication skill development among grade 3,4 and 5 students.

Groups	Sum of Squares	Df	Mean Square	F	p
Between Groups	31.68	2	15.84	5.99	.003
Within Groups	1799.42	681	2.64		
Total	1831.10	683			

Summary of the results in the above table, containing F=5.99 and p=.003, indicates that there exists a statistically significant relationship between communication skill and curriculum. Hence, the null hypothesis was rejected. Value of F ratio (5.99) and respected p value (.003) indicates that there is significant difference among the students of different classes. Eta Squared has been calculated for seeing the effect size of ANOVA. Eta Squared value is 0.17 which is showing a large effect size. Hence, the difference between groups are statistically significant.

Table 4.7

Tukey's *Post hoc table on communication skill*

Comparison among classes	Mean Difference	P
Grade 3 V.S Grade 4	.28	0.58
Grade 4 V.S grade 5	.23	.120
Grade 3 V.S Grade 5	.52*	.001

Post hoc test statistics provided significant mean score difference between the groups, whereas the difference of communication skills mean score between grade 3 and grade 4 was not significant. Similarly, the difference of communication skills mean score between grade 4 and grade 5 was not significant. However, there was a significant mean score difference between the communication skills of grade 3 and grade 5.

Table 4.8

ANOVA analyses on Creativity Skill

There is no difference between creativity skill and national curriculum.

Groups	Sum of squares	df	Mean Squares	F	p
Between groups	23.35	2	11.67	5.24	.006
Within groups	1517.57	681	2.22		
Total	1540.92	683			

Summary of the results in the above table, containing F=5.24 and p=.006, indicates that there exists a statistically insignificant difference between creativity skill and national curriculum. Hence, the null hypothesis was accepted. Value of F ratio (5.24) and respected P value (.006) indicates that there is insignificant difference among the students of different classes. Eta Squared has been calculated for seeing the effect size of ANOVA. Eta Squared value is 0.015 which is showing a smaller effect size.

Table 4.9

Tukey's Post Hoc table on Creativity Skill

Comparison among classes	Mean Difference	P
Grade 3 V.S Grade 4	.20175	.149
Grade 3 V.S grade 5	.45175*	.001
Grade 4 V.S Grade 5	.25000	.074

Post hoc test statistics provided significant mean score difference between the groups, whereas the difference of creativity skills mean score between grade 3 and grade 4 was not significant. Similarly, the difference of creativity skills mean score between grade 4 and grade 5 was not significant. However, there was a significant mean score difference between the creativity skills of grade 3 and grade 5 developed through curriculum implementation.

Table 4.10

ANOVA analyses on Critical Thinking Skill

There is no difference between critical thinking and national curriculum

Groups	Sum of Squares	Df	Mean Square	F	p
Between Groups	31.30	2	15.65	6.56	.001
Within Groups	1620.28	680	2.38		
Total	1651.58	682			

Summary of the results in the above table, containing F=6.568 and p=.001, indicates that there exists a statistically significant relationship between critical thinking skill and national curriculum. Hence, the null hypothesis was accepted. Value of F ratio (6.56) and respected P value (.001) indicates that there is significant difference among the students of different classes. Hence, value of F ratio (6.56) and respected p value (.001) indicates that there is significant difference among the students of different classes. Eta Squared has been calculated for seeing the effect size of ANOVA. Eta Squared value is 0.018 which is showing a smaller effect size.

Table 4.11

Tukey's Post hoc table on Critical Thinking Skill

Comparison among classes	Mean Difference	P
Grade 3 V.S Grade 4	.14564	.315
Grade 3 V.S grade 5	.36313*	.012
Grade 4 V.S Grade 5	.50877	.000

Post hoc test statistics provided significant mean score difference between the groups, whereas the difference of critical thinking skills mean score between grade 3 and grade 4 was not significant. Similarly, the difference of critical thinking skills mean score between grade 4 and grade 5 was not significant. However, there was a significant mean score difference between the critical thinking skills of grade 3 and grade 5.

Table 4.12

ANOVA analyses on Problem Solving Skill

Groups	Sum of Squares	Df	Mean Square	F	p
Between Groups	27.58	2	13.79	4.97	.007
Within Groups	1887.52	681	2.77		
Total	1915.10	683			

There is no difference between problem solving skill and national curriculum. Summary of the results in the above table, containing F=4.97 and p=.007, indicates that there exists a statistically insignificant difference between problem solving skill and national curriculum. Hence, the null hypothesis was accepted. Value of F ratio (4.97) and respected p value (.007) indicates that there is insignificant difference among the students of different classes. Eta Squared has been calculated for seeing the effect size of ANOVA. Eta Squared value is 0.014 which is showing a smaller effect size.

Table 4.13

Tukey's *Post Hoc Table on Problem Solving Skill*

Comparison among classes	Mean Difference	P
Grade 3 V.S Grade 4	.22368	.152

Groups	Sum of Squares	df	Mean Square	F	P
Between Groups	13.75	2	6.87	1.98	.13
Within Groups	2357.91	680	3.46		
Total	2371.67	682			
Grade 3 V.S grade 5		.26754		.087	
Grade 4 V.S Grade 5		.49123		.002	

Post hoc test statistics provided significant mean score difference between the groups, whereas the difference of problem solving skills mean score between grade 3 and grade 4 was not significant. Similarly, the difference of problem solving skills mean score between grade 3 and grade 5 was not significant. However, there was a significant mean score difference between the problem solving skills of grade 4 and grade 5.

Table 4.14

ANOVA analyses on Social skill

There exist no difference between social skill and national curriculum

	Communication skill		Creativity skill		Critical thinking		Problem solving		Social skill	
	R	P	R	p	R	P	r	P	r	p
Communication skill		1	.34	.000	.47	.000	.47	.000	.45	.000
Creativity skill	.47	.000		1	.47	.000	.56	.000	.39	.000
Critical thinking skill	.47	.000	.34	.000		1	.34	.000	.31	.000
Problem solving skill	.47	.000	.35	.000	.56	.000		1	.31	.000
Social skill	.45	.000	.33	.000	.39	.000	.34	.000		1

Summary of the results in the above table, containing F=1.984 and p=.138, indicates that there exists a statistically insignificant relationship between social skill and national curriculum. Hence, the null hypothesis was accepted. Value of F ratio (1.98) and respected P value (.13) indicates that there is insignificant difference among the students of different classes.

4.3. Correlation Analysis of class 3, 4 and 5

This section presents the class wise (3, 4 & 5) correlation analyses of students 21st century skills developed through national curriculum. Details have been mentioned below:

Table 4.15

Relationship among developed skills of class 3 students

	Communication skill		Creativity skill		Critical thinking		Problem solving		Social skill	
	r	p	r	p	r	p	r	p	r	p
Communication skill		1	.32	.000	.47	.000	.48	.000	.65	.000
Creativity skill	.32	.000		1	.32	.000	.41	.000	.27	.000
Critical thinking skill	.47	.000	.31	.000		1	.50	.000	.45	.000
Problem solving skill	.48	.000	.41	.000	.50	.000		1	.31	.000
Social skill	.65	.000	.27	.000	.45	.000	.31	.000		1

Table 4.15 shows the relationships between five skills of Class 3 students: Communication, Creativity, Critical Thinking, Problem Solving, and Social Skills. The table reveals strong positive correlations between each skill, indicating interconnectedness among them. Notably, Communication skill is strongly related to Creativity (r = 0.47) and Critical Thinking (r = 0.47), while Creativity is strongly linked to Critical Thinking (r = 0.56) and Problem Solving (r = 0.47). Critical Thinking is also positively correlated with Problem Solving (r = 0.34) and Social Skills (r = 0.39).

These findings suggest that developing one skill can benefit others, and that Class 3 students' skills are interconnected.

Table 4.16

Relationship among developed skills of class 4 students

	Communication skill		Creativity skill		Critical thinking		Problem solving		Social skill	
	r	p	r	p	r	p	r	p	r	p
Communication skill		1	.32	.000	.47	.000	.48	.000	.65	.000
Creativity skill	.32	.000		1	.32	.000	.41	.000	.27	.000
Critical thinking skill	.47	.000	.31	.000		1	.50	.000	.45	.000
Problem solving skill	.48	.000	.41	.000	.50	.000		1	.31	.000
Social skill	.65	.000	.27	.000	.45	.000	.31	.000		1

The correlation table shows the relationships between five skills of Class 4 students: Communication, Creativity, Critical Thinking, Problem Solving, and Social Skills. The table reveals strong positive correlations between each skill, indicating a strong interconnectedness among them. Notably, Communication skill is strongly related to Social Skills (r = 0.65) and Critical Thinking (r = 0.47), while Creativity is strongly linked to Critical Thinking (r = 0.32) and Problem Solving (r = 0.41). Critical Thinking is also positively correlated with Problem Solving (r = 0.50) and Social Skills (r = 0.45). These findings suggest that Class 4 students' skills are highly interconnected, and developing one skill can benefit others. The strong relationship between Communication and Social Skills highlights the importance of effective communication in social interactions.

Table 4.17

Relationship among developed skills of class 5students

	Communication skill		Creativity skill		Critical thinking		Problem solving		Social skill	
	R	P	R	p	R	P	r	P	r	p
Communication skill		1	.33	.000	.69	.000	.65	.000	.70	.000
Creativity skill	.33	.000		1	.45	.000	.36	.000	.30	.000
Critical thinking skill	.69	.000	.45	.000		1	.63	.000	.43	.000
Problem solving skill	.65	.000	.36	.000	.63	.000		1	.50	.000
Social skill	.70	.000	.30	.000	.43	.000	.50	.000		1

The correlation table shows the relationships between five skills of Grade 5 students: Communication, Creativity, Critical Thinking, Problem Solving, and Social Skills. The table reveals exceptionally strong positive correlations between each skill, indicating a highly interconnectedness among them. Notably, Communication skill is extremely strongly related to Social Skills (r = 0.70) and Critical Thinking (r = 0.69), while Critical Thinking is strongly linked to Problem Solving (r = 0.63) and Social Skills (r = 0.43). These findings suggest that Grade 5 students' skills are highly interdependent, and developing one skill can significantly benefit others. The exceptionally strong relationship between Communication and Social Skills highlights the crucial importance of effective communication in social interactions.

4.4 Summary of the Chapter

The mean score analysis of 21st century skills reveals that Class 4 consistently exhibits higher mean scores across all skills, including communication, creativity, critical thinking, problem-solving, and social skills. However, the standard deviation values indicate that Class 3 has more variability in scores, suggesting that some students may perform exceptionally well or poorly compared to the rest of the class. Class 5 shows a tighter clustering of data points around the mean, indicating more consistent performance.

Overall, Class 4 exhibits higher average performance, but Class 3 and Class 5 also show potential in various skills. The variability in scores within each class suggests that some students may need additional support or enrichment opportunities to reach their full potential. By understanding these differences, educators can tailor their teaching strategies to meet the unique needs of each class and promote overall growth in 21st century skills. The mean score analysis highlights the strengths and weaknesses of each class, providing insights for future instruction and skill development. Class 4 exhibits higher average performance, but Class 3 and Class 5 also show potential in various skills. The variability in scores within each class suggests that some students may need additional support or enrichment opportunities to reach their full potential. By understanding these differences, educators can tailor their teaching strategies to meet the unique needs of each class and promote overall growth in 21st century skills. the mean score analysis provides a comprehensive understanding of the distribution of 21st century skills across three classes. Class 4 consistently exhibits higher mean scores, while Class 3 shows more variability in scores.

Class 5 students display a tighter clustering of data points around the mean, indicating more consistent performance. By recognizing these differences, educators can develop targeted strategies to enhance student development and promote 21st century skills. The ANOVA analysis of 21st century skills reveals significant differences in communication, critical thinking, and problem-solving skills among students in grades 3, 4, and 5. However, no significant differences were found in creativity and social skills. In communication skills, there was a significant mean score difference between grade 3 and grade 5, but not between grade 3 and grade 4 or grade 4 and grade 5. In critical thinking skills, there was a significant mean score difference between grade 3 and grade 5, and also between grade 4 and grade 5. In problem solving skills, there was a significant mean score difference between grade 4 and grade 5, but not between grade 3 and grade 4 or grade 3 and grade 5.The analysis suggests that the national curriculum has a significant impact on the development of communication, critical thinking, and problem-solving skills, but not on creativity and social skills. The post-hoc test results provide further insight into the significant mean score differences between specific grade levels.

Overall, the study highlights the importance of considering the impact of curriculum on the development of 21st-century skills in students. The results of the ANOVA analysis and post-hoc tests suggest that the national curriculum has a varying impact on the development of different 21st century skills in students. While significant differences were found in communication, critical thinking, and problem-solving skills, no significant differences were found in creativity and social skills. The correlation analysis reveals the interconnectedness of 21st century skills, including communication, creativity, critical thinking, problem-solving, and social skills, across three grades (3, 4, and 5). The analysis highlights the strengths and weaknesses of each grade level, providing insights for future instruction and skill development. In Grade 3, communication skills are strongly correlated with critical thinking and problem-solving skills, indicating that individuals who demonstrate strong communication abilities are also likely to excel in these areas. Creativity skills show a weaker correlation with communication skills, suggesting that while creativity is valued, it may not necessarily align closely with communication skills. In Grade 4, communication skills are strongly correlated with social skills, indicating that individuals who excel in communication tend to also possess strong social skills. Critical thinking skills are strongly correlated with problem-solving skills, highlighting the close connection between these two skills.

Creativity skills show a moderate positive correlation with critical thinking skills, suggesting that individuals who exhibit higher levels of creativity tend to also possess better critical thinking abilities. In Grade 5, communication skills are strongly correlated with social skills, problem solving skills, and critical thinking skills, indicating that individuals who excel in communication tend to also possess strong abilities in these areas. Creativity skills show a moderate positive correlation with critical thinking skills, suggesting that individuals who engage in critical thinking processes are more likely to demonstrate creative thinking and innovation. Overall, the correlation analysis highlights the importance of developing a range of 21st century skills, including communication, creativity, critical thinking, problem solving, and social skills, to promote overall student growth and preparedness for future challenges. By understanding the relationships between these skills, educators can design instruction and assessments that integrate multiple skills and promote a more holistic approach to learning.

CHAPTER 5
SUMMARY, FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

This chapter contains summary, findings, conclusions, discussion and recommendations for implementations and future researches.

5.1. Summary

21st century has introduced new paradigms of education. There is rapid spread of information due to technology. Trends of education have been changed in 21st century. It is the need of every individual to be equipped with certain skills in this digital era. Presence of these skills will enable the individuals to cope up with the challenges of modern era. Therefore, government of Pakistan has introduced new curriculum initially at primary level. This curriculum has focused on certain competencies and skills which will enable the students to meet the challenges of 21st century. Major purpose of this curriculum is to ensure one system of education for all and meet the challenges of 21st century. The skills which are mainly focused in the curriculum are critical thinking, problem solving, social skills, creativity and communication skills.

In recent times, many countries have initiated curriculum reforms. Main purpose is to make a shift from narrow educational perspectives to application-based education. Pakistani government has also focused on certain skills in curriculum which are considered necessary to meet the challenges of modern times. Moreover, in this digital era, curriculum should be consisting of critical thinking, innovation, creativity, digital skills and real-life experiences. Students should be taught in a way that they learn certain competencies in order to meet the demands of 21st century. Therefore, it is highly needed to assess the extent to which intended 21st century skills have been developed among the students. Major purpose of this research was to assess the extent these skills have been developed in the primary level students. This study was cross sectional type of research. All students from grade 3 to grade 5 were the population of study. Data were collected from primary schools under the administration of Federal Directorate of Education. Students from Islamabad sector were the population of study.

There are total 189 primary schools administered by Federal Directorate of education. Among them, 90 schools are working in Islamabad Area. Total number of students (grade 3 to grade 5) in 90 schools was approximately7000. Therefore, population size was be7000. Self-constructed criterion referenced tests were developed for students. Separate criterion referenced tests were constructed for measuring each skill. For creativity skill, English subject was considered for constructing the test. For critical thinking and problem solving skill, science, mathematics and English language subjects were considered. English subject was selected for assessing communication skills. Social studies and general knowledge subjects were used for assessing social skills. One way table of specifications was developed for developing student's tests for measuring each skill.

Researcher first got official permission from relevant authorities. Schools principals were informed about purpose of research and requested for data collection. Purpose of research was shared with students, concerned teachers and school principals. After seeking their permission, self-constructed tests were administered once to the students from grade 3 to grade 5. Data were analyzed by keeping in view the objectives of the research. Data were analyzed quantitatively. Mean score, ANOVA analysis and correlation test was applied for detailed analyzed of data.

5.2 Findings

Following were the findings were obtained after detailed analysis and interpretation of data. Findings are described according to research questions.

1. Mean score was calculated for examining the students' communication skills of three classes (3, 4 & 5). The mean scores for communication skills across different grade levels indicate subtle variations. Grade 4 students display the highest mean score (M = 13.70, SD = 1.52), followed closely by Grade 5 (M = 13.44, SD = 1.58), with Grade 3 showing a lower mean score (M = 13.17, SD = 1.76). Therefore, based on these mean scores, Grade 4 students appear to have better communication skills compared to students in Grade 3 and Grade 5 (Table 4.1).

2. The mean scores for creativity skills across different grade levels suggest minor variations. Grade 4 students exhibit the highest mean score (M = 7.72, SD = 1.44), followed closely by Grade 5 (M = 7.48, SD = 1.51), with Grade 3 displaying the lowest mean score (M = 7.27, SD = 1.52). Therefore, according to these mean scores, Grade 4 students appear to have better creativity skills compared to students in Grade 3 and Grade 5 (Table 4.2).

3. The mean scores for critical thinking skills across different grade levels indicate minimal variations. Grade 5 students have the highest mean score (M = 11.27, SD = 1.45), followed by Grade 3 (M = 11.18, SD = 1.56), with Grade 4 showing the lowest mean score (M = 11.06, SD = 1.64). Therefore, according to these mean scores, Grade 5 students appear to have better critical thinking skills compared to students in Grade 3 and Grade 4 (Table 4.3).

4. The mean scores for problem solving skills across different grade levels indicate minimal variations. Grade 5 students have the highest mean score (M = 11.26, SD = 1.50), followed closely by Grade 3 (M = 11.25, SD = 1.73), with Grade 4 displaying the lowest mean score (M = 11.02, SD = 1.74). According to these mean scores, Grade 5 students appear to have better problem-solving skills compared to students in Grade 3 and Grade 4 (Table 4.4).

5. The mean scores for social skills across different grade levels indicate variations. Grade 5 students have the highest mean score (M = 15.5614, SD = 1.90541), followed closely by Grade 4 (M = 15.27, SD = 1.81), with Grade 3 displaying a similar mean score (M = 15.25, SD = 1.85). According to these mean scores, Grade 5 students appear to have better problem solving skills compared to students in Grade 4 and Grade 3 (Table 4.5).

6. One way ANOVA was calculated for observing the significant difference for communication skill among students of 3 classes. Result shows that (F ratio=5.99, P value=.003) there is significant difference among the students of different classes. This indicates that the variability between the groups is statistically meaningful compared to the variability within the groups. These findings suggest that there are

indeed significant differences in the means of the groups under investigation (Table 4.6).

7. The post hoc analysis of groups on communication skill revealed important insights into the differences among grade levels. Comparing Grade 3 to Grade 4 yielded a non-significant mean difference of .28 (p = 0.58), suggesting no significant variance between these two groups. Similarly, the comparison between Grade 4 and Grade 5 indicated a mean difference of .23 (p = .12), again not statistically significant. However, the most significant contrast emerged when comparing Grade 3 to Grade 5, showing a substantial mean difference of .52 (p = .001). This suggests a notable distinction between Grade 3 and Grade 5 performance levels (Table 4.7).
8. The analysis of variance (ANOVA) results present significant differences among of creativity skill of the groups. Notably, the between-groups variation accounted for 23.35 units, with a mean square value of 11.67, while within-groups variation amounted to 1517.57 units. This disparity suggests that the variability observed between the groups is statistically significant compared to the variability within the groups. These findings imply that there are notable distinctions among the groups under examination (Table 4.8).
9. The post hoc analysis of creativity skill of students of 3 classes uncovered insightful differences among grade levels. Comparing Grade 3 to Grade 4 revealed a non-significant mean difference of .20 (p = .149), indicating no statistically significant variance between these groups. However, a significant contrast emerged between Grade 3 and Grade 5, with a substantial mean difference of .45 (p = .001), suggesting a notable disparity in performance between these grade levels. Conversely, the comparison between Grade 4 and Grade 5 yielded a mean difference of .25000, approaching significance with a p-value of .07. These findings imply distinct performance levels among the different grades, particularly emphasizing the significant gap between Grade 3 and Grade 5 (Table 4.9).
10. The analysis of variance (ANOVA) results demonstrates significant differences among the critical thinking skill of students of 3 classes (F (2, 68) = 6.56, p = .001). Notably, the between-groups variation amounted to 31.301 units, with a mean square

value of 15.65, while within-groups variation totaled 1620.28 units. This discrepancy suggests that the variability observed between the groups is statistically significant compared to the variability within the groups. These findings indicate notable distinctions among the groups under examination (Table 4.10).

11. The post hoc analysis on critical thinking skill of students' of 3 classes reveals interesting distinctions among grade levels. When comparing Grade 3 to Grade 4, the mean difference was found to be .14564, with a non-significant p-value of .315, suggesting no statistically significant difference between these groups. However, a significant contrast emerged between Grade 3 and Grade 5, with a notable mean difference of .36 ($p = .012$), indicating a substantial disparity in performance between these grades. Similarly, a significant difference was observed between Grade 4 and Grade 5, where the mean difference was .50, with a p-value of .000. These findings underscore significant variations in skill proficiency across different grade levels, particularly emphasizing the substantial gap between Grade 3 and Grade 5 (Table 4.11).

12. The analysis of variance (ANOVA) indicates significant differences of problem skill of students of 3 classes ($F (2, 681) = 4.976$, $p = .007$). Between-groups variation accounted for 27.58 units, with a mean square of 13.79, while within-groups variation totaled 1887.52 units. These results suggest that the variability observed between the groups is statistically significant compared to the variability within the groups (Table 4.12).

13. The post hoc analysis of students' problem solving skill highlights differences among 3 grades. Comparing Grade 3 to Grade 4 revealed a mean difference of .22, with a non-significant p-value of .15, suggesting no statistically significant variance between these groups. Similarly, no significant difference was found between Grade 3 and Grade 5, with a mean difference of -.26 ($p = .08$). However, a significant contrast emerged between Grade 4 and Grade 5, with a mean difference of .49 ($p = .002$), indicating a notable disparity in problem solving skill between these two grades. These findings underscore the significance of differences in problem solving skill between Grade 4 and Grade 5 (Table 4.13).

14. The analysis of variance (ANOVA) suggests no significant differences on the students' social skills of 3 classes. Between-groups variation accounted for 13.75 units, with a mean square of 6.87, while within-groups variation totaled 2357.91 units. These results imply that the observed variability between the groups is not statistically significant compared to the variability within the groups. Consequently, there appears to be no significant disparity in social skill levels among the groups under examination (Table 4.14).

15. The post hoc analysis of students' social skills reveals insights into social skill differences among 3 grade levels. Comparing Grade 3 to Grade 4 yielded a negligible mean difference of .029, with a non-significant p-value of .86, suggesting no statistically significant variance between these groups. Similarly, no significant difference was found between Grade 4 and Grade 5, with a mean difference of .28 ($p = .10$). However, a notable contrast emerged between Grade 3 and Grade 5, with a mean difference of .31 ($p = .07$), approaching significance. These findings imply that while there are minor variations in social skill levels between some grade pairs, they are not statistically significant overall (Table 4.15).

16. The correlation table reveals a positive relationship among the developed skills of Class 3 students. Communication skill is significantly correlated with Creativity skill ($r = 0.47$, $p = 0.00$), Critical thinking skill ($r = 0.47$, $p = 0.00$), Problem solving skill ($r = 0.47$, $p = 0.00$), and Social skill ($r = 0.45$, $p = 0.00$). Similarly, Creativity skill is positively correlated with Critical thinking skill ($r = 0.47$, $p = 0.000$), Problem solving skill ($r = 0.56$, $p = 0.00$), communication skill ($r= 0.46$) and Social skill ($r = 0.399$, $p = 0.00$). Critical thinking skill is also positively correlated with Problem solving skill ($r = 0.34$, $p = 0.00$) and Social skill ($r = 0.39$, $p = 0.000$). These findings suggest that development in one skill area is associated with development in other skill areas, highlighting the interconnectedness of these skills. Overall, the results indicate that Class 3 students who demonstrate strong Communication skills also tend to exhibit strong Creativity, Critical thinking, Problem solving, and Social skills (Table 4.16).

17. The correlation table reveals a positive relationship among the developed skills of Class 4 students, with some variations in strength. Communication skill is strongly

correlated with Social skill (r = 0.65, p = 0.00), and moderately correlated with Creativity skill (r = 0.32, p = 0.00), Critical thinking skill (r = 0.47, p = 0.00), and Problem solving skill (r = 0.48, p = 0.00). Creativity skill is moderately correlated with Critical thinking skill (r = 0.32, p = 0.00) and Problem solving skill (r = 0.411, p = 0.00), but weakly correlated with Social skill (r = 0.27, p = 0.00). Critical thinking skill is strongly correlated with Problem solving skill (r = 0.505, p = 0.000) and moderately correlated with Social skill (r = 0.45, p = 0.00). These findings suggest that Class 4 students who demonstrate strong Communication skills also tend to exhibit strong Social skills, and those with strong Critical thinking skills tend to exhibit strong Problem solving skills. However, the relationships between Creativity skill and other skills are relatively weaker(Table 4.17).

18. The correlation table reveals a strong positive relationship among the developed skills of Class 5 students. Communication skill is highly correlated with Critical thinking skill (r = 0.69, p = 0.00), Problem solving skill (r = 0.65, p = 0.00), and Social skill (r = 0.70, p = 0.000), indicating that students with strong Communication skills tend to also exhibit strong Critical thinking, Problem solving, and Social skills. Creativity skill is moderately correlated with Critical thinking skill (r = 0.45, p = 0.000) and Problem solving skill (r = 0.36, p = 0.000), but less strongly correlated with Social skill (r = 0.302, p = 0.000). Critical thinking skill is highly correlated with Problem solving skill (r = 0.63, p = 0.00) and moderately correlated with Social skill (r = 0.43, p = 0.00). These findings suggest those Class 5 students, who demonstrate strong Communication and Critical thinking skills tend to also exhibit strong Problem solving and Social skills, highlighting the interconnectedness of these skills. Overall, the results indicate a strong relationship among the developed skills of Class 5 students (Table 4.18).

5.3. Discussion

21st century has introduced new paradigms of education. There is rapid spread of information due to technology. Trends of education have been changed in 21st century. It is the need of every individual to be equipped with certain skills in this digital era.

Presence of these skills will enable the individuals to cope up with the challenges of modern era. Therefore, government of Pakistan has introduced new curriculum initially at primary level. This curriculum claimed that it will develop on certain skills which will enable the students to meet the challenges of 21st century. Major purpose of this curriculum is to ensure one system of education for all and meet the challenges of 21st century. The skills which are mainly focused in the curriculum are critical thinking, problem solving, social skills, creativity, and communication skills. Major purpose of this research was to assess the extent these skills have been developed in the primary level students. Assessing 21st century skills at the primary level curriculum is essential for preparing students for success in an increasingly dynamic and interconnected world. While challenges exist, innovative assessment strategies, the integration of technology, and alignment with curriculum and instruction can help to address these challenges and promote meaningful skill development.

Moving forward, continued research and collaboration among educators, policymakers, and researchers are needed to refine assessment practices and ensure that all primary students have the opportunity to develop effective assessment of 21stcentury skills. It requires alignment with curriculum standards and instructional practices. Curriculum frameworks should articulate clear learning objectives for skill development at the primary level, providing guidance for educators on what skills to assess and how to assess them. Moreover, assessment practices should be integrated into everyday teaching and learning activities, ensuring that assessment serves as a natural part of the learning process rather than an isolated event. This alignment fosters coherence between curriculum, instruction, and assessment, supporting meaningful skill development for primary students. Despite these challenges, educators have developed various strategies for assessing 21st century skills in primary education.

One approach is the use of performance-based assessments, such as project-based learning tasks and portfolio assessments, which allow students to demonstrate their skills in authentic contexts. Rubrics and scoring guides are often employed to provide clear criteria for evaluating student performance and providing constructive feedback. Additionally, formative assessment practices, such as peer and self-assessment, empower students to reflect on their learning progress and take ownership of their development.

The analysis of 21st century skills revealed that Class 4 consistently performs higher across all skills, including communication, creativity, critical thinking, problem-solving, and social skills. However, Class 3 shows more variability in scores, indicating some students may perform exceptionally well or poorly. Class 5 shows consistent performance with a tighter clustering of data points around the mean. The analysis highlights strengths and weaknesses in each class, providing insights for future instruction and skill development. Class 4 students exhibit higher average performance, but Class 3 and Class 5 also show potential in various skills. The variability in scores within each class suggests some students may need additional support or enrichment opportunities. The analysis revealed significant differences in communication, critical thinking, and problem-solving skills among students in grades 3, 4, and 5. However, no significant differences were found in creativity and social skills. The analysis suggests that curriculum has a significant impact on the development of communication, critical thinking, and problem-solving skills. Overall, the study highlights the importance of considering the impact of curriculum on the development of 21st century skills in students. The findings suggest that educators should tailor instruction to address the unique needs and abilities of each class and student, providing additional support or enrichment opportunities as needed.

By doing so, educators can help students reach their full potential and develop essential skills for success in the 21st century. Based on the first research objective, to examine students' communication skills developed through curriculum, the results analysis showed that Class 4 consistently exhibits higher mean scores in communication skills, indicating that the curriculum has been effective in developing this skill. However, results also suggest that Class 3 has more variability in scores, indicating that some students may need additional support or enrichment opportunities. The findings of this study is consistent with previous researches as Hynes (2016) found that students who received explicit instruction in communication skills showed significant improvement in their ability to communicate effectively. Another study by Dignath, Buettner, and Langfeldt (2016) found that students who were taught communication skills as part of a broader social-emotional learning program showed improved communication skills and social skills.

These results are also consistent with previous research that suggests that communication skills develop progressively across different stages of education (Pellegrino & Hilton, 2013). The positive correlation between communication skills and other skills such as creativity, critical thinking, problem-solving, and social skills highlights the interconnectedness of these skills (Many, 2002).In second research objective, to assess students' critical thinking skills developed through curriculum, result analysis revealed significant differences in critical thinking skills among students in grades 3, 4, and 5, indicating that the curriculum has a significant impact on the development of this skill. Moreover, results show that there is a significant mean score difference between grade 3 and grade 5, and also between grade 4 and grade 5, highlighting the importance of curriculum in developing critical thinking skills. A study by Abrami et al. (2015) found that students who received explicit instruction in critical thinking skills showed significant improvement in their critical thinking skills and problem-solving skills. Another study by Halpern (2014) found that students who were taught critical thinking skills as part of a broader critical thinking program showed improved critical thinking skills and problem-solving skills. This is consistent with research that suggests that critical thinking skills develop progressively across different stages of education (Kuhn, 2010).

The strong correlation between critical thinking skills and problem-solving skills highlights the importance of critical thinking in solving problems (Halpern, 2014). Third research objective was to investigate students' social skills developed through curriculum. The results analysis shows that Class 5 has the highest mean score in social skills, indicating that the curriculum has been effective in developing this skill. However, results also suggest that Class 3 has more variability in scores, indicating that some students may need additional support or enrichment opportunities. A study by Durlak et al. (2011) found that students who received explicit instruction in social skills as part of a broader social-emotional learning program showed significant improvement in their social skills and academic performance. Another study by Zins et al. (2004) found that students who were taught social skills as part of a broader social-emotional learning program showed improved social skills and academic performance.

This is consistent with research that suggests that social skills develop progressively across different stages of education (Elias et al., 2010). The positive correlation between social skills and other skills such as communication, creativity, critical thinking, and problem-solving skills highlights the interconnectedness of these skills (Goleman, 2008). Fourth research objective was to measure the creativity level of students developed through curriculum. Results analysis shows that creativity skills are strongly correlated with critical thinking skills in Grade 4 and Grade 5, indicating that the curriculum has been effective in developing creativity skills. Moreover, results analysis shows that Class 4 consistently exhibits higher mean scores in creativity skills, indicating that the curriculum has been more effective in developing this skill in Class 4. A study by Plucker and Renzulli (2005) found that students who were taught creativity skills as part of a gifted education program showed significant improvement in their creative thinking skills. Another study by Kim (2017) found that students who received explicit instruction in creativity skills showed improved creative thinking skills and problem-solving skills. This is in line with research that suggests that creativity skills develop throughout childhood and adolescence (Plucker & Renzulli, 2009). The moderate correlation between creativity skills and critical thinking skills suggests that these skills are related but distinct (Kim, 2011).

A fifth research objective was to investigate the extent to which problem solving skill has been developed in the students. Results analysis revealed significant differences in problem-solving skills among students in grades 3, 4, and 5, indicating that the curriculum has a significant impact on the development of this skill. Moreover results showed that there is a significant mean score difference between grade 4 and grade 5, highlighting the importance of curriculum in developing problem-solving skills. A study by Mayer and Wittrock (2006) found that students who received explicit instruction in problem-solving skills showed significant improvement in their problem-solving skills and critical thinking skills. Another study by Jonassen (2011) found that students who were taught problem-solving skills as part of a broader problem-based learning program showed improved problem-solving skills and critical thinking skills. Overall, the results suggest that the curriculum has been effective in developing 21st century skills, including communication, critical thinking, social skills, problem-solving, and creativity skills.

This is in line with research that suggests that problem-solving skills develop throughout childhood and adolescence (Mayer, 2010). The moderate correlation between problem-solving skills and social skills suggests that these skills are related but distinct (Goleman, 2011). As concerned to sixth objective, data revealed that students in Grade 5 have better communication skills compared to those in Grade 3. This finding is supported by previous research that suggests that communication skills develop progressively across different stages of education (Pellegrino & Hilton, 2013). Grade 5 has better creativity skills compared to those in Grade 3. This finding is supported by previous research that suggests that creativity skills develop throughout childhood and adolescence (Plucker & Renzulli, 2009). Grade 5 have better critical thinking skills compared to those in Grade 3. This finding is supported by previous research that suggests that critical thinking skills develop progressively across different stages of education (Kuhn, 2010). Again Grade 5 has better problem-solving skills compared to those in Grade 4. This finding is supported by previous research that suggests that problem-solving skills develop throughout childhood and adolescence (Mayer, 2010). Analysis showed that there were no significant differences in social skills between any of the grade levels. This suggests that social skills may not develop significantly across different stages of education.

This finding is supported by previous research that suggests that social skills may be more influenced by individual differences and experiences rather than grade level (Goleman, 2008). Mansoor and Din (2023) critically analyzed the Grade 5 General Science curriculum under the Single National Curriculum and found that although critical thinking and problem-solving were emphasized, gaps in teacher preparedness and instructional materials limited practical application. This suggests that curriculum alone cannot guarantee skill development without adequate systemic support. Soomro et al. (2024) emphasize that environments encourage creativity, collaboration, and critical thinking, formal assessment of such skills is still underdeveloped. The study underscores the need for increased educator awareness and appropriate evaluative strategies to harness the full potential of these innovative spaces.

In nutshell, this study assessed the development of 21st century skills in primary level students in Pakistan and found that the curriculum has been effective in developing skills such as communication, critical thinking, social skills, problem-solving, and creativity. The results showed that Class 4 consistently performed higher across all skills, while Class 3 and Class 5 also showed potential in various skills. The analysis highlighted the importance of considering the impact of curriculum on skill development and the need for tailored instruction to address the unique needs and abilities of each class and student. The findings are consistent with previous research and suggest that educators should continue to emphasize the development of 21st century skills in primary education, providing additional support or enrichment opportunities as needed, to help students reach their full potential and succeed in an increasingly dynamic and interconnected world.

5.4 Conclusions

Following were the conclusions of study on the basis of research findings:

1. It was concluded that Grade 4 students possess better communication skills compared to Grade 3 and Grade 5 students. Hence, students in Grade 4 have reached a developmental stage where their ability to express ideas clearly, listen effectively, and engage in meaningful conversations is more refined than in earlier or later grades. It may reflect targeted teaching methods or age-related cognitive development that peaks for communication in this grade level. (finding1).
2. It was concluded that Grade 4 students possess better creativity skills compared to Grade 3 and Grade 5 students. Students in Grade 4 tend to demonstrate more originality, imagination, and ability to think outside the box compared to their counterparts. This could be attributed to increased exposure to open-ended tasks and creative activities during this academic stage, fostering a richer creative expression. (findings 2).
3. It was concluded that Grade 5 students possess better critical thinking skills compared to Grade 3 and Grade 4 students. Grade 5 students appear to be better at analyzing information, making logical connections, and evaluating ideas critically.

This may be due to more complex academic content introduced at this level, which encourages students to apply higher-order thinking skills.(findings 3).

4. It was concluded that Grade 5 students possess better problem-solving skills compared to Grade 3 and Grade 4 students' proficiency level on problem solving skills. Grade 5, students are more capable of identifying problems, exploring solutions, and applying appropriate strategies to resolve them. This improvement may reflect both cognitive maturation and the cumulative impact of prior problem-solving experiences in earlier grades(findings 4).
5. It was concluded that Grade 5 students possess better social skills compared to Grade 3 and Grade 4 students. As students progress to higher grades, they typically gain more experience in group activities, peer collaboration, and conflict resolution. Hence, grade 5 students have had more opportunities to refine their ability to interact respectfully, cooperate with others, and build social relationships.(findings 5).
6. It was concluded that significant difference exists in communication skills among students of Grade 3, Grade 4, and Grade. Communication skills are not consistent across these grade levels and may develop unevenly. The variation could be influenced by both age-related development and the teaching strategies used at each grade, highlighting the importance of grade-specific approaches to enhance communication skills. (findings 6).
7. It was concluded that significant difference exists between Grades 3 and 4, and between Grades 4 and 5. However, it did find a significant difference between Grades 3 and 5, with Grade 5 students showing much better communication skills than Grade 3 students. This means that students' communication skills improve significantly between Grade 3 and Grade 5, with a big jump in skills between these two grade levels (finding 7).
8. It was concluded that creativity skills development varies across different grades. Significant differences exists among grade 3, 4 and grade 5 students. It is highlighting the need for targeted interventions to support creativity skills growth in specific groups (finding 8).
9. It was concluded that no significant difference exists between creativity skill of Grade 3 and Grade 4, but a significant gap between Grade 3 and Grade 5, indicating

that students in Grade 5 have significantly higher creativity skills than those in Grade 3 (finding 9).

10. It was concluded that significant differences exist in critical thinking skills among students in three different classes (Grade 3, Grade 4, and Grade 5). The results showed that the variability between the groups was statistically significant, indicating that the groups have distinct levels of critical thinking skills (finding 10).
11. It was concluded that significant differences exist in critical thinking skills among Grade 3, Grade 4, and Grade 5 students while no significant difference exists between Grade 3 and Grade 4. Hence, substantial gap exists between Grade 3 and Grade 5, and also between Grade 4 and Grade 5 students (finding 11).
12. It was concluded that significant differences exist in problem-solving skills among students in Grade 3, Grade 4, and Grade 5. The results showed that the variability between the groups was statistically significant, indicating that the groups have distinct levels of problem-solving skills. Specifically, the analysis revealed a significant difference in problem-solving skills between the groups, with a notable discrepancy between the groups (finding 12).
13. It was concluded that problem solving skills may undergo significant development between Grade 4 and Grade 5. The lack of significant differences between Grade 3 and Grade 4, and Grade 3 and Grade 5, implies that problem-solving skills may not undergo significant changes during these grade levels (finding 13).
14. It was concluded that there were no significant differences in social skills among students in Grade 3, Grade 4, and Grade 5, suggesting that social skills development is consistent across these grade levels (finding 14).
15. It was concluded that minor variations exist but no statistically significant differences in social skills among students in Grade 3, Grade 4, and Grade 5 (finding 15).
16. It was concluded that there is a positive correlation among the developed skills of Class 3 students, indicating that development in one skill area is associated with development in other skill areas. Specifically, Communication skill was found to be significantly correlated with Creativity skill, Critical thinking skill, Problem solving skill, and Social skill. Additionally, Creativity skill was positively correlated with Critical thinking skill, Problem solving skill, and Social skill. Critical thinking skill

was also positively correlated with Problem solving skill and Social skill. These findings suggest that the developed skills of Class 3 students are interconnected, and strength in one skill area is likely to be accompanied by strength in other skill areas (finding 16).

17. It was concluded that there is a positive relationship among the developed skills of Class 4 students, with some variations in strength. Specifically, Communication skill was found to be strongly correlated with Social skill, and moderately correlated with Creativity skill, Critical thinking skill, and Problem solving skill. This suggests that Class 4 students who demonstrate strong Communication skills also tend to exhibit strong Social skills. Additionally, Critical thinking skill was found to be strongly correlated with Problem solving skill, and moderately correlated with Social skill, indicating that students with strong Critical thinking skills tend to exhibit strong Problem solving skills. However, the relationships between Creativity skill and other skills were found to be relatively weaker, with moderate correlations with Critical thinking skill and Problem solving skill, and a weak correlation with Social skill (finding 17).
18. It was concluded that there is a strong positive relationship among the developed skills of Class 5 students, highlighting the inter connectedness of these skills. Specifically, Communication skill was found to be highly correlated with Critical thinking skill, Problem solving skill, and Social skill, indicating that students with strong Communication skills tend to also exhibit strong Critical thinking, Problem solving, and Social skills. Additionally, Critical thinking skill was highly correlated with Problem solving skill and moderately correlated with social skill, suggesting that students with strong Critical thinking skills tend to also exhibit strong Problem solving and Social skills (finding 18).

The study concluded that 21st century skills communication, creativity, critical thinking, problem-solving, and social skills vary in development across Grades 3, 4, and 5. Grade 4 students showed slightly better performance in communication and creativity, while Grade 5 students demonstrated higher proficiency in critical thinking, problem-solving, and social skills.

Significant differences were found in most skills across grade levels, particularly between Grades 3 and 5, indicating notable growth as students advance. Although social skills showed minimal variation, strong positive correlations among all five skills were observed across all grades, highlighting their interconnected nature. These findings emphasize the need for integrated and targeted approaches in curriculum and instruction to foster holistic development of 21st century skills at the primary level.

5.5. Recommendations

A. Recommendations of the Study for Federal Directorate of Education

On the basis of data analysis, findings and conclusion, following recommendations have been proposed:

1. Since Grade 3 students have slightly lower scores in communication skills compared to Grade 4 and 5, interventions targeting communication skills development in Grade 3 may help in bridging this gap.it is recommended to implement targeted classroom interventions focused on oral expression, active listening, and vocabulary development. These may include structured group discussions, storytelling activities, and role-playing exercises incorporated into daily lessons. Introducing these strategies at the Grade 3 level may help strengthen students' communication abilities.
2. Grade 4 students exhibited the lowest scores in critical thinking skills, it is recommended to implement structured, classroom based interventions that foster problem solving, logical reasoning, and reflective thinking. Effective strategies may include the use of open-ended questioning techniques, the integration of inquiry-based learning projects, and activities that prompt students to articulate and justify their reasoning during class discussions. These approaches can help enhance students' critical thinking abilities.
3. As the findings indicate a significant gap in creativity skills between Grade 3 and Grade 5 students, it is recommended to implement targeted interventions at the Grade 3 level that actively promote creative thinking and innovation. These interventions may include project-based learning, arts-integrated activities,story telling and opportunities for open-ended exploration and idea generation.

4. Since Grade 3 and Grade 4 students scored lower in critical thinking skills compared to Grade 5, it is recommended to implement targeted instructional interventions that develop students' analytical, reasoning, and decision-making abilities. These may include the use of problem-solving tasks, guided group discussions, case-based learning, and reflective questioning strategies.

5. A structured assessment model may be designed that outlines specific indicators, performance levels, and rubrics for each 21st century skill across primary grades. This framework may align with students' cognitive and developmental stages and provide clear benchmarks to guide both instruction and evaluation.

B. Recommendations for Future Studies

1. Future research can investigate the effectiveness of combining qualitative and quantitative assessment methods to measure 21st century skills such as critical thinking, creativity, collaboration, and digital literacy.

2. Researchers may use repeated measures such as annual performance assessments, teacher evaluations, and self-assessment surveys to track changes in students' skill levels.

3. Further research may uncover the reasons behind the significant differences in communication skills among these grade levels.

4. Research studies can explore the interconnectedness of skills in grade 3. Further research may help understand how the development of one skill area is associated with development in other skill areas in Class 3 students.

5. Future researchers can explore the variations in strength of relationships among skills in Class 4. Further research may help understand the reasons behind the variations in strength of relationships among skills in Class 4 students.

6. Longitudinal studies may be conducted to track students' progress in developing 21st century skills over time and examine the factors that contribute to skill growth and variability.

C. Recommendations for Teachers

1. Since the findings revealed variations in skill development across grades, teachers should implement teaching strategies tailored to diverse learning needs to support weaker areas, especially in critical thinking and problem-solving for Grade 4 students.
2. Given the strong correlations between skills (e.g., communication with problem-solving and social skills), teachers should design interdisciplinary activities that promote multiple skills simultaneously through group projects, debates, collaborative storytelling, etc.
3. For enhanced critical thinking development, especially in lower-performing grades (e.g., Grade 4), teachers should integrate reflective practices like journaling, question prompts, and real-life problem scenarios into lessons.
4. Plan cooperative learning activities (peer tutoring, group challenges) to strengthen social skills, especially for students in earlier grades who showed comparatively lower social skill proficiency.
5. Teachers' training may be designed to enhance their capacity to teach 21st century skills effectively at the primary level.

D. Recommendations for Curriculum Developers

1. Adjust curriculum design to ensure a coherent and progressive development of skills across Grades 3 to 5. For instance, ensure critical thinking and problem-solving tasks increase in complexity across the grades.
2. Embed 21st century skills not as separate content areas but within core subjects like math, science, language, and social studies through real-life, project-based learning.
3. Revisit content and instructional design for skills that showed comparatively lower-performance in certain grades like problem-solving and creativity in Grade 4, critical thinking in Grade 4.
4. Develop specific assessment rubrics and guidelines for evaluating 21st century skills so that teachers can assess them reliably and consistently.

E. Recommendations for Educational Administrators

1. Offer continuous professional development programs on 21st century pedagogy and skill assessment methods.
2. Establish monitoring systems at school and district levels to ensure that the skills outlined in the curriculum are being actively taught and assessed.
3. Ensure supportive environments, especially in early grades, to boost the development of social and communication skills across all students.

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Appendix-1

Table of specification for Communication Skill Test

	Level of skills	No. of items	Total Marks
Reading Skills	Vocabulary	1	2
	Fluency	1	2
	Comprehension	1	2
Writing Skills	Structure	1	2
	Content	1	2
	Organization	1	2
	Total	06	12

Appendix-2

Table of Specification for Creativity skill Test

Level of Skills	**No of items**	**Total Marks**
Fluency	1	1
Flexibility	1	1
Originality	1	1
Total	3	3

Appendix-3

Table of specification for problem solving skill Test

Level of skills	No. of Items	Total Marks
Understanding the problem	2	2
Devising the solution plan	2	2
Applying the solution plan	2	2
Total	6	6

Appendix-4

Table of specification for social skill

Level of skills	No of Items	Total Marks
Resolving Conflicts	1	1
Helping others	1	1
Being fair with others	1	1
Communication skills	1	1
Ethical Behavior	1	1
Sense of Responsibility	1	1
Total	6	6

Appendix-5

Table of specification for Critical thinking skill Test

Level of Skills	No. of Items	Total Marks
Focusing on question	1	1
Analysis	1	1
Inference	1	1
Deciding on Action	1	1
Total	4	4

Appendix-6

Rubric for communication skill Test

Indicators	Scoring Areas	Low	Moderate	Proficient
(a)Content & organization	Accuracy, frequency of words, spellings, sentence length, uses of tenses and sentence structure.	Less than half criteria met	Half criteria met	Full criteria met
(b) Comprehension	Vocabulary, sentence construction, accuracy	Less than half criteria met	Half criteria met	Full criteria met
(c)Structure	Accuracy, frequency of words, spellings, sentence length, uses of tenses and sentence structure.	Less than half criteria met	Half criteria met	Full criteria met
(d) fluency	Sentence length, uses of tenses and sentence structure.	Less than half criteria met	Half criteria met	Full criteria met
(e)Vocabulary	Paying attention, accuracy	Less than half criteria met	Half criteria met	Full criteria met

Appendix 7

Rubric for creativity skill Test

Indicators	**Scoring Areas/Ans key**	**Low (1)**	**Moderate(2)**	**Proficient(3)**
Fluency	Accuracy, frequency of words, spellings, and sentence length	Less than half criteria met	Half criteria met	Full criteria met
Flexibility	Uses of tenses and sentence structure.	Less than half criteria met	Half criteria met	Full criteria met
originality	Vocabulary, spellings and frequency of word	Less than half criteria met	Half criteria met	Full criteria met

Appendix 8

Rubric for Problem Solving Skill Test

Indicators	**Answer key**	**Low**	**moderate**	**Proficient**
Understanding the problem	A1). 93 A2). 7	Partly correct	One correct and one incorrect	All correct
Devising the solution plan	b). Hare, tortoise, challenge, fast, left, the, the, winning, woke, won c). cheer, window, every, world, scene	Less than half is correct	Half correct	All correct
Applying the solution plan	D1). 8, 4,0 D2). 32, 36, 40	Partly correct	One correct and one incorrect	All correct

Appendix 9

Rubric for Social Skill Test

Indicator	Answer Key	Low	Moderate	Proficient
a). Being fair with others	A1). True A2). False A3). True	One answer is correct	2 answers are correct	All answers are correct
b). Resolving conflict	Accuracy, innovation & linkage of ideas to main theme	Less than half criteria met	Partly correct	whole criteria met
c).Helping other	Accuracy, innovation & linkage of ideas to main theme	Less than half criteria met	Partly correct	whole criteria met
D). Ethical behavior	D1). false D2). False D3). True D4). True D5). True D6). False D7). False	Less than 4 are correct	4 answers are correct	All answers are correct
E). Sense of responsibility	E1). Irresponsible E2). Irresponsible E3). Responsible E4. Irresponsible E5). Responsible E6). Responsible E7). Irresponsible	Less than 4 are correct	4 answers are correct	All answers are correct
F). Communication skills	F1).M F2). L F3).M F4).M F5). M	Less than 3 answers are correct	3 answers are correct	All answers are correct

Appendix 10

Rubric of Critical Thinking Test

Indicators	Answer key	Low	Moderate	Proficient
a). Focusing on question	A	Less than half criteria met	Partly correct	Half criteria met
b). Analysis	B	Less than half criteria met	Partly correct	Half criteria met
c). Inferences	D	Less than half criteria met	Partly correct	Half criteria met
d). Deciding on action	B	Less than half criteria met	Partly correct	Half criteria met

Appendix 11

Communication Skill Test

(Reading & writing domain)

Background of test

The process of communication skill test development involved four major components. First, test development began with an attempt to define the construct of communication skill test. Second, a blueprint of communication skill components was developed. Third, test development continued with the writing of specific items or questions. The 2 skills of communication have been considered like reading (vocabulary, fluency & comprehension) and writing (structure, content & organization).

Test Instructions

Today, you are going to take a test called The Test of Communication skill. How well you do on this test will not affect your grade in this class. Think carefully about each possible answer and choose the best one. You will mark all of your answers on the same sheet. Total duration of test is 50 minutes.

1). what you see in the picture? Write five sentences. (Content & organization)(4 marks)

_____

_____

_____

_____

_____

2). Comprehension activity (comprehension) (2 marks)

Dear mummy and Daddy

We are having a good time with grandmother.

We have just come back from a trip to the beach. It seemed to take a long time to get there and the beach was quiet crowded. At first, I thought that the trip was going to be a waste of time but I soon changed my mind. First grandmother gave us money for a drink and we both felt better after that. Then she found an empty piece of beach and put up a sort of beach tent. It was great! We could change in private, and so we were soon splashing around in the water. When we came out, it was good to have the tent to get out of the sun. Can we get a tent like that? I hope you are having a quiet time without us.

Lots of love,

Shenaaz

Scan the text and answer these questions.

1. With whom shenaaz is staying?

----

2. How did shenaaz feel when she first got to the beach?

_____

3. Why did she get changed?

_____

3). Character Portraits activity (structure) (2 marks)

Choose 5 words from the word below and use each of them to write sentences about a girl.

Curious, thoughtful, lazy, selfish, scared, helpful, famous, interested, unknown, brave, boring, imaginative, adventurous

My five words are: 1. ----------2. ----------3. ----------4. ----------5.--------

_____

_____

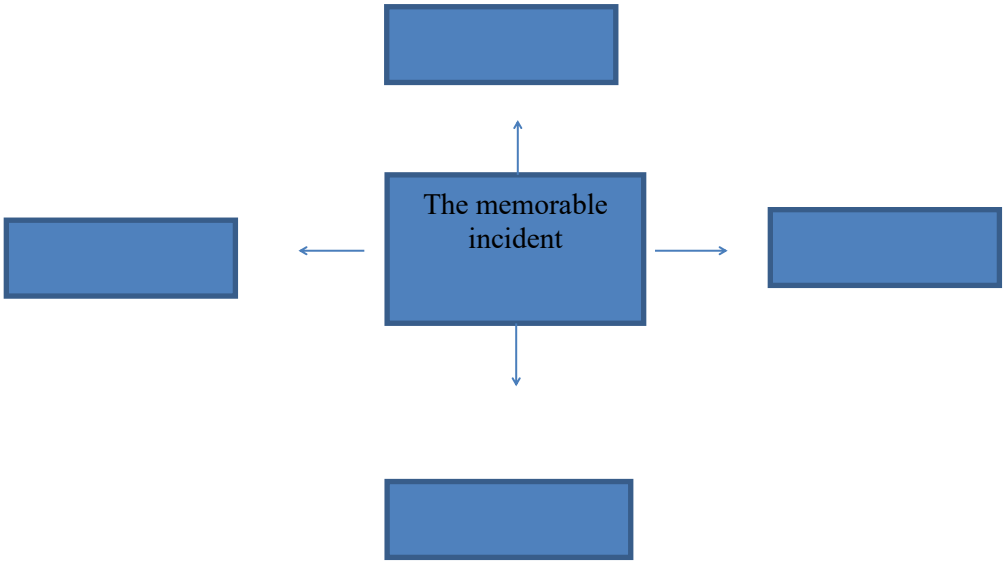
_____

_____

_____

_____

4). write four sentences about any incident of your life when you treated someone with kindness. (Fluency) (2 marks)



5). Read the given story and fill in the blanks with the correct words given below. (Vocabulary) (2 marks)

A, the winning, hare, challenged, fast, woke, won, tortoise, left, the

Once there lived a hare and a tortoise in a forest. The ---------- was very proud of his speed. He used to make fun of the ---------- for being too slow. One day, the tortoise ---------- the hare to the race. The hare accepted the challenge. The race started. The hare ran very ----------. The tortoise was --------- much behind. The hare got tired and stopped to have some rest under ---------- tree. He fell asleep. ---------- tortoise passed him and reached the ---------- post. The hare ---------- up and ran as fast as he could. He saw that the tortoise was already there at ---------- winning post. The tortoise had ---------- the race.

Good Luck!

Appendix 12

Creativity Skill Test

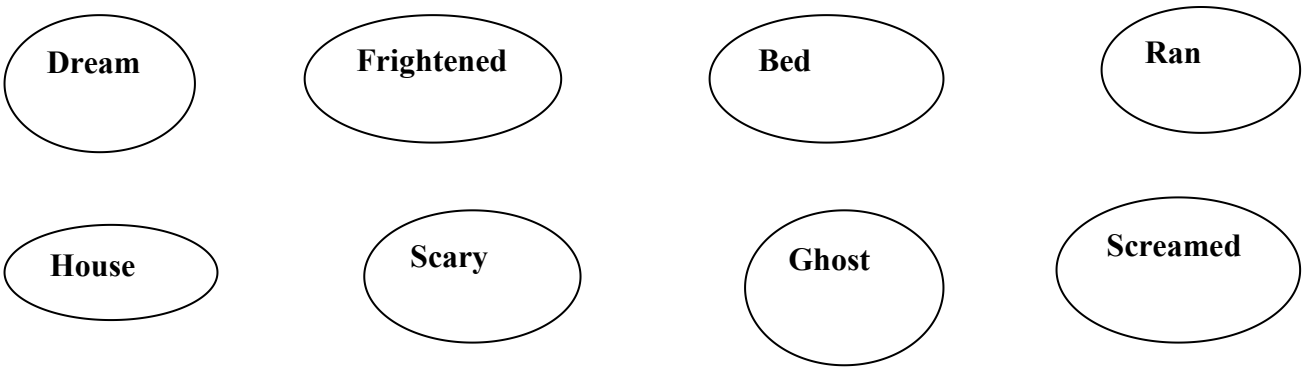
Background of test

The process of creativity test development involved four major components. First, test development began with an attempt to define the construct of creativity. Second, a blueprint of creativity skill components was developed. Third, test development continued with the writing of specific items or questions. The core skills of creativity skill have been considered like: Fluency (quantity or the ability to produce a large number of ideas), flexibility (changed viewing angle) and originality (generating innovative ideas).

Test Instructions

Today, you are going to take a test called The Test of Creativity. How well you do on this test will not affect your grade in this class. Think carefully about each word and create a best story.

1). Write an interesting story using these words. (fluency)



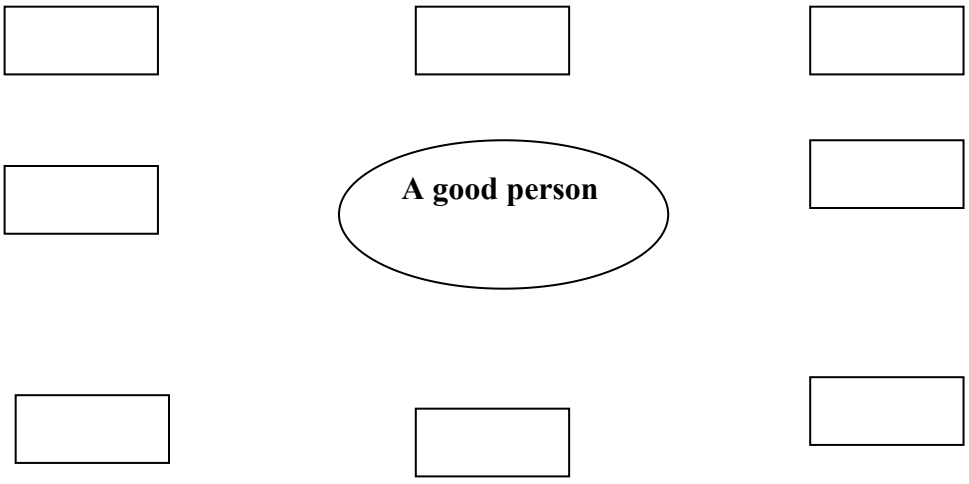
_____

_____

_____

2. What do you want to be when you grow up so that you can serve your country. And why? (Changing view ideas/Flexibility)

3). Look at the mind map and write about some qualities of a "good person". (Originality)



Appendix 13

Critical Thinking Test

Background of test

The process of critical thinking test development involved four major components. First, test development began with an attempt to define the construct of critical thinking. Second, a blueprint of critical thinking components was developed. Third, brief scenario or short story was created. Fourth, test development continued with the writing of specific items or questions. English mathematics & science subjects have considered for the construction of test. The four core skills of critical thinking have been considered like focusing question, analysis, inference and deciding on an action.

Test Instructions

Today, you are going to take a test called The Test of Critical Thinking. How well you do on this test will not affect your grade in this class. You will read a short story. After you read story carefully, you will answer some questions. Think carefully about each possible answer and choose the best one. You will mark all of your answers on the same sheet.

A). Match the columns. (Focusing on question)

No new substances are formed	Chemical changes
Mostly permanent changes	Rain
Substance that gets dissolved	Gas
Most loosely packed particles	Physical changes
Unstable water	Solute

B). The magic paintbrush Story Time

Rose loved drawing. She was very poor and didn't have pens or pencils. She drew pictures in the sand with sticks. One day, an old woman saw Rose and

said, ‘Hello! Here’s a paintbrush and some paper for you.’ ‘Thank you!’ smiled Rose. She was so happy. ‘Hmmm, what can I paint?’ she thought. She looked around and saw a duck on the pond. ‘I know! I’ll paint a duck!’ So she did. Suddenly, the duck flew off the paper and onto the pond. ‘Wow!’ she said. ‘A magic paintbrush!’ Rose was a very kind girl and she painted pictures for everyone in her village. She painted a cow for the farmer, pencils for the teacher and toys for all the children. The king heard about the magic paintbrush and sent a soldier to find Rose. ‘Come with me,’ said the soldier. ‘The king wants you to paint some money for him.’ ‘But he’s already rich,’ said Rose. ‘I only paint to help poor people.’ But the nasty soldier took Rose to the king. ‘Paint me a tree with lots of money on it,’ he shouted. Rose was brave and said, ‘No!’ So the king sent her to prison. But Rose painted a key for the door and a horse to help her escape. The king chased after her. So she painted a big hole, and splat! The king fell in. Today, Rose only uses her magic paintbrush to help people who really, really need help.

What’s the order of sentences? (Analysis)

	She painted a key and a horse to escape.
	The king sent Rose to prison because she didn't want to help.
	Rose loved drawing but she was very poor.
	The king wanted Rose to paint a tree with money on it.
	One day, an old woman gave Rose a magic paintbrush.
	She painted lots of things to help the people in her village.
	The king chased after Rose but she painted a hole and he fell in.
	She painted a duck and it became real!

C). There are many words in this word search. All words are linked to celebrations. The words can go across or down. Count 5 words you can find. (Inference)

F	A	M	I	L	Y	E	H	A	P	P	Y
R	B	O	L	I	P	A	R	A	D	E	S
A	N	N	I	V	E	R	S	A	R	Y	M
N	T	H	E	G	R	E	O	N	U	F	E
T	F	F	L	A	F	T	R	N	M	I	A
C	E	R	E	M	O	N	Y	I	S	E	L
P	S	I	T	E	R	A	F	E	A	S	T
A	T	E	E	S	M	E	E	T	I	T	G
R	I	N	F	C	A	R	N	I	V	A	L
T	V	D	U	I	N	K	J	H	U	N	A
Y	A	S	N	N	C	J	O	L	L	Y	U
A	L	W	F	T	E	N	Y	O	D	O	G
B	I	R	T	H	D	A	Y	Z	I	N	H

D). what do you think is the moral of the story? Circle the best answer. (Deciding on action)

a. Money is important.

b. Don’t be greedy and be kind to others.

c. The king is always right.

Good Luck!

Appendix 14

Problem Solving Skill Test

Background

The process of problem solving test development involved four major components. First, test development began with an attempt to define the construct of critical thinking. Second, a blueprint of problem solving components was developed. Third, brief scenario or short story was created. Fourth, test development continued with the writing of specific items or questions. English mathematics & science subjects have considered for the construction of test. The four core skills of problem solving have been considered like understanding the problem, devising the solution plan and applying the solution plan.

a). Word Problems (understanding the problem)

Ahmad picked 72 cherries and Ali picked 45 cherries. They used 24 cherries to make pies for their school bake sale. How many cherries do they have left?

Asma had 19 candies and then she bought 23 more candies. She wants to share them between herself and 6 friends. How many candies will each friend get?

b). Read the given story and fill in the blanks with the correct words given below. (Devising the solution plan)

A, the, winning, hare, challenge, fast, woke, won, tortoise, left, the

Once there lived a hare and a tortoise in a forest. The ---------- was very proud of his

speed. He used to make fun of the ---------- for being too slow. One day, the tortoise-

------ the hare to a race. The hare accepted the challenge. The race started. The hare ran

very ----------. The tortoise was ---------- much behind. The hare got tired and stopped

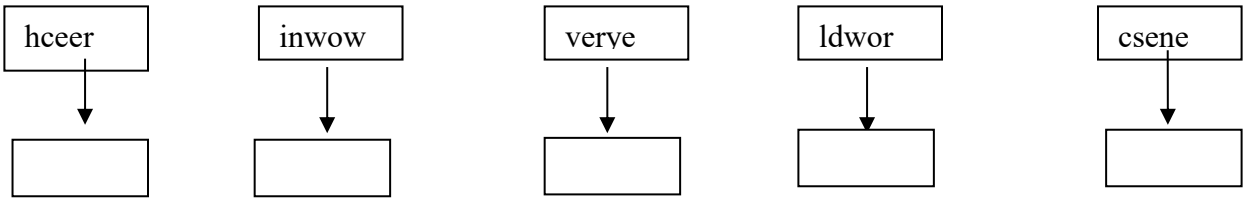
to have some rest under ---------- tree. He fell asleep. ---------- tortoise

passed him and

reached the ---------- post. The hare ---------- up and ran as fast as he could. He saw that

the tortoise was already there at ---------- winning post. The tortoise had ---------- the race.

c). Rearrange the jumbled letters to make words and make correct words. (Devising the solution plan)



d). Continue each pattern. (Applying the solution plan)

20, 16, 12, ----------, ----------, ----------

20, 24, 28,----------, ----------, ----------

Good Luck

Appendix 15

Social Skill Test

Background of test

The process of social skill test development involved four major components. First, test development began with an attempt to define the construct of social skill. Second, a blueprint of social skill components was developed. Third, test development continued with the writing of specific items or questions. The core skills of social skill have been considered like: resolving conflicts, helping others, being fair with others, communication skills, ethical behavior and sense of responsibility.

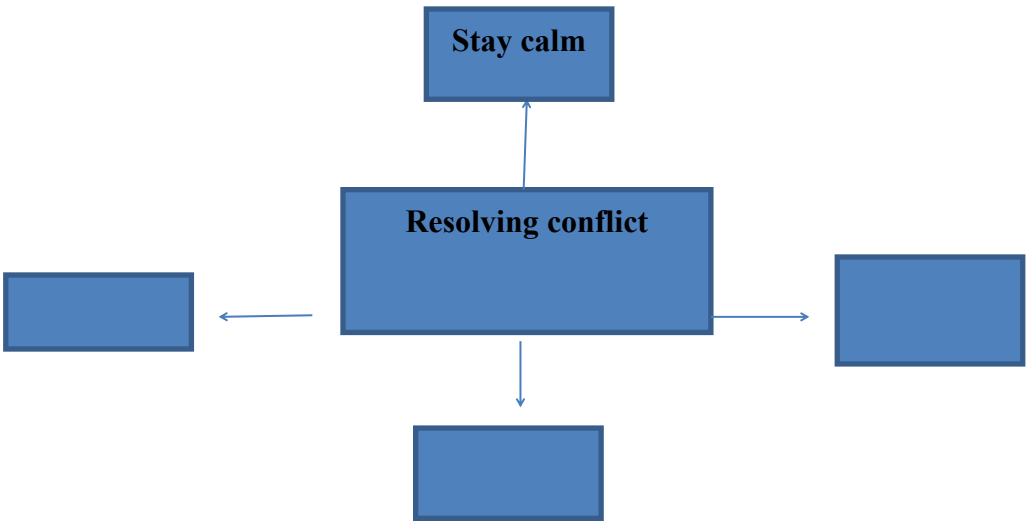
Test Instructions

Today, you are going to take a test called The Test of social skills. How well you do on this test will not affect your grade in this class. Think carefully about each task and solve it.

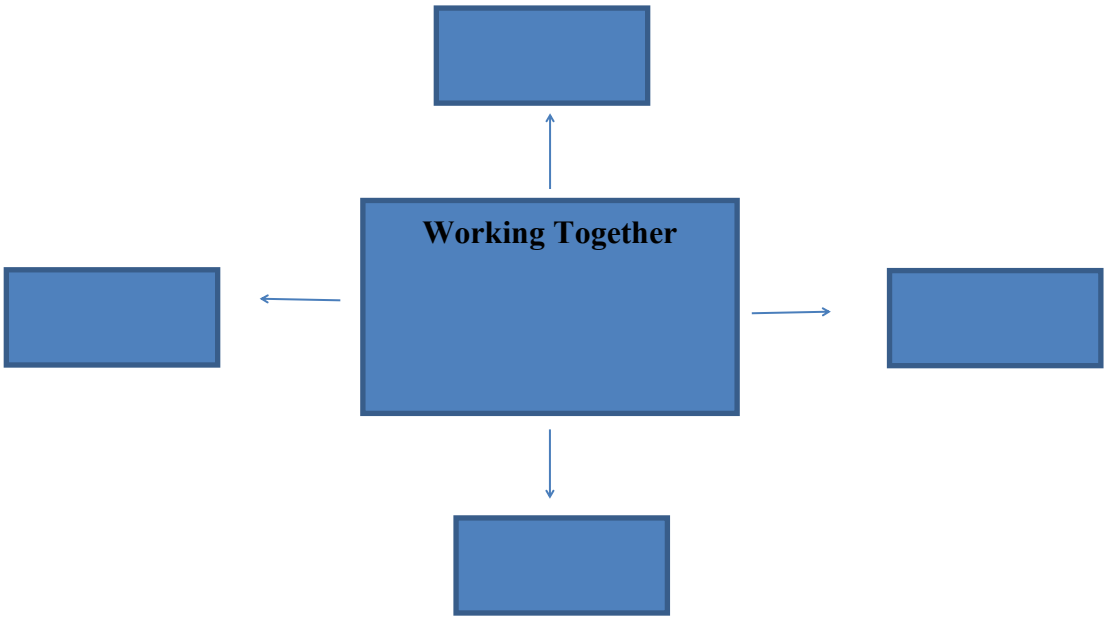
a). Decide whether each situation is fair or not. Tick the fair one. (HR) (Being fair with others)

1. Perveen gives everyone a chance to join in her game.
2. Ali says Ahmad cannot play the football because he is not wearing the same color shirt as everyone else.
3. Asim bring cookies into school. He makes sure he has enough for everyone in the class.

b). Conflict usually involves two or more people who have different opinions to each other. Can you think of ways you could resolve conflict. One has been done for you.(Culture and diversity, Resolving conflict)



c). Describe how you feel when you are working together with someone else. Write one example in each box. (Citizenship) (Helping others)



d). Write good or bad next to each situation below to show if you think the behavior is good or bad. (Citizenship, Ethical behavior)

Behavior	**Good or Bad**
Pushing someone over for not playing with you	
Not tidying up the things you have played with at home	
Helping a friend when they have fallen over	
Listening to an adult when they are talking	
Carrying someone's shopping bag when their hands are full	
Not feeding your pet	
Being rude to a teacher	

e). what does it means to be responsible? Draw a line to match the sentences with the words. (Citizenship) (Sense of responsibility)

Leaving the door open on a cold day	**Responsible**
Wasting food	
Helping an adult to tidy up	
Leaving the tap running when you are cleaning your teeth	**Irresponsible**
Turning the lights off when you are not in the room	
Looking after your family members	
Telling a lie	

f). Read carefully and write your answers. (Culture and diversity)(Communication skills)

Asma makes a list of the ways that she can show that she is listening carefully when someone else is speaking to her. Which of these do you think is most important and which do you think is least important. Write "M" in front of most important and write "L" in front of least important.

Asking questions or making comments	
Keeping still while the speaker is talking.	
Saying things like "I see" and "I understand" etc.	
Smiling or nodding to show you are paying attention. Making eye contact with the speaker.	
Allowing the speaker to finish what they are saying.	

Good luck

Appendix 16

List of schools

1	Islamabd Model school (I-V) G-7/1
2	Islamabad Model School for Girls (I-VIII)G-7/3-4
3	Islamabad Model School for girls (I-X) G-5
4	Islamabad Model School, I-9/1, Islamabad.
5	Islamabad Model School, I-9/4, Islamabad.
6	IMS(I-IV) No. 2 I-9/4

CERTIFICATE of PROOF READING

This document certifies that the thesis listed below was reviewed and edited for proper English language, grammar, spelling and overall style by the undersigned. Neither the research content nor the authors' intentions were altered in any way during the editing process.

THESIS TITLE

ASSESSMENT OF PRIMARY SCHOOL STUDENTS' 21st CENTURY SKILLS DEVELOPED THROUGH CURRICULUM

RESEARCHER

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178-FSS/PHDEDU/F20

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