

ART EDUCATION: A CONTRIBUTORY FACTOR IN ENHANCEMENT OF PROBLEM SOLVING ABILITY



By

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**COLLEGE OF HOME ECONOMICS
UNIVERSITY OF PESHAWAR
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*A dissertation submitted to University of Peshawar for the partial fulfillment of
the requirements for the degree of Doctor of Philosophy in
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CERTIFICATE OF APPROVAL

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**COLLEGE OF HOME ECONOMICS
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Dedicated to Abu, Ami

&

Munir

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ABSTRACT

This study provides a baseline analysis of the extent to which the elementary education system in Pakistan is capable of enhancing or inhibiting children's creativity. The present study was designed to examine the impact of elementary visual art in enhancing problem solving ability of children. The primary aim was to determine the relationship between visual art and problem solving ability among students. The predictive relationship between these variables was studied among elementary school children and young college students. For this purpose, the study utilized a quantitative approach to measure the difference in problem solving ability between art students vs. non-art students. Further, the study examined the role of two visual art instructional pedagogies: student-centered and teacher centered to evaluate their impact on the two thinking types, i.e., convergent thinking and divergent thinking along with the problem solving performance of the participants.

The research encompassed two interconnected studies. Study I was a retrospective study concentrating on the long term effects of elementary visual art at the age of young-adult. While study II was conducted in the present scenario of education being practiced at the elementary school level in Peshawar. The two studies were carried out in further two Phases. Phase I consisted of two stages: stage I dealt with item selection and try out of scales to see if the instruments were understandable by Pakistani sample, whereas Stage II dealt with the determination of validity and reliability estimates of all the instruments used in current research. The instruments finalized in Phase-I were administered in Phase II on two independent samples, i.e., 150 college students from the National College of Arts, Lahore and Rawalpindi and 180 students across the elementary schools of Peshawar, KP to verify the study hypotheses. The Raven's Standard Progressive Matrices, Wallach & Kogan's Creative thinking Tests and Problem Solving Ability Test were administered to measure the participants' convergent thinking, divergent thinking and problem solving ability respectively. The findings revealed significant relationship of visual art received at elementary level with problem solving ability of the students in their present life as well as later

life. ANOVA and t-test analysis demonstrated significant differences in such a way that art students scored significantly higher on all the three instruments as compared to non-art students. There were also significant differences in problem solving abilities of students exposed to different art instructional pedagogies at the elementary school level. The linear regression analysis suggested significant prediction of enhanced problem solving ability along with divergent and convergent thinking as outcome products of visual art in general and student-centered visual art in specific. ANOVA revealed that student-centered visual art group performed well and scored significantly higher on all the three instruments as compared to teacher-centered and non-art group, whereas the results found no significant difference between the performance of teacher-centered and non-art students.

The findings highlight the importance and contribution of visual art in developing a higher level thinking skill transferable to later life. It is hoped that this study will contribute to the advocacy for the inclusion of visual art in the national curriculum.

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CHAPTER – I

INTRODUCTION

CHAPTER-I

INTRODUCTION

Art education prepares individuals to face the challenges of daily life by mostly using the problem solving approach to introduce students to the thought process necessary to arrive at a solution. These thought processes include identifying problems, gathering information; generating potential solution to the problems and developing and testing the optional solution (Fox 2008; Hurwitz, 2006; Mayer, Salovey, Caruso & Sitarenios, 2003; Poliya, 1954). Survival in today's world requires children to be more active, creative and critical learners than before in order to develop their full cognitive potential to tackle the problems in a better way (Griffith, Dubow, & Ippolito, 2000). When children get involved in art activities, their indulgence in the process of thinking and restructuring help them to develop inquisitiveness and curiosity (Lowenfeld & Brittain, 1987). The education in art enhances the capacities to imagine and develops novel abilities motivated by creative problem solving and flexible thinking (Perrin, 2008). Recent research has confirmed the effectiveness of art education in developing interest and affection towards learning, reducing student dropout, increasing student attendance, developing better group members, enhancing student dignity and creativity, developing cognitive competencies and producing a well-rounded citizen for today and for tomorrow. (Alter, 2010; Dunbar, 2008; Eisner, 2002; Funch, 1997; Gardner, 1990, 2004; Haanstra, 2000; Hickman, 2004; Hurwitz, 2007; Mayer, et al, 2003; Ruppert,& Nelson 2006). Lowenfeld (1954) defined art as a subject that provides a platform to polish cognitive behaviors normally associated with divergent thinking and problem solving activity. Hickman (2004), argued that art education can play a significant role in developing practical problem-solving skills as it facilitates creative behavior and lateral thinking skills; promotes inventiveness and risk taking; and enhances student's ability to make informed judgments about their environment. Art learning not only prepares

students to meet the challenges of their present lives, but also prepares them for their future live as well (Dewey, 1916).

Problems are multi-faceted and each person has a different sensitivity and perception about them as well as varying intentions about how to solve them. Effective problem solving requires a balance of both analytical and creative thinking skills: analytical or logical thinking is a convergent process while creative thinking is deemed divergent (Efland, 2002; Guilford, 1967). Convergent process limits the solution to one precise answer, whereas divergent process offers a number of possible solutions to a problem depending upon its application on the basis of suitability.

The early life experiences with visual art can be the most influential for attaining cognitive competencies. Art activities provide an atmosphere where students find new form and order and try to seek solutions with their own intelligence. This practice develops visual thinking and creative problem solving ability (Smith, 2003). However, different atmosphere in two different classrooms influences differently the problem solving approach of students (Gardner, 1990). Hence, the important issue at hand is whether different atmospheres created by different instructional pedagogies in visual art classrooms make any difference in the outcomes of the art learning in respect of problem solving ability. In broad term, pedagogies can be classified into teacher-centered and student-centered pedagogy. In student-centered pedagogy, student learning is the focus of the class. This approach facilitates student's voice and understanding with an emphasis upon self-expression, creativity and innovation, whereas in the teacher-centered approach, the emphasis is upon teacher's transmission of content and control of the learning (Weimer, 2013).

The works of Rousseau, John Dewey, Carl Rogers, Jean Piaget, Lev Vygotsky, Viktor Lowenfeld and others focused on how students learn and that was the basic motive for promoting student-centered approach (Chegenizadeh, Nikraz & Zadeh, 2012). Therefore, art educationists prefer the student-centered visual art to attain its maximum learning outcomes. Keeping in view the works of the above eminent philosophers, psychologists and art educationists, this study

utilized a quantitative approach to examine the impact of student-centered pedagogy in contrast to teacher-centered in the context of examining the importance of visual art in solving problems.

Guilford (1954) believed that among the abilities most likely to be important in problem-solving are general reasoning, fluency of ideas, flexibility, evaluation, and originality. Funch, 1997 and many others also agreed with Guilford's idea about the relevancy of all these variables with the ability of solving problems that getting involved in art experiences strengthens a number of fundamental cognitive abilities; such as reasoning ability; problem solving ability and the components of creative thinking, i.e., originality, flexibility, fluency of ideas, and elaboration (Alencar and Frith, 2003; Ruppert, 2006; Sternberg, 2005a; Torrance, 1967; Wakefield, & John, 1989; Wallach 1965).

The process of thinking is fundamental to creativity. It has also been defined through the use of convergent and divergent thinking by researchers (Baer, 1993; Guilford, 1950). These two thinking styles divide the problem solving into two methods. Convergent thinking involves solving a problem, with a single correct solution, while divergent thinking generates multiple possible solutions to solve a problem. Divergent thinking encourages different types of thinking and due to the generation of multiple solutions to a particular problem situation, creativity is considered to appear in divergent thinking production (Dunbar, 2008). Umphrey (2004) opined that aesthetic experiences enhance creative and critical thinking skills that are essential components of problem solving ability. Hence, the above studies illuminated the fact that creative and critical thinking are common constructs that are equally shared by both variables i.e., visual art and problem solving ability. Creative thinking is divergent and initiates with identifying the problem and diverges to produce different possible solutions. Critical thinking is a convergent process, narrowing down the possible solutions to seek out one correct answer or the most suitable solution.

Art education is a mean to encourage the process and the experience of thinking and hence, makes things better. The experience of making decisions and choices in the course of creating art also reaches out to later years of life. It has the ability to transform thinking by developing higher cognitive skills, which facilitate success not only in school but throughout the life. It inculcates multidimensional approach in an individual.

The term art education refers to education in the disciplines of applied arts, performing arts, and visual arts. However, the present study focuses specifically on the visual art. The processes involved in making visual art are important to develop and refine the highest and most sophisticated forms of human cognition (Eisner, 1994). In the present study the term art education will refer to visual art education which includes the creation of images and objects such as drawing, painting, printmaking, sculpturing and photography.

The visual art presents distinct opportunities for the growth and development of children beyond its singular, domain specific artistic development (Phillips, Gorton, Pinciotti & Sachdev, 2010). It is a unifying and dynamic activity for children.

The work of art, e.g. drawing, painting, coloring, printing or structuring is a multifaceted process and by passing through that a child blends together varied components of personal experiences to create a new and an absolute meaning. Through the interpretation, selection, and reformation of these components, a child gives us more than a picture; an image of his inner world. His feelings and thoughts are exposed for all to view (Lowenfeld, 1987).

Every commodity of life in one way or the other revolves around art and it is absolutely interrelated with our daily life. To promote a product, to advertise a job, to publicize a social issue, to promulgate a political concern, all need art to be commercialized. Art deals with the designing of the products and issues. From a drawing room to office décor, from a car engine to the spaceship and iPod to brain chips all are designed according to the principles of art & design to attain

sustainability for a longer period of time. Art educators consider art making tasks as problem solving tasks (Eisner, 2002). In consonance with evident relationship between art education and cognitive abilities the present study aimed at identifying the relationship between visual art education and problem solving performance.

Though the review of literature has shown the relationship of visual art with cognitive competencies in a variety of contexts, yet there are many other avenues to explore. Thus, the present research aimed to study the predictive relationship of visual art with problem solving performance among elementary school children. Further the research aimed at testing the proposed model of the relationship of these variables with each other in later years of life.

For this purpose, the extensive study of literature was carried out. The role of visual art education was examined in respect of enhancing problem solving ability based on the theories presented by cognitive psychologists. Cognitive psychologists, philosophers and art educationists have given due importance to children's creativity and freedom of self expression and have linked these constructs of art education positively with cognitive competencies (e.g. Piaget, 1955; Rousseau, 1762; Lowenfeld, 1954; Cole, 1960).

In the following section of the literature review at first the historical background of art education will be discussed, followed by the review of the two important movements; mimeticism and cognitivism. The development of theories based on philosophical and psychological discoveries will be discussed next. The primary instructional pedagogies of art education, which originated during mimeticism and cognitivism will also be highlighted in order to identify the most appropriate pedagogy to equally nurture the two types of thinking to improve the problem solving skills in children. The study will also illuminate the two thinking types, i.e., convergent and divergent thinking.

CHAPTER – II

REVIEW OF LITERATURE

CHAPTER-II

REVIEW OF LITERATURE

2.1 Historical Background of Art Education

Hurwitz (2007) defined contemporary art education as a result of an evolutionary process. The two most influential factors responsible for this progression are discussed here; (1) the nature and tradition of art; (2) the development of theories based on philosophical principles and psychological discoveries.

2.2 The Nature and Tradition of Art

The history of art is as old as the history of man. When man felt a need of some container and vessels to store food and water, he learnt to make vessels out of the clay. At first the emphasis rested on the functional use of those containers. Gradually, when he attained mastery on developing the basic shape he started adding beauty to please his eyes. Hurwitz (2007) stated that besides technical consideration the primitive potter commenced to concentrate on decoration of those pots. He then decorated the surface with patterns like waves, scrolls, swirls, and so on. Soon it was discovered that he could use these signs to communicate his ideas to others, hence art took up the pictorial form of self-expression for the primitive man and it was then, that cave painting came into existence. It was a personal expression of the artist's reaction to experience the traditional nature of the art (p. 15). Hurwitz concluded with the remarks that:

Art results from an act of self-expression involving emotions and intellect. Thus we may say that art is a significant expression giving form and order to human being's reaction to his environment. It is this concept of art, a traditional one that governs to a great extent the art program in our schools today (p.14).

2.3 The Beginning of Art in Schools

The advent of art activities took place apparently with the beginning of mankind. However, art as a part of school curriculum is comparatively new (Hurwitz, 2007). Boughton (1986) refers to a sequence of phases in art education. Before the mid nineteenth century art was introduced in a restricted form in the curriculum of schools and was considered merely as a leisure time activity. In 1850's the inclusion of "linear drawing" in many European schools can be regarded as the beginning of school art but it lacked the expressive work. In 1880's the linear drawing was upgraded to map-drawing which was followed by advance art training known as hand-eye training period, generated through the colonial influence of the British South Kensington system of drawing instruction (Boughton, 1989; Brown, 2006; Hurwitz, 2007).

2.3.1 The Hand-Eye Training Phase

Hand-eye training was aimed at providing children with two things: developing their manipulative skills and inculcating habits of good work. These were also demanded from manufacturing industries. Students were devoid of any internal structures for aid to understand complex ideas, consequently, led them to be dependent on their teachers (Mandelson, 1984). Students' work was evaluated in the form of grading and their progress was measured accordingly.

2.3.1.1 Traditional Teaching Methodology

Darbor (1961) asserted that hand-eye training established a teaching methodology that was more concerned with accuracy and correctness of the end product; therefore, those students were discouraged and assumed unfit for the subject who couldn't produce exact and correct artwork.

In this teaching approach, students' expression was considered less important. Even students in art schools were discouraged from expressing individuality in their drawing styles (Rugg and Schumaker 1928; as cited in Brown 2006). This method considered children of lacking essential 'internal structures' to

aid them in understanding complex ideas (Kennedy, 1988). Due to this assumed deficiency, children were thought to be in need of the firm guidance of elders (Brown, 2006).

This belief still persists today in the minds of teachers and adults. Schickedanz and others described it as ‘the environmental-behavioral view’ of child development (Schickedanz et al., 1983). Efland termed as ‘mimetic behaviorism’, stated that in mimetic behaviorism art is only imitation, because learning takes place by the act of imitation (Efland, 1990).

Burke (1964) defined such activity as parrot-like imitation. Herberholz and Hanson (1990) called this mimetic behaviorist teaching practice as pre-determined art because it clings to the similar characteristics, for example color-in images, prepared patterns, and copying adult models and stepwise instructions, therefore, the result is prearranged by the teacher. Spidell et al., (1992) referred it as a teacher directed approach derived from behaviorist beliefs. However, the present study has used the terminology of ‘teacher-centered’ for the same purpose.

2.3.1.2 Teacher-Centered Art Education

In the teacher-centered approach the students are forced to adjust to the commands given by the teacher. The curriculum, too, is based upon considerations concluded by the teacher and paper work. The lessons planned are above student level and the teacher is continuously involved in assessing student’s competency, modeling correct procedure and giving feedback (Efland 1990). This teaching pedagogy encourages the students to imitate. It is the teacher who controls the content and also its difficulty level, sequence and intensity and frequency in the learning environment. Peers (2002) opined that this traditional method of teaching art acts as a stumbling block in the abilities, aptitudes and creativities that are essential for the art students to make artistic performances and achievements.

2.3.2 Creativity Phase

The hand-eye training, followed by the creative phase emerged in the 1940s and 1950s (Marché, T. 2000) was mostly due to the ideas of the Austrian teacher Franz Cizek (Boughton, 1989; Hurwitz 1970). Franz Cizek reassured the children for the visual expression of their emotions. His aim was not only to develop the creativity among children but also help them flourish according to the laws of nature (as cited in Boughton, 1989, p. 83). It was with the advent of child psychology that a child's spontaneous expression in practical domains could be studied and acknowledged (Brown, 2001). This interest gave rise to child-centered art education.

2.3.2.1 Child-Centered Art Education

Child-centered art education was a reaction to hand-eye training and it rejected traditional teaching method. In opposition to mimetic behaviorism and hand-eye training, which regarded a child as deficient, child-centered art education regarded the child as a valued resource (Bussis, Chittenden & Amarel, 1976). Brown favors this system writing, "instead of directing students towards a narrowly defined goal, child-centered teachers encouraged children's self-expression" (Brown, 2006. p.113). Pioneers of child-centered art education were Cizek and Schaefer-Simmons, in the early twentieth century. Later expounders include Cole, Richardson, Read and Lowenfeld, all inspired by predecessors.

2.4 Theoretical Background of Art Education

The art history went through many periodic changes in artistic theories which brought profound changes in art (Hurwitz, 2006).

2.4.1 Contribution of Philosophical Principles

Historical roots revealed that after primitive influences the philosophers were the next to concentrate on the arts. Their work was further refined by the psychologists of this era (Hurwitz, 2001; Daniels & Shumow, 2003). Brown (2006)

opined that the child-centered art education gave expansion to one's own view of the world and nurtured this individuality through self-expression.

2.4.1.1 Jean-Jacques Rousseau. Jean-Jacques Rousseau, an eighteenth-century philosopher, strongly believed that human nature was basically good (Brown, 2001) and that children have their own feelings and thought process which should be supported by adults and encouraged to surface. He advocated giving a free hand to the children to learn through self-initiated activities (Hurwitz, 2001).

2.4.1.2 John Dewey. In the twentieth century American Philosopher John Dewey (1916-1966) also considered to be the father of progressive education showed great concern for the relationship of learners to their environment and to the society in which they reside.

Dewey perceived education as an opportunity to discover how to use previous experiences in new ways. Dewey opined that students should be master of following scientific methods to meet the demands of ever-changing world: (1) to identify a problem; (2) describe it; (3) put forward different hypotheses to solve it; (4) look at previous experiences to judge each hypothesis; and (5) test the best possible solution (as cited in Sadker & Zittleman, 2010, p. 319).

The social reformers, educationists and psychoanalysts of nineteenth and early twentieth century, supported the concept presented by Rousseau that childhood is a vulnerable and formative time. Keeping in view the theoretical work by the French sociologist Pierre Bourdieu, Stankiewicz (2007) elaborated the importance of visual art in historical perspective, saying that it is the formation and transmission of capital: 'human capital, cultural capital, social capital and economic capital' (Stankiewicz, 2007). In order to help a child's self to appear, the educationists, like Pestalozzi, Froebel, Montessori, Neil and Isaac brought changes in Europe, and Dewey, Rugg and Schumacher in the United States, designed education programs that emphasized child's interests, aptitudes and strengths and this effort laid a baseline for initiating child-centered education (Dewey, 1966, p.178).

2.4.2 Contribution of Psychology

The thinking of psychologists and the cognitive revolution, both influenced the art education in the middle of the 20th century. Psychology contributed a lot to research findings and also helped the teachers to understand the learning process of children (Daniels & Shumow, 2003). Gestalt psychologists believed that the only way of acquiring knowledge is by achieving insight through which the relationship between the various aspects of the learning situation can be understood. Their system of psychology has strongly influenced the art education (Hurwitz, 2001).

2.4.2.1 Gestalt Psychologists. Gestalt theory is a general psychological theory of systems and organization that emphasizes the phenomenon that the whole is not equal to the sum of the parts, or the whole is greater than the sum of the parts. Gestalt Psychologists believed that in education, learning takes place through active, constructive and fundamentally motivated process, using human power to think and solve problems instead of just being directed, trained and conditioned. Therefore, they stressed on active, productive, and creative aspects of learning and thinking (Köhler, 1917; Wertheimer, 1945; as cited in Soff, 2013, p.49).

2.4.2.2 Carl Rogers. Carl Rogers, the humanistic psychologist was the founder of the humanistic client-centered approach. He believed this to be the best approach in understanding human personality and human relationships. His theory declares that human being is the center of a constantly changing world. Each person goes through a number of experiences and responds according to his or her perception. To him the response of a student was more important than the response of a teacher (Rogers, 1951). Each student brings his own experiences to the classroom and reacts differently depending on what he or she is exposed to. According to him the person who has a free choice would have an original and novel approach, whereas in a restricted environment the flow of original ideas can be thwarted. The humanistic view of education goes hand in hand with art educators who lay emphasis on the creativity and expressive aspects of human personality (Hurwitz 2001).

2.4.2.3 Jean Piaget. The cognitive development theory of Jean Piaget's has had a great influence on education. He believed that the relationship of children with art is purely based on their ability to understand the permanent existence of objects. Lack of such understanding will prevent them from evoking the past and anticipating the future as they will have no image to help them move on. In order to recall what is not there and to think about it, they require a schema (a diagrammatic presentation). These schemas help human beings organize their experiences and understand them. Piaget's different stages of development gained extensive attention in child education and cognitive development. He believed that teachers, needed to design different environments and interact with children to bring out their creative, inventive and critical thinking (1964).

Similarly, Freud opined that, childhood is an absolutely formative time. He believed that the very sophisticated mechanisms of the mind had their origins in the early years of childhood (as cited in Wolf, 1992, p.949).

Other psychological theory, such as Cole's psychoanalytic theory, (1960) stated that child art is a reflection of his deep inner emotions, feelings, and inner psychological drives. For example, fathers are usually drawn tall because emotionally children believe them to be powerful and dominating. Lev Vygotsky (1978) was of the view that each child should be considered as an individual who learns distinctively. He advocated the idea of developing higher level thinking and problem solving in education (as cited in Daniels & Shumow, 2003, p. 497). These philosophical and psychological theories not only attracted the attention towards the importance of children's art, emotions, expressions and cognitive development but also facilitated the concept of child-centered art education.

2.5 Theoretical Background of Child-Centered Art Education

It was late in the nineteenth century that scholars and artists in Europe noticed children scribbling and creating images on the walls. This marked the beginning of the child art which at first was considered as part of their play, but later the drawings were purposefully collected and analyzed by adults to understand their perception of the world. The psychologists discovered

developmental stages and found striking similarities in compositions that change with age and persisted across cultures. These characteristics, which varied from one writer to another were studied intensely to discover universal patterns of developmental progress in children drawing (Brown 2006; Kindler, 1997).

2.5.1 Developmental Stages of Children's Art

In the 1950s, growth and learning were separated into distinct levels of children's intellectual, emotional, perceptual, physical, social, creative, and aesthetic development. Many art education publications were based on developmental stage theories about the art development in children (Michael, 1983). They also included the Piaget's stage theory of cognitive development, Gesell's theory of maturational development, Freud's five stages of psycho-sexual development, and Erickson's psychosocial stages (as cited in Berk, 2007, p.14-20). The most lasting and significant descriptions of children's artistic development were provided by Viktor Lowenfeld in the book, 'Creative and Mental Growth' (1947/1987). Lowenfeld (1947) put emphasis on the individuality of the child and suggested self-directed approach. He illustrated six stages of children's artistic development:

1. The scribbling stage: 2-4 years;
2. The pre-schematic: 4-7 years;
3. The schematic: 7-9 years;
4. The gang age: 9-12 years;
5. The pseudo-naturalistic stage: 12-14 years; and
6. The adolescences art: 14 – 17 years.

2.5.2 Viktor Lowenfeld's Ideology

He was of the idea that "children's art was closely associated with various types of growth: social, physical, emotional, aesthetic and perceptual growth" (Lowenfeld, 1947). Their art was a sign and force for the continued growth of these capabilities (Kindler, 1997). Cole, Read and Richardson agreed with

Lowenfeld ideology that children were born artists and should be given space “for freedom of expression, should be allowed to progress naturally through their stages of development and the teacher should take care to satisfy the needs of every single child” (Brown, 2006, p. 58). The views of all those philosophers, educators and psychologists about child-centered approach proposed rationale for art education and set ground to raise the objectives of art program upon.

2.5.3 Children’s Art and Self Expression

The process of making art is as important as the product of art in itself. The beauty of art lies within the essence of studying emotional responses rather than the formal properties of an art object (Koffka, 1940; Lowenfeld 1954).

In the first half of the 20th century, Hall and other psychologists launched the child study movement and introduced the term creativity. Creativity and self expression were among the art education constructs as defined in the writings of Cole (1940), Richardson (1946), Read (1956), Lowenfeld (1954), Lowenfeld and Brittain (1947/1987) and others. It was in this period that the educators and psychologist started studying children drawing as evidence of psychological states. Self-expression and creativity were highly appreciated, encouraged and practiced in art education (Eisner, 1972).

2.6 Arts Learning and Cognition

In literature, theories have been developed in the areas of arts and cognition. Howard Gardner (1985) opined that the art learning is an important element in improving human cognitive competencies. Funch (1997) and Efland (2002) also asserted that cognitive activities like imagination, intuition, emotions, conceptualization and appreciation are naturally connected with the process of making art. Hence, art is considered cognitive as it includes creativity, imagination and emotions.

Art provides multiple ways of learning and hence adds to the cognitive development; with a curriculum including problem solving, discussion, inquiry and decision making process.

Kindler (1997) stated that 1950 brought forth new approaches to artistic development with the results of the cognitive turn. From that time artistic development theories have based on two fundamental concepts: the art in the art-world and second the cognition in psychology (Kindler, 1997). Parsons (1998) reviewed that the work of three giants 'Gombrich (1960), Goodman (1967) and Arnheim (1954-1969) gave a new approach that was the cognitive interest of psychology in the art and established a dominant paradigm of artistic cognition.

Before that time behaviorists considered art as a non cognitive subject. While in the cognitivism all the mental activities were considered cognitive. Arnheim argued that perception is cognitive in nature because it's a mental activity. When the perceiver perceives an object he gets involved in the process of selection, generalization and conceptualization. Thus, it is a constructive knowing, not a passive reception. Another argument was that in the arts, representation of three-D objects on two-D surfaces requires an additional kind of active and constructive effort while the artist creates images equivalent to three-dimensional objects. The Reality is quite different from art images. Both cannot be placed on an equal footing. Each medium poses a puzzle for the child artist. How to create an image to represent some aspects of reality is the real problem which the artist solves using his artistic approach. This idea of considering a child as a problem solver enormously influenced the researchers and set forth a research agenda to follow (as cited in Parsons, 1998, p.81).

Anderson et al., (2001) commented on Bloom's taxonomy as being supportive to their proposition. They believed that intelligence along with creativity is the basic components of the academic success. Egan, Stout, & Takaya (2007) believed that imagination which is connected with creativity helped in hypothesizing all the possibilities. Critical thinking helps in judging those possibilities, and evaluation helps in assessing whether hypothesizing and reasoning are proceeding towards positive ends. Based on these reviews Anderson

et al., (2001) recommended that emphasis on critical and analytical thinking, along with the practical, creative, and wisdom skills could maximize students' learning and understanding in academic as well as other aspects of life.

Research has been conducted for investigating the impact of art on major cognitive processes involved in reasoning, like producing new and original ideas. Guilford (1967) and Hudson (1967) found that arts students performed differently than non-arts students; they produced more varied and creative uses than non-arts students.

2.7 The Brain on Arts

Art pave ways for the development of the neural system, spreading over months and years. The art fosters the process of learning. The systems which it nourishes, include our sensory, cognitive, emotional, and motor capacities, that are actually the driving forces behind all other learning (Burton, Horowitz, & Abeles, 1999; Jensen, 2001).

To find the reason of the association of art-training and academic performance, 'Dana Arts and Cognition Consortium', in 2008, invited neuroscientists from seven universities across the United States. The question under study was whether art training in early ages makes any changes in the brain, which in turn develops other aspects of cognition. The consortium reported that there was a possible causal relationship between art-training and the brain's ability of learning in other domains. Furthermore, an interest in arts directs towards a high state of motivation that turns out in the form of sustained attention and brings improvement in other domains of cognition (Posner, et al., 2008). John Jonides (2008) revived that positive correlations between training in music and both reading comprehension and sequence learning was also found. The consortium also found that "aesthetic ability and arts education correlate with improvements in children's reading abilities" (Wandell, et al., 2008, p.51).

Vohra & Verma (2012) revealed that people who use both hemispheres, i.e., left brain and right brain are fast problem solvers. Left brain involves convergent

thinking and right brain involves divergent thinking. The left brain is logical i.e., rational and fact oriented. From literature, it is evident that the specialty of the left brain is related to language, analysis, proposition and serial tasks while the right brain specializes in creative and non verbal functions (Mishra, 1983). In Traditional standard of education, left hemisphere is given preference for use and development; reinforcement at work, stressing upon logical analysis for conclusions and results. The Right hemisphere is inventive, subjective, insightful and spontaneous. Its specialties include stress management, use of multiple intelligence, creativity and joint working. The right brain skills deal with images, color, shape and imagination (Griffiths, 2012). These two brains working together, illustrates our multiple intelligence and their working improves the more when they are used jointly.

2.7.1 Art Activities as Right-Brain Activities.

Visual thinking is an essential aspect of cognitive learning and human communication. The visual art such as drawing, painting, and so forth in their appreciation or creation, are almost exclusively right-brain activities (Vannatta, 1979, p.12). Yet in our schools the visual art is not given due importance as a separate or integrated subject. Education that permits the child to deal with visual learning can be accomplished through activities that appeal to the right hemisphere of the brain.

Recent research on the human brain, especially that which deals with the special capabilities of the left and right brains, has important implications for education. Educators need to become aware of the important role of the right hemisphere in learning and of the importance of the visual arts in enhancing visual thinking in that hemisphere, as well as their relationship to humanistic curriculum. Human beings have a capacity for art experiences via the right brain, and it is only through these experiences that the child can reach the highest level of mental functioning (Vannatta, 1979, p.13).

Recently neuroscientists have begun to delve into the biological underpins of aesthetics by studying neurological patients with impairment in aesthetic

experiences and applying neuro-imaging methods to locate brain circuits that are active when people look at art works (Shimamura, 2012).

2.7.2 Brain, Art and Thinking Styles

According to Sternberg (2006), real creativity needs synchronized occurrence of six distinctive yet unified resources as: logical abilities, knowledge, motivation, thinking style, environment and character and individuality. While talking about thinking style, Faste (1994), defined it as ambidextrous thinking. Ambidextrous thinking is a combination of two different modes of thinking, i.e. convergent and divergent thinking. It involves the integrated use of capacities of both cerebral hemispheres and it fundamentally enhances mental operations to a “superior level of heightened awareness” (Faste, 1994).

2.7.3 Convergent and divergent thinking

Guilford's theory (1967) proposed 5 mental processes: “cognition, memory, convergent- production, divergent-production, and evaluation” (as cited in Mishra, 1998 p.145). Guilford (1967), the initiator of ‘modern creativity research’, differentiated convergent thinking and divergent thinking. In his view, Divergent thinking is sketching an idea from various disciplines and area of knowledge for an in-depth awareness of the world and one’s own place in the world. Divergent thinking engages in providing a number of solutions to a problem which is not properly defined.

In contrast, he presented another term, i.e. convergent thinking. According to him this type of creativity is capable of selecting a single correct solution to a well defined problem. The selection of an answer is based on accuracy, logic, restructuring and recognizing familiar information and recalling the past experiences. Previous knowledge is most valuable when the answer exists, but it only needs to be dug out from the stored information. According to him divergent and convergent thinking are two types of human responses to a set problem.

Kelly (2000) also defined divergent-production as the generation of options and convergent-production as the selection of options. Others also agreed

upon the ideology that divergent thinking is the ability to choose alternative approaches to a problem (Dorn, 1999; Essa, 2010), while convergent thinking is a way of thought that considers all available information to arrive at the single best possible answer (Arthur 2006; Chermahini, Hickendorff, & Hommel, 2012). Based upon the ideology of Guilford, divergent and convergent thinking are considered as two different ideal types of creativity.

2.7.4 Art activities increase divergent thinking

Art experiences mostly involve right brain functioning because creative thinking is a divergent process. It uses imagination to generate a variety of ideas for solutions. Hence art activities increase the divergent thinking ability of students. It motivates them to look beyond the apparent, to create novel ideas. There is a large element of creative thinking in solving open problems. Hudson (1966, 1968) suggested that divergent abilities might also be important in determining the pupils' choice of academic subjects. In particular, he found that art students scored higher on divergent-thinking tests while the science students, particularly those doing physics, scored higher on convergent thinking tests. Unfortunately the elementary and secondary schools emphasize subjects like science, mathematics, languages and general knowledge where students memorize names, and learn dates or formulas that tend to favor left brain tasks only and downplay operations on the right side overlooking the fact that art is as necessary as any other formal subjects. Broudy (1972) suggested that we need to educate our students' aesthetic perception and analytical skills, in order to cultivate their vision and sensibility, and make aesthetic literacy as common as linguistic literacy. These studies give a realization that both sides of the brain are of equal value and the school curricula should give importance to arts and science subjects on an equal footing.

2.7.5 Children's art and their Creativity

“Art is nonlinguistic but it gives a language to the emotions and feelings”

(Hurwitz, 2007)

Gowan (1972) considered creativity as an element of intellect. He defined creativity as cognitive, semantic and rational. Creativity is a reflection of child development related to his psychological and physical growth influenced by his surroundings. He opined that very young children expressed creativity extensively.

Lowenfeld (1954) tended to view the child's graphic expression to be the result of the mind's own activity. He asserted that art is differently perceived by a child and an adult. For a child art is novel and a mean of expression. The fact is that no two children are alike and that each child differs even from his earlier self as he constantly grows and understands and interprets his environment.

Children's art is innate. It is a universal pattern that very young children make scribbles (random marks). They are not demonstrated or taught how to make a scribble. It's like an instinctive activity. As soon as a child gets ready to grasp a pencil he begins to make random marks on whatever surface, he finds whether a wall, table top, a paper or a floor. It seems like a natural urge to express himself. It is the time when creativity flourishes. Very young children cannot articulate with words. Art becomes a language for them, through which others can better understand their personalities. Piaget (1970), declared that since childhood each human being looks at the world around him using his own perception and tries to make sense of it according to his measure of understanding. These doodling might be meaningless marks and lines for elders, but actually they represent a whole insight of a child and reflect his physical development. For example, they can tell whether a child's motor development is going parallel to his biological age or not. Similarly, by the end of the scribbling stage (2-4 years of age) a child grasps a crayon with his or her fingers and draws with the movement of the wrist (Lowenfeld, 1947; Schirrmacher, 1998). As his perception grows day by day he starts establishing a connection between inner and outer world. He becomes increasingly aware of the world around him, consequently his environment begins to appear in his drawings (Hurwitz, 2007, Lowenfeld, 1970).

Children learn and express what they know in many different ways. In the theory of multiple intelligence, Gardner (1983) suggested different ways of

learning other than the traditional ones, integrated in formal education and measured in traditional tests of intelligence as our educational settings put emphasis on linguistic, logical, and mathematical intelligence (Gardner, 1999).

However, according to Gardner (1999), there are many other, less recognized ways in which our understanding of the world can be shown. Some of these are expressed through creative means rather than through language or mathematics. Research shows that children improve their ability with the passage of time. The work of Piaget (1973) suggests that children progress through a series of distinct stages of development; as a result, there are gradual quantitative changes in children's mental capacities. Contradictory to this, teachers and elders usually expect children to perceive and draw like an adult. Further the occurrence of cognitive development also varies from child to child, depending upon the inheritance, and the richness of surroundings and experiences (Dorn 1999). In other words, it can be said that learning environment is one of the factors that nurtures the growth of creativity. MaryAnn Kohl (1994) an art educator opined that when children get involved in exploring, thinking, experimenting and trying new ideas, then creativity has a great chance of blossoming. There is nothing right or wrong to discover and explore art. Actually, the valuable thing is the process of discovering and exploration, not the finished product.

2.8 Importance of Elementary Art Education

Elementary school period is a crucial stage in a child's life. Any damage done during this period is irrevocable. It leaves its mark imperceptibly on one's later personality. That's why the early years of life are considered foundational for the cognitive growth and development in later years of life. Thus, this study is also concerned with the importance of elementary art experiences shaping problem solving in the later years of life.

2.8.1 Art is Necessary, Not just Nice (Hurwitz, 2007, p. 27)

It is the journey of transmission of ideas from "private world to the public space of the work of art" (Funch, 1997. P. 96). Students can only be helped to

form and develop their own values and attitudes through art education if their feelings are engaged. The emotional learning which students derive from their art education is important for them to develop a strong sense of self and an empathetic respect for others and a tolerance of difference (Hickman, 2004).

For well-rounded productive thinkers, the relevancy between visual art and young people is very crucial to be established. For this purpose, we have to be more focused on the learner rather than the teachers and curriculum content. When students are involved in art activities that probe their own ideas and thoughts and, introduce them with values, they are getting those life experiences that are considered the “cultural capital of the students” (Freire, 1993). This process of probing molds them into a being who can go beyond producing just numbers and figures. In art education, the student’s cultural capital can be respected by the teacher by providing an atmosphere where a student can indulge in the process of creativity; a process of probing students that will enable them to solve the actual problem they experience (Allison, 1998). The process of creativity depends upon the art curriculum, objectives, contents and most of all the pedagogical modes through which the art objectives are to be attained. The purpose of the curriculum determines the curriculum content (Hickman, 2004). The pedagogy of art is much dependent on the objectives of its curriculum. Whether the art class has been included in the curriculum as a formality for providing a fun hour or it has been included with the understanding that art is an integral part of human development makes the real difference (O’Farrell & Meban, 2003).

2.8.2 Elementary Art Activities Foster Creativity

One generally accepted phenomenon is that art training fosters creativity. Another important issue addressed in this study is the intrinsic difference between art and non-art students. Dunbar, (2008), Guilford (1967) and Hudson (1967) examined the creativity of art and non art students using, Uses of Object Task. They revealed that art students produced more artistic and creative uses than non-art students, thus performed in a different way. A study undertaken by Burton, Horowitz and Abeles (1999) in America discovered a significant correlation between good art and creative

thinking ability. Students of those institutes where art was integrated into the curriculum secured greater scores as compared to other institutes who did not give much attention to art in their syllabus.

The process of thinking is fundamental to creativity as one needs to think in a different frame of mind in order to be able to elicit novel ideas. Creativity is a multi-dimensional trait (Dunbar, 2008). It is a blending of originality and usefulness (Dunbar, 2008; Furnham & Bachtar, 2008; Guilford, 1950; Sternberg 2005b). Gardner (1993) and Sternberg and Lubart (1996) regarded creativity as a social process. Creativity has also been defined as the ability to identify new problems (Getzels, 1987; Runco, 1990) and generation of quality solutions (Jaarsveld, Lachmann & Leeuwen, 2012). Another popular approach to define creativity is through the use of divergent and convergent thinking (Baer, 1993; Dunbar, 2008; Guilford, 1950). Lowenfeld (1970) also considered creativity as a 'divergent production' opposite of convergent thinking. Schools usually stress the latter thinking style, resultant the outcome of the thinking is a single correct answer or the most acceptable solution (Lowenfeld, 1970). Creative art activities are extremely important in our educational system because they stress divergent thinking, in which there is no wrong answer, and any number of possible solutions to problems or any number of outcomes are acceptable (Lowenfeld, 1970).

2.8.3 Factors affecting the outcomes of Elementary Art Education

Among the many sources of an art classroom the important ones are; art curriculum contents and their objectives, art material, art activities and the teachers to facilitate students to achieve these goals. Teachers play a vital role in an art classroom as they know about the curriculum contents and goals, and provide instructions accordingly. They conduct activities intended to foster learning, and use evaluation processes to assess students' learning. With this point in mind, the present study focused attention specifically on teaching methods (Hurwitz, 2007). In an art classroom the teacher can probe for the inner world of a child; his fantasies, innocent desires, fears and reveries. Provision of visual objectification of what is felt, imagined, observed and directly experienced in the world is the true function of the art program (Hurwitz, 2007). Give a child a free

hand to express his inner feelings and you will see how much he is capable of expressing his inner world. Once a child is stopped by an external obstacle such as a scolding comment; ‘don’t scribble on the wall, it’s really bad’ or ‘have you ever seen a blue apple? Stupid, use red color for an apple’. These comments may shake the confidence of a child; a confidence of understanding one’s self, and a confidence of expressing one’s inner vision. Hurwitz (2007) describes this situation aptly:

“A well-known cartoon of children looking up at a teacher and asking with rueful expressions, “Do we have to do anything we want to?” illustrates the point. It is not that children are incapable of expressing rather that they might have difficulty connecting total freedom with expressive acts” (p. 302) as they have always being dictated and never let free.

These studies suggest that an art classroom should provide an atmosphere where children can express themselves freely. Moreover, it is very important to understand that children’s drawing ability develops parallel to their physical and psychological growth. As they cannot act and behave like adults, similarly they cannot draw and paint like adults. “Instead of considering this as a defect in children’s artwork, one might appreciate their honesty” (Lowenfeld, 1970, p. 145). For this reason, children’s art should not be judged as right or wrong and teachers should avoid forcing the children to draw or copy stereotype schema. Instead, the children’s creative thinking; ability to problem solving; reasoning, imagining and understanding the world should be stimulated to foster their artistic development.

2.8.4 Types of Instruction in Art Education

Among many other factors affecting the art education outcomes, one of the most important factors is instructional pedagogy. One type of instruction is direct instruction which is teacher-centered; traditional and stereotype. In this traditional method, it is the teacher who gives all the instructions without encouraging any response from the learners, whereas, the students act as passive receivers waiting for their teacher’s orders. This practice may inhibit the students from imagining,

thinking and reasoning. Such type of instruction may be useful for a short period of time before new information is provided.

Another type is indirect instruction commonly known as student-centered. In this, the process of producing an end product or arriving at a final conclusion is as necessary as the product or conclusion itself. Indirect-instruction activities involve group discussions, exchange of ideas, concept mapping and problem solving. In order to nurture creativity, children should be exposed to a wide range of materials and motivated to use them according to their own ideas (Essa, 2010).

A program can be well planned and resources plentiful, but if a teacher is unaware of the process of getting children to move in a productive way, then the art program, the teacher and students' envision will probably never be accomplished (Hurwitz, 2007). Through this discussion, it can be concluded that an art classroom should provide an environment in which traits of creativity are encouraged and valued. The creative environment is made up not just of the physical arrangements, such as material for an art classroom, but is permeated by an attitude of openness, acceptance, freedom of self expression, and encouragement (Essa, 2010).

2.9 Visual Art and Problem Solving Behavior

Hickman (2004) stated that art plays a significant role in achieving aims such as developing problem-solving skills through manipulation of materials and providing a platform to polish cognitive behaviors normally associated with divergent thinking and problem solving activity.

Art education has different approaches. One good influence comes from psychologists. Hurwitz (2007) regards contemporary art education as a contribution of the history of art and of general education along with the psychologists' investigation about learning processes. Previous researches have nonetheless made much progress toward a psychological understanding of artistic perception and aesthetic appreciation (Funch, 1997).

2.10 Problem Solving Ability

We daily meet many problems, some are simple, some complex and some ill-defined. People have distinct ways in which they perceive and assimilate information and take decisions and solve different problems. In the problem solving process the nature of the task and how it has been tackled by the person plays an important role in determining his problem solving performance. Effective problem solving requires a balanced combination of analytical and creative thinking skills.

Analytical thinking involves a process to reorganize, to compare, to evaluate and to select the relevant information. It is endowed with a logical framework to solve problems and often predominates in solving closed problems (a convergent process). On the other hand creative thinking utilizes to generate a huge range of ideas for solutions. It is a divergent process (Guilford 1950; Lowenfeld 1947). Creative thinking usually predominates in solving open problems.

Therefore, the term problem solving ability in this study is operationally defined as performance on problem solving ability tests (including divergent and convergent thinking tasks where divergent thinking was measured on Wallach and Kogan's Creative Thinking Test while convergent thinking was measured on Raven's Progressive Matrices. To be an efficient problem solver one needs to be proficient to switch from one kind of thinking to the other and back again, though this is not easy all the time.

2.11 Evolution of Problem Solving Theories

Since ages, problem solving has attracted the interest of psychologists, philosophers, and educationists who have put in a lot of effort and time to come up with substantial solutions (Johnson & Ranson, 1990). Different learning theories influence problem solving theories differently. According to behaviorists, problem solving process builds up through the positive and negative reinforcement mechanisms. On the other hand cognitive psychologists considered

problem solving as a process comprising observation, introspection, and heuristics development.

2.11.1 Behaviorism. Behaviorist learning theory explains two methods of problem-solving process. One of them is learning by trial and error. In this method the problem is tackled by a number of ways until the problem solver arrives at a solution. Solving jigsaw puzzles demonstrate this method of problem-solving behavior. In another method the learned responses are applied to a situation in a hierarchical manner known as Hull's response hierarchy. In this hierarchy, during solving problem situation, stimuli may evoke several different responses, one at a time, in order of strength, until the problem is solved or the organism runs out of its responses. These behaviorists' notions of learning and problem solving illustrated the apparent distinctiveness of the process but did not seek-out the cognitive mechanisms underlying the learning and problem solving process (Hardin 2002). These early conceptions of learning and problem solving described the obvious characteristics of the process but did not seek to elaborate on the cognitive mechanisms of the subject (Hardin 2002).

2.11.2 Cognitive approach. Advancement in cognitive psychology created new avenues and interests towards the psychological and intellectual processes involved in learning and solving problems. Initially those mental stages were identified through which problem solving process progress. Wallas and Polya, were renowned cognitive psychologists who at first proposed a four-stage model of problem solving. Wallas model of problem solving comprised four steps i.e., 1) preparation: defining the problem and gathering relevant information; 2) incubation: thought process occurring in subconscious; 3) inspiration: insight into the solution; and 4) verification: confirm the correctness of solution.

Polya's model (1954) illustrated the following four steps in the problem-solving process: 1) to identify the problem; 2) to develop a plan; 3) to act on the plan, 4) and to look backward. Nearly all problem solving methods have acknowledged Polya's four-step process in understanding the problem (Johnson & Ranson, 1990; Reynolds, & Fletcher-Janzen, 2007).

2.12 Problem Solving Thought Process

Lee (2004) stated that problem solving is a creative process. Similarly, Puccio (2006) defined problem solving as a mental process in which people need certain effective thinking skills that will support creativity in general way . Creativity is a combination of intrinsic, motivational and creativity-relevant skills that include coping with unpleasant situations, knowledge of problem-solving strategies, concentration, and ability to set aside problems (Amabile 1983; Sternberg 1999).

Fox (2008) also defined the problem-solving process within the framework of creative thinking process. According to his model the process of creative thinking in problem-solving can be seen as a five-step process. (1) *setting the goal* – the goal may not be clear initially, but will become clearer once the creative thinking begins; (2) *creative thinking step* – generating relevant ideas to the goal, putting logic aside as he elucidated that logical thinking may rule out some key components of the goal; (3) *organizing ideas* – according to priority; (4) *planning and implementing ideas* – to meet the goals. (5) *Evaluation* – evaluate the progress. It is a very important step though often neglected. Completion of the action brings about a sense of closure and the evaluating process is left out. Mark suggested in-depth thinking while moving towards action plan as hasty decisions may be detrimental to problem solving.

2.13 Creative Problem Solving

It is worth mentioning that the first comprehensive concept of creative problem solving was proposed by Alex Osborn (1942). Simultaneously, Guilford was making his way to this. Guilford (1954) opined that there were numerous kinds of problem-solving and for each kind of problem there were several possible ways by which they could be solved Such as reasoning, fluency of ideas, flexibility, evaluation, and originality. His ideas were highly recognized and universally accepted and made distinct contribution in art education.

Bies (1972) also classified the problem-solving ability into five abilities: problem identifying, reasoning, originality, flexibility, and hypotheses testing.

Alex Osborn's idea of creative problem solving CPS was further modified as a result of research and practice. Puccio, Murdock, and Mance (2007) referred to CPS model as the *Thinking Skills Model*. Osborn's original model initially comprised seven steps i.e., orientation – identification of the problem; preparation: collecting significant information; analysis: ordering the available information; hypothesis: gathering alternative solution, incubation: illumination; synthesis: restructuring relevant ideas; and verification: evaluating the final ideas.

Later in 1963 he himself modified his model and merged the seven steps into three steps: (1) Fact Finding: included problem definition, data collecting and analyzing; (2) Idea Finding: included idea production and idea development; and (3) Solution Finding: included evaluation and adoption.

This model was further modified by Parens (1967) commonly known as the Osborn-Parens CPS model. Many others also modified the model (e.g., Isaksen and Treffinger 1994; Basadur 1994; Isaksen, Dorval & Treffinger 2000; Puccio, Murdock & Mance, 2005) there were some mutual commonalities as their model's were based on Osborn's CPS Model. Puccio, Murdock & Mance (2005) presented a review of all these models and pointed out important similarity shared by all the CPS models that is the presence of the divergent and convergent phases of the CPS process. Each step of CPS model contains an initial divergent phase when many alternatives are generated using deferral of judgment, followed by a convergent phase in which the most promising of the options is selected by applying confirmatory judgment. This intentional severance and repetition of both divergent and convergent phases is the basis of CPS and appears in each of the models one way or the other. Researchers like Csikszentmihalyi (1996), Florida & Goodnight (2005), Puccio (2007) and Sternberg (1999) have associated certain cognitive and affective skills with creative individuals. These cognitive and affective skills include idea generation, curiosity, reasoning, imagination, elaboration, concentration, persistence, risk taking and empathy. Idea generation further comprises some characteristics i.e., fluency, flexibility, originality and divergent thinking. But all of these are not to be considered as a part and parcel of

a creative person or process. Some of these characteristics induce successful critical thinking while others are distinct but not mutually exclusive.

2.14 Assessment of Problem Solving Ability

Problem solving ability is a multifaceted cognitive ability that characterizes one of our intelligent activities. Our knowledge, beliefs, experiences, mental models and understandings all influence the way we perceive the problems and the way we solve them in everyday life, in school, at play and at the workplace (Chi & Glaser, 1985).

Sternberg (2005c) stated in his Structure of Intellect (SI) Theory that success in life can be accomplished through maintaining equilibrium of three characteristics of intelligence: analytical thinking, creative thinking and practical skills. Analytical thinking is basically computed by traditional tests. However success in every aspect of life needs the analysis of one's own thoughts and the thoughts of others as well. Moreover, it actually requires the creation and advocacy of novel ideas to other people.

Assessing problem solving ability of a person primarily depends on the understanding of how people perceive and define this cognitive ability. The Guilford's theory of creativity, Wallas and Polya's models of problem solving, SI theory of Sternberg, and CPS models by Osborn and Perkins all involve constant occurrence of divergent and convergent thinking as the problem solver moves from one step to the next (Reynold & Fletcher, 2002). Based on these theories and models the present research study assessed problem solving ability by measuring two distinct types of mental skills: 1) analytical skill, i.e., convergent thinking and 2) creative skill, i.e., divergent thinking. Therefore, tests involving convergent and divergent thinking were required to assess the operationally defined problem solving ability of the participants. For the successful production of ideas and creative achievement both convergent and divergent thinking are required. However tasks assessing these cognitive processes may be approached and tackled differently by different individuals (Carson, Peterson, & Higgins, 2003).

2.14.1 Convergence and Divergence Tests

A convergence test requires a participant to go through a list of options and converge on the right option (Gladwell, 2008; Villalba, 2008). As opposed to this, in a divergence test, a test taker is required to use imagination and think in as many different directions as possible. Hence there is no single right answer in this test. The examiner scores the number and uniqueness of the participant's responses. In fact the test measures something much closer to creativity instead of analytical intelligence. Both divergence and convergence tests are very challenging (Gladwell, 2008). The divergent thinking tests entail open-ended questions whereas convergent thinking requires a process of narrowing down the ideas. (Reynolds, Fletcher, 2002). The process is essential to recall past experiences, knowledge and recognition strategies.

2.14.2 Assessing Divergent Thinking

The tests of divergent thinking study individual differences in creativity by evaluating the production ability of the test takers and creative quality of the responses (Clapham, 2004; Guilford, 1950; Roue, 2011, Silvia, 2008; Weisberg, 2006). The figural and verbal prompts stimulate the creation of ideas (Kim, 2006; Michael & Wright, 1989; Wallach & Kogan, 1965).

The modern psychometric study of creativity, pioneered by J.P. Guilford's group developed a number of tests in 1967 to gauge creativity and divergent thinking, for example:

- Plot Titles: writing of original titles for a specified short story
- Quick Responses: a word-association test that scored uniqueness.
- Figure Concepts: finding of common characteristics of two or more pictures.
- Unusual Uses: telling alternatives of objects, e.g., bricks.
- Remote Associations: finding a related word between two specified words e.g. broken _ clear (the answer is glass).

- Remote Consequences: listing the consequences of unexpected events, such as loss of gravity.

Other popular tests used to measure creative and divergent thinking are the Torrance Tests of Creative Thinking (1966), and Wallach & Kogan's Creative Thinking Tests (1965). These creativity tests have been used to measure problem solving skills (Houtz and Krug, 1995; Clark and Zimmerman, 1984) and divergent thinking abilities (Darbor, 2010; Houtz and Krug, 1995; Kim, 2006; Roue, 2012; Plucker, 2001; Silvia, 2008; Sternberg, 2006).

2.14.2.1 Torrance Tests of Creative Thinking (TTCT). Torrance Tests of Creative Thinking (TTCT) this test was constructed in 1966 by Elis Paul Torrance. Nowadays, the test is used in the corporate world as well as in education to evaluate the participant's capacity for creativity (Kim, 2006, p. 3). The TTCT has verbal and figural tests. Both tests measure the five mental skills: fluency; originality; elaboration; abstractness of titles; and resistance to closure or openness (Silvia, 2008). The figural version comprises three activities composed of some shapes, figures and lines which require the subjects to construct a picture, complete a picture and use the lines or circles as a part of a picture (Kim, 2006; Treffinger, 1985). Though this test is a popular test of creativity (Kim, 2006), yet some researchers have opined that TTCT does not completely enfold Torrance's operational definition of creativity (e.g., Chase, 1985). Torrance himself never concluded that his tests assessed all dimensions of creativity, nor did he ever suggest that they should be solely used for making final decisions (Kim, 2006).

2.14.2.2 Guilford's Alternative Uses Task (GUAT). In 1967 Guilford developed a test known as Guilford's Alternative Uses Task to assess creativity. The test takers were required to tell as many alternate uses for a common household item (such as a brick) as they could. Guilford opined that production of a large range of ideas or solutions is central to creativity. He described this course of action as divergent thinking and classified this thinking type into further three measures: 1) fluency: the skill to come across various solutions promptly; 2) flexibility: the skill to generate a variety of alternatives; and 3) originality: the skill to create novel ideas different from the ideas of others (Roue, 2011).

Guilford, believed that creativity required a total freedom from functional fixedness in drawing up novel solutions (Kim, 2006).

2.14.2.3 The Remote Associates Test (RAT). To measure creativity Mednick and Mednick in 1962 developed the Remote Associates Test (RAT). The test comprised 12 two or three specified words, e.g., cherry, time, smell. The test taker requires identifying a word that can connect or relate these three apparently dissimilar words. In the above example, the answer or connecting word is 'blossom'. The connection between words is simply associative as based on the Mednick's (1962) associative theory of creativity (as cited in Chermahini, Hickendorff & Hommel, 2012, p. 177).

2.14.2.4 Wallach and Kogan Creative Thinking Test (WKCT). Wallach and Kogan (1965) constructed a creativity test similar to the TTCT. The distinction of this test is that it includes specified objects, for example, shoe, knife and key. The task is to tell the alternative uses of these objects. Wallach and Kogan (1965) originated a novel approach to the question raised after the Guilford's theory of intellect that: do convergent and divergent tests measure distinct traits? At that time their contemporary psychologists (e.g. Getzels and Jackson, 1962; Hudson 1966; Butcher, 1968) compared contrasting groups, i.e., convergers and divergers and found significant correlations between divergent and convergent tests and did not consider the two thinking types as being completely independent of one another (Lytton, 1971). The findings of Getzels, Jacksons and others raised questions and doubts about generally established level of correlations between convergent and divergent thinking tests. Assessing this issue Wallach and Kogan suggested that the test-like atmosphere and pressure under which these measures were always administered might have been the underlying factors which resulted in these findings. Therefore, they not only removed the evaluative atmosphere and time-pressure of school achievement, but also the IQ tests from the situation, disguising their tests as games.

After reviewing all these tests it was found that the Remote Associates Test was not full filling the scope of the study. Because it requires the test takers to make associations, based on their memory and rich vocabulary of words, hence

measures creative convergent thinking (Chermahini, Hickendorff & Hommel, 2012). However, the present study required a test that would not depend on declarative knowledge gained by academics. Therefore, this test could not be included in the current study. Similarly, Guilford Alternative Uses Task was also dropped because Wallach and Kogan (1965) Creative Thinking Tests already comprised the *Alternative Uses Task*, used by Guilford, along with *Instances Task* and *Pattern Meaning Task*. Hence, offering more opportunity to measure divergent thinking of the subjects. Similarly, Torrance Test of Creative Thinking was also dropped due to its non-availability in the country.

The study selected Wallach and Kogan (1965) Creative Thinking Tests to measure divergent thinking of the participants due to some reasons. 1) The tests measure operationally defined divergent thinking, i.e., generation of multiple ideas and alternate responses; 2) short versions could be easily extracted; 3) easily available and admissible in a game like situation favorable for children; 4) reliability and validity was also available. Therefore, the study used this test as a framework to develop two short versions. One version was developed for adolescents, consisting of 15 open-ended questions matching their level of cognitive ability and the second version for children sample, comprising 9 open-ended questions. The test measures commonly involve a scoring of the fluency and originality of ideas, which can be considered to reflect the quantity and quality of ideation performance (Benedek, Mühlmann, Jauk, and Neubauer, 2013; Kim, 2006; Roue, 2011; Runco, 2008).

2.14.3 Convergent Thinking Tasks

The traditional IQ tests concentrate upon measuring the convergent thinking level, which enables an individual to select a single correct response from a series of alternatives through logical reasoning (Guilford, 1959). A number of convergent spatial tasks are available, many of which are well established, such as Raven's Progressive Matrices, and Wechsler scales.

2.14.3.1 Wechsler Scales. The WISC-IV tests were developed by a psychologist David Wechsler in 1939. Today three different Wechsler scales are

available for different age groups: 1) WAIS-R: The Wechsler Adult Intelligence Scale; 2) WISC-R: The Wechsler Intelligence Scale (for Children); and 3) WPPSI-R: The Wechsler Preschool and Primary Scale of Intelligence.

All these scales need to be administered individually and are graded to provide four different scores: reasoning matrices, verbal IQ, performance IQ and full scale IQ (Colman 1990). The Full IQ Score depends on aggregate scores; therefore usually it is worthless if test taker has inconsistent scores in different scales of the test.

Colman (1990) described that, these tests do not measure a child's creativity or other forms of intelligence, and there are many factors that can affect the results of the test. He further stated that, a number of the item questions in WAIS appeared to assess knowledge or memory instead of thinking ability. For example, in the comprehension sub-test the questions about the writer of 'Tom Sawyer' and asking the meaning of 'flexible' are the items that scored on the basis of general knowledge (O'Leary, Rush, & Guastello, 1991).

2.14.3.2 Raven's Progressive Matrices. Raven's Progressive Matrices test is a standardized psychological test of solving the reasoning problems and was originally developed by John C. Raven in 1936.

This test comprised 60 matrices. In each test item, the subject is asked to identify the missing element that completes a pattern from a given set of additional patterns, by using analytical and logical reasoning as required for the converging thinking process (Raven, 2000; Carpenter, Just, & Shell, 1990). This test is considered to provide an estimate of fluid intelligence, and is an insight-problem test (Chermahini, Hickendorff, & Hommel, 2012). This test needs new information to get solutions to the problems without depending on declarative knowledge obtained either by schooling or earlier practices (Carpenter, Just, & Shell, 1990).

Further, the inferences based on validity generalization studies using Raven's Progressive Matrices since last 60 years also provide evidence of its criterion-related validity. For example the scores on RPM were found to be correlated with the scores of participants on creativity tasks (Ree & Carreta, 2002). Similarly the scores on SPM were found to be correlated with performance in decision making tasks (Gonzalez, Thomas, & Vanyukov, 2005). The results obtained from the pilot study of the present research were also incongruous with the studies conducted abroad.

The Raven's Progressive Matrices have been designed to cover a very wide range of mental ability to be usable with subjects irrespective of age, sex, nationality, or education (Colman, 1990). Because of being nonverbal and simple in its use and interpretation, two different forms of matrices i.e., Standard Progressive Matrices (SPM) and Colored Progressive Matrices (CPM) were selected to measure convergent thinking of the present sample.

2.15 Problem Solving Tasks

In order to measure the problem solving ability of the study sample the selection of a relevant test was an uphill task. The present study required a test which could operationalize the definition of problem solving ability presented by the current study. Problem solving theories revealed that problem solving thought process always contained phases of divergent and convergent thinking. Divergent thinking is often used in combination with convergent thinking. The procedure pursues a particular set of logical steps so that best possible solution can be selected. Once the divergent thinking process is completed, convergent thinking starts organizing and arranging ideas and available information in order to select the few most promising ideas (Vidal, 2004). Vidal illustrated this process in the form of a diamond as shown in the following figure.

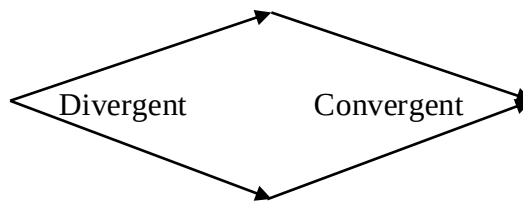


Figure-1: The creative Diamond (Vidal, 2004, p. 17)

2.16 Gestalt psychologists' problem solving approach

One leading approach to solve problems was initiated in 1920s by Gestalt psychologists. They investigated how people solved complex problems. In the consequence of their research a range of traditional problems were generated and widely used in problem solving research. Such as, Dunker's radiation problem, Dunker's candle problem, Maier's two string problem and Maier's nine dot problem.

Gestalt psychologists referred these problems as insight problems. They argued that problem-solving performance has two approaches: productive as well as reproductive. The productive approach characterized by restructuring the problem leading towards a sudden insight with an 'Ah-ha!' experience. On the other hand, reproductive approach leads to re-process of the past experiences. This might possibly act as an obstacle to delay or even prevent the successful problem solving, for example, the occurrence of functional fixedness. The concept of functional fixedness as proposed by Gestalt psychologists accounted for the negative effects of past experience on a problem. Similarly, Lovett and Anderson (1996) have also revealed that people see the current state of a problem in the scenario of their previous related experience of success. Therefore, they usually try the already practiced operators to solve their existing problem. This can be easily illustrated by the Dunker's candle problem.

2.16.1 Dunker's Candle Problem

In this problem participants were given a candle along with a box of matches, a wooden box of nails, and a hammer. The task was to attach the candle to the wall above a table in a manner that its wax didn't drop on the table. The majority of the test takers tried to fix the candle directly to the wall with nails. Some of them also attempted to stick it to the wall. However, only a few of the participants got the idea of using the wooden box of nails that could be fixed on the wall to hold the candle. This problem exemplified the term of functional fixedness. Dunker asserted that the test takers were stuck to or fixated on the box's usual function of holding nails and could not re-conceptualize it. This fixation kept them from solving the problem.

2.16.2 Maier's Two-String Tie Problem

Maier (1931), a Gestalt psychologist developed two-string problem commonly known as string tie problem. In this task two strings were hung from the ceiling in a room having a number of objects e.g., a set of pliers lying on the floor. When the test takers entered the room on their turn they were asked to tie the two strings. Both were hanging so far apart that they could not tie them together by holding one string in a hand and walking towards the other. It often happened that after a great deal of thinking some of them fixed the pliers to one of the strings and moved it to swing like a pendulum, while holding the other string in order to grab the other on its upswing and tie the two together. Most of the participants got the idea of using pliers to move the string to and fro when Maier himself moved the string posing that it happened accidentally while he passed by the string. Maier revealed that it was the pendulum hint that resulted in the re-organization and re-structuring and led the problem to be solved.

2.16.3 Insight problem

An insight problem requires test takers to alter their perceptive and view the problem in an innovative way to find a novel solution. There are different types of insight problems. The widely used types are verbal, mathematical, and spatial (Dow & Mayer 2003). Gestalt psychologists even stated that insight

problems are a separate category of problems in their own right. Gestalt psychologists asserted that the insight problems are a separate type of problems. The solving of such a problem often has an Aha! Experience (Chi & Glaser, 1985; Chu, 2009).

2.17 Newell and Simon's Approach

Another approach of solving problems widely used by researchers was presented by Newell and Simon (1972). They stated that solving problem comprises a process of search in a problem space. A problem space is one that has an initial state, a goal state, and a set of operators that are useful to direct the solver to move from one state to another. This whole set of states which can take place after the application of operators is identified as the problem space. A typical task used to explore problem solving was the Tower of Hanoi task (Chi & Glaser, 1985; Chu, 2009). In this task, a board with three rods on it is used. The leftmost rod holds three disks of decreasing size. The problem solver is required to shift all the disks on the rightmost rod. The problem solver has to follow rules while moving the disks. He can move only one disk at a time, whereas the larger disk can never be placed on a smaller disk. There are many actions such as physical actions, or mental operations required by the problem solver to move from the initial state to the goal state. Another example is the nine dot problem, which is a spatial insight problem. This problem comprised nine (9) dots arranged in a square. The participant is asked to connect all the nine dots by using not more than 4 straight lines, without retracing or lifting up one's pen from the pattern. There are many operators involved from the initial state to the goal state. This problem can be solved only if the problem solver draws lines beyond these dots that make up the square (Kershaw & Ohlsson, 2004; Chu & MacGregor, 2011). Many psychologists have used this problem to study insight. The difficulty in solving this problem is caused by fixity. Actually the solution lies in looking beyond the conventional figure i.e., looking outside the box. Most respondents stay inside the square formed by the dots and thus are unable to solve this problem (Kershaw & Ohlsson 2004; MacGregor, Ormerod & Chronicle, 2001). Similarly, in the matchstick problem (which is a spatial composition of several matchsticks like the one used by Guilford, 1967) many operators can occur to form a new pre-

described composition. The task involves restructuring of the composition to get the new composition (Kleibeuker et al. 2013).

2.18 Edward de Bono's Approach

Another indirect and creative approach for problem solving was proposed by Edward de Bono in 1967. The approach was termed lateral thinking. He defined lateral thinking as a reasoning ability that is not so obvious and is independent of traditional step by step logic. This ability leads to creative thinking and to think outside the box when someone needs to solve problems.

Lateral Thinking Puzzles are widely used in critical thinking; reasoning and problem solving research. These are a fusion of puzzles and small stories commonly known as verbal insight problems. People usually read these or share with others and determine the answers by asking for clues. For Example, the following puzzle has a story in it that a black man dressed all in black, wearing a black mask, stands at a crossroad in a totally black-painted town. All of the streetlights in the town are broken. There is no moon. A black-painted car without headlights drives straight toward him, but turns in time and doesn't hit him. Now the respondent will think how that can happen and will have to find its logical explanation that can truly satisfy (Second lateral thinking test, University of Kent Careers and Employability Service).

In problem solving research psychologists have been inclined towards the uses of two approaches. They either have used Newell and Simon's approach or have applied a more descriptive approach used by Gestalt psychologists (Dunbar, 1998). Many recent research studies have utilized these problems to assess divergent thinking, and problems solving ability of their sample participants. For example, Chein, et al. (2010) asked the participants to draw as many shapes as possible from nine dot square grids. Lewis, (1991) selected Guilford's Matchsticks Task as a divergent thinking task for assessing spatial and problem solving ability of the subjects. Similarly Knoblich, et al. (1999) developed and used matchstick arithmetic. This involved matchsticks that were arranged to show a simple but incorrect math equation in Roman numerals. The task was to correct

the equation by moving only one matchstick. Goel and Vartanian, (2005) and Kleibeuker et al. (2013) used a set of matchstick problems to assess creative problem solving and divergent thinking and to measure the relationship of creative performance. They found increased activation in bilateral ventral and dorsal prefrontal cortex when solving match-stick problems, the brain imaging data showed that activation of these regions correlated with successful creative problem solving performance.

The present study selected some verbal and some spatial insight problems (discussed in detail in chapter IV) to devise a problem solving ability test for adolescents. For the children's sample the study utilized a set of matchstick problem tasks MPT to assess their problem solving ability (see chapter-V). These problems focused on visual-spatial tasks because performance on these tasks is relatively independent of conceptual development and knowledge (Kavac et al., 2010).

CHAPTER – III

RATIONALE OF THE STUDY

CHAPTER-III

RATIONALE OF THE STUDY

The purpose of this study was to examine the role of elementary visual art and its impact on problem solving ability of children along with its long term effects on their later life.

Today, the world acknowledges the importance of art education. It not only builds up students' confidence, but also equips them with the skills needed to combat the hurdles that come their way. It teaches them to become better problem solvers. It infuses integrity, dignity and fairness. Art arouses their curiosity to explore the world around them and teaches them the art of working together as a team to improve their existing conditions. Art has the power to bring about a humanistic change in the society and this can be done fruitfully if it is introduced in elementary years of life. Thus, the art should be an integral part of the curriculum if we wish to bring a positive change around us.

The present study will contribute in the educational, social, emotional and interpersonal wellbeing of our children. It will contribute in developing strategies and art curriculum that could nurture their creative and analytical thinking and ultimately their problem solving skills and decision making powers. The study will also facilitate the policy makers, practitioners, teachers and caregivers to have better understanding of the importance of visual art in education and its role in developing and enhancing cognitive competencies of the children.

In addition, the study will contribute in drawing attention towards the importance of equity and equality of visual art education. Equity is the most important concept in characterizing the fairness and effectiveness of education systems (Sherman & Poirier, 2007). For the very purpose this study will deal with the issues of when and how the visual art education should be introduced to gain the maximum advantages in terms of achieving higher thinking level and cognitive competencies. The study will

also help in determining the most appropriate age for stimulating ‘artistic expressiveness’ in children, i.e., elementary school years because its blossoming, seemed at an end afterwards (Gardner, 1980). It is like a child who in order to become a ballet dancer has to be trained between the ages of 5 to 8 years because the bones harden beyond those years and cannot be bent or turned in the desired manner. Similarly, the mental and physical growth of a child can be affected adversely if he is deprived of a balanced diet during the crucial early years of his life. The study will also contribute in identifying the most appropriate type of visual art pedagogy to provide a creative learning environment in nurturing the two types of thinking i.e., convergent and divergent thinking to foster problem solving ability of the children.

To address the issue of equality for visual art education the study will sensitize the policy makers to the slogan ‘*Art Education for all*’ and to the fact that art education should be given importance on equal footing as other academic subjects. The study will inculcate a better understanding of visual art education among the policy makers and teachers in order to bring it at par with the other academic subjects. It will help them acknowledge the role of art in motivating students towards their studies, providing them freedom of expression, time and space to enjoy their innocent creativity; helping them in discovering their latent abilities and ultimately infusing self confidence in children. This freedom of expressing their emotions without the fear of adult intervention or denial will goad them on, to achieve new horizons. The dropout rates of elementary level will decrease because art brings color and a pleasant change in the life. It is the stereotype teaching methodology which causes boredom, fear and stagnation, leading to lack of interest in studies and a decrease in attendance and enrollment. Art infuses, trust, faith and confidence in the life of a child.

Furthermore, the study will provide directions for the art curriculum to be incorporated at a relevant age in accordance with their developmental stages. It will also highlight the importance of teachers’ training to become specialists in this field in order to understand not only the significance of children’s art but also its relationship with their physical and mental growth. Unfortunately our present education system does not acknowledge the significance of art education. The elimination of visual art from the public schools’ curriculum reveals that we are

unaware of its importance. In fact, this act of elimination of visual art from the elementary school curriculum was the major reason of taking up this research and the primary motive behind the present research to highlight the importance of visual art education for the future. The study has made an effort to bring about a positive change in the general perception of the policy makers towards the visual art. This study will open new avenues for visual art education as no considerable research on this topic has been conducted in Pakistan yet. On the other hand it will motivate and give impetus for the research ventures to conduct further research on studied variables in relation to different age, gender and income groups, etc.

In short, this study will bring worth answers to some questions that arise in the minds of the general public, like what does art education do for the human being and for humanity? How does art contribute to education? Why do we include art in the curriculum? It will focus on how art education becomes meaningful as a language; as a source of self expression and as the noblest expression of the human spirit, i.e., to create: to create work to the best of one's ability, for the sake of its own personal fulfillment; for the sake of social advancement and for the sake of economic development. This is what art has been from the earliest days of mankind and from childhood to old age.

Conceptual Model of Relationship among Study Variables

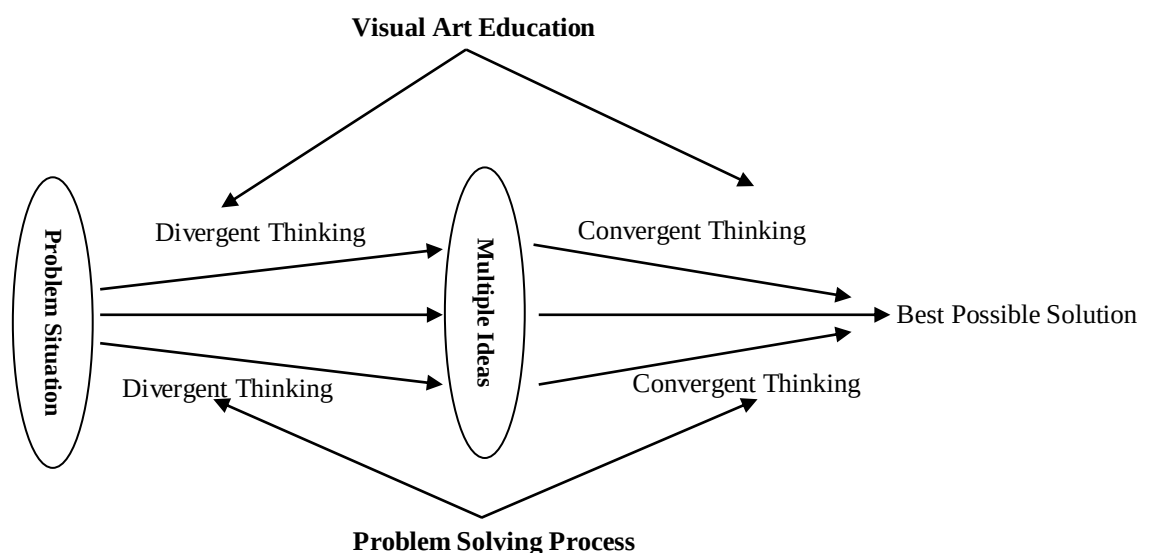


Figure 2: A diagrammatic representation of the positive relationship between visual art and problem solving ability along with their common constructs.

3.1 Research Design

This research comprised two interrelated studies. Study I was a retrospective study concentrating on the long term effects of elementary visual art on later years of life. While study II was conducted in the present scenario of education being practiced at elementary school level in Peshawar. Study I facilitated study II in respect of examining the impact of different instructional pedagogies of visual art upon the problem solving ability in later life. In this study independent variable was visual art education along with its two different pedagogical approaches, whereas, dependent variable was the performance on problem solving test as well as convergent and divergent thinking tests.

The studies were carried out in two Phases. Phase I further comprised two stages. Stage I dealt with item selection and try out of instruments to see if these were clear to Pakistani sample whereas stage II dealt with determination of validity and reliability estimates of all the scales currently used in this research. Phase II was carried out to collect data from actual sample subject of the study to verify the study hypotheses and the proposed model of relationship between study variables.

CHAPTER – IV

IMPACT OF ELEMENTARY VISUAL ART EDUCATION ON PROBLEM SOLVING ABILITY IN LATER YEARS OF LIFE

CHAPTER-IV

IMPACT OF ELEMENTARY VISUAL ART EDUCATION ON PROBLEM SOLVING ABILITY IN LATER YEARS OF LIFE

4.1 Phase-I: Determination of Psychometric Properties

4.1.1 Method

The Phase I of present study dealt with the item selection, try out and determination of psychometric properties of the instruments. This phase consisted of multiple stages.

4.1.2 Stage I: Item Selection

Objectives

The main objective of stage I was to devise scales and to explore whether these scales were comprehensible by Pakistani adolescents.

Instruments

The Following instruments were developed and used in Phase I of Study I.

1. Questionnaire
2. Problem Solving Ability Test (PSAT)
3. Creative Thinking Test

Questionnaire:

A questionnaire was devised to collect relevant information regarding demographic characteristics and visual art pedagogies followed during the elementary school years of participants. Another purpose of the questionnaire was to inquire whether the respondents had received visual art at the elementary level or not in order to form relevant groups i.e., art group and non-art group. It was a

simple questionnaire. Initial questions were designed to obtain the demographic data of the participants such as name, age, gender and name of their elementary school, etc. (see Appendix A). The rest of the questions incorporated to record the information regarding their elementary art education and to identify the pedagogies of visual art education that participants received during their elementary school years. The generation of such particular questions was based on the information extracted from theories of visual art education. Afterwards, the questions were analyzed and checked by a committee of two experts for the selection of relevant questions for the tryout stage.

Problem Solving Battery:

A battery was devised to measure the operationally defined constructs or variables of the present study. Effective problem solving requires a controlled mixture of analytical and creative thinking. Analytical thinking is a convergent process while creative thinking is a divergent process (Arthur, 2006; Guilford, 1967). In the convergent process the seeker consciously narrows down the available possibilities to select one correct answer or solution for a problem. On the other hand divergent thinking helps the seeker to generate novel and alternate solutions to a problem (Gardner 1993). Raven's Standard Progressive Matrices (SPM) (1936) being nonverbal and simple in its use and interpretation, were selected in its original form to measure convergent thinking of the present sample. To measure the divergent thinking, a short version of Wallach and Kogan's Creative Thinking Test (WKCT) devised by Riaz (1976) was used. To measure problem solving ability of the participants a separate test, Problem Solving Ability Test (PSAT) was used. Before describing the SPM and WKCT the study will discuss the development of PSAT at first.

Problem Solving Ability Test:

This test was developed indigenously. As per requirement of the present study a test was needed to be developed that could measure the problem solving ability of adolescents. To devise the test evidence based research literature, different theories and models of problem solving were consulted. Many foreign

researchers have used lateral thinking puzzles or insight problems for this purpose, which seek for only one correct answer (e.g., Metcalfe & Wiebe 1987; Batchelder, W. H. & Alexander, 2012). But the present study needed a kind of test that would have comprised a set of problem statements for which participants could bring about many possible solutions or answers to a problem.

After extensive study of research publications it was found appropriate to develop a test comprising a set of problems with more than one appropriate solution. For this purpose initially a number of lateral, verbal and spatial puzzles were selected from the research literature to develop a set of lateral thinking problems and insight problems. (e.g., Chu & MacGregor, 2011; Dunker, 1945; Mayer, 1931). The problems that were identified by the experts as relevant and having the capacity to provoke alternate appropriate solutions were retained, while the rest were discarded. After which a total of twelve items were retained for the tryout stage (see Appendix B).

Wallach–Kogan Creativity Tests (WKCT). Wallach and Kogan Creativity Tests (1965) are commonly used divergent thinking tests (Cheung, Lau, Chan, & Wu, 2004) and are useful in collecting effective data quickly.

The present study utilized three instruments out of five from the original test. The selected instruments were: Alternate Uses, Instances, and Pattern Meaning. The study further selected five items for each instrument. The reliability of the short version of Wallach and Kogan's Creative Thinking Tests for the current sample was computed in the next stage.

The WKCT test required participants to list as many possible uses for a common household as possible (e.g., knife) and to list possible instances for square and round things (see Appendix E). They were also required to give meaning for five patterns. In each case two variables of creativity were studied to measure divergent thinking of the participants (Hota, 2000) I) *fluency*; the total number of responses produced by the respondents; II) *originality*; the number of unique and unusual responses made by respondents (Riaz, 1978). No time limit was given to the participant for giving responses as recommended by Wallach that

creativity test should be administered without time limits, since time limits necessarily limit ideational fluency by cutting of the flow of ideas and hence also restrict creativity (as cited in Hota, 2000, p. 588).

The two out of three instruments involved verbal stimulus behavior and one involved non-verbal stimulus behavior (Hota, 2000). The details of selected instruments are given as under:

1. ***Alternate Uses.*** This activity requires the participant to generate possible uses for verbally specified objects. The instrument consisted of five items, three examples of which are as follows:
 - Tell all the different ways you could use a newspaper.
 - Tell all the different ways you could use a knife.
 - Tell all the different ways you could use a shoe.
2. ***Instances.*** In this task the participant was required to generate possible instances of a class concept that is specified in verbal terms. Some simple items of the task:
 - Name all the round things you can think of.
 - Name all the things you can think of that will make a noise.
 - Name all the square things you can think of.
3. ***Pattern Meanings.*** This task involves visual stimulus material. A total of five patterns were included in this measure. The participants were required to generate possible meanings for each of the abstract visual pattern appear on the separate cards. Respondent were instructed to take every design as a complete entity and produce responses, for example:
 - Look at this drawing and tell all the things you think this could be (Hota, 2000).

Example items were also provided to warm-up students' thinking.

4.1.3 Stage II: Tryout

Instruments

A tryout study was conducted to see the relevancy, suitability and comprehension of the items devised for the questionnaire, creative thinking test, and problem solving test and standard progressive matrices. The study sample (N=75) was selected through convenience sampling technique. Permission was taken from the administration of a local college in Peshawar. The participants were given the booklet comprising all the scales and were also given a brief explanation about the present research. After distribution of the tests among participants they were instructed to read each item carefully to identify if any statement was difficult to understand or not relevant to the Pakistani culture. Moreover, for problem solving ability test the participants were required to generate as many possible alternate solutions for each problem as possible. The received responses were then compiled to verify the maximum number of possible and logical solutions of each puzzle. There is usually only one correct answer for a given puzzle, but, in this test, those puzzles were selected for which more than one solution was possible and satisfying as well.

The committee of experts was consulted to analyze the data critically. After the consultation of the committee, the item format of the questionnaire was changed from the Likert format to dichotomous to avoid confusion in answering the questions. The items included in problem solving test, WKCT and SPM were reported sound and relevant. No issue related to understanding of concepts, suitability for the age group of current study sample was identified. The sample also reported that there is no item in the test irrelevant to our cultural values. So the committee concluded that the items are general in nature and globally acceptable.

After the thorough analysis of received responses in the problem solving ability test the experts selected those items that could provoke two (2) to three (3) logical explanations for each problem item. Therefore, seven problems having more than one logical explanation and solutions were retained to be scored in the

final test while the rest were discarded. Further the committee also decided a title ‘*Problem Solving Ability Test, (PSAT)*’ for this instrument. The seven items of the test consisted of four verbal insight problems and three spatial insight puzzles. (see Appendix D).

Verbal Insight Problems

These four items were lateral thinking puzzles. These items were selected to tap the analytical as well as creative thinking of the participants. Participants were asked to read the problems carefully, imagine the situation and bring about maximum of three logical explanations (example given below).

Example: There is blood on the ceiling of my bedroom. There has been no murder or killing of any person. Nobody has played any trick with me. Can you suggest logical explanations?

Examples of possible multiple answers provided by the participants and approved by expert committee were:

1. Blood of an Injured Lizard
2. A bird’s blood: as it might have entered into the room through a window, got injured by a ceiling fan, and spotted ceiling with blood.
3. Mosquito’s blood: somebody might have hit the mosquito with pillow and it left the blood spot on the ceiling.

Examples of illogical explanations brought about by participants:

1. There was a murder or suicide committed in that room. (Although it was clearly written in the puzzle statement that none of these situations happened).
2. Red ink was splashed (word “blood” clearly indicates the kind of spot”).
3. A ghost lived in that room.

Spatial Insight Puzzles

These puzzles were chosen to assess the ability that one could perform a novel or difficult task. Three items were selected to tap this construct; a matchstick puzzle, a string tie puzzle and a candle stick puzzle. These problems were presented in picture form.

Standard Progressive Matrices, SPM (Raven, 1938)

The SPM is a reliable test to measure the level of convergent thinking (Jaarsveld, Lachmann, & Leeuwen, 2013). This nonverbal group test has been quite extensively and effectively used in cross-cultural research and has proved reasonably valid in Pakistan (Riaz, 1978). The reliability of the scale for logical intelligence has been checked and proven to be optimal by a number of studies in the Country (Gondal, 2013). The estimated internal reliability of test in Pakistan is .88 to .89 (Ahmad, Khanam, & Riaz, 2008; Gondal, 2013). It was therefore decided to use it as a test to measure the convergent thinking of respondents in the present research. The study utilized the original form of the matrices. The booklet consists of five sets: A to E of 12 items each. These items within each set are specified in order of difficulty, requiring ever greater cognitive ability to encode and evaluate information. All items are printed in black and white form. Each matrix of geometric shape is presented with one part missing and set of answer choices are given against each matrix from which the right missing part is to be selected by following the right pattern. The study used all the 60 multiple choice questions. In each test item, the participant was required to identify the missing element that completes a pattern.

4.1.4 Stage III: Determination of the Psychometric Properties of Instruments

The psychometric properties of the instruments used in present research were conducted in stage II. This is an important step in establishing the usefulness of any scale

Results

To analyze the data, SPSS version 18 was used. Two tests were designed in the present study i.e., problem solving ability test and creative thinking test while the Raven's Progressive Matrices were used in original form. Therefore construct validity of the first two tests were required to be computed. Furthermore, to determine the reliability of the all the three scales on the study sample, Alpha Coefficient was calculated after the exclusion of unsatisfactory items through Cronbach Alpha.

Item total correlations

After the exclusion of unsatisfactory items the Item total correlations of PSAT and WKCT were calculated to analyze each item in order to check whether all the items significantly measured the respective construct. For this purpose, the items of each scale were individually correlated with the total score of their corresponding scale for internal consistency.

Table 1

Item total correlations of Problem Solving Ability Test 7 items (N=75)

Item No.	R
1	.61**
2	.60**
3	.56**
4	.20*
5	.42**
6	.39**
7	.37**
* $p < .05$, ** $p < .01$	

Table 1 shows that all the items are significantly positively correlated with the total score of the subscale. This suggests that internally the scale is consistent with all the items having their due share in the measurement of problem solving ability. The highly significant correlations are also suggestive of the fact that the scale was not only valid but also measured same construct.

Table 2

Item total correlations of fluency and originality measures on WKCT 15 items (N=75)

Fluency		Originality	
Item no.	R	Item no.	R
1	.47**	1	.42**
2	.57**	2	.43**
3	.59**	3	.24*
4	.65**	4	.50**
5	.59**	5	.48**
6	.53**	6	.21*
7	.69**	7	.23*
8	.53**	8	.30**
9	.62**	9	.27*
10	.70**	10	.24*
11	.74**	11	.16*
12	.82**	12	.44**
13	.80**	13	.40**
14	.79**	14	.35*
15	.75**	15	.17*

* $p < .05$, ** $p < .01$

Table 2 indicates item total correlations of fluency and originality measures of WKCT. All the items have highly significant correlation with the total score and hence suggest that the scale is internally consistent and all the items have their due share in the measurement of divergent thinking. The moderately to highly significant correlations are also suggestive of the fact that the scale was constructing valid and all items are measuring one construct.

Reliability Analysis: Internal consistency of the scales was estimated on the responses of the sample. In order to establish the internal consistency of three tests, Alpha Coefficient was calculated through Cronbach's Alpha. The summary of the results is presented in Table 4.

Table 3***Reliability Estimates of all Scales (N = 75)***

Scales	Subscales	No. of items	
PSAT		7	.73
SPM		60	.89
WKCT	Fluency	15	.90
	Originality	15	.62

Table 3 indicates the alpha coefficient of all the three tests. It indicates the magnitude of reliability, ranging from .62 to .90 for the two measures of WKCT; .89 for SPM; while .73 for PSAT.

4.1.5 Discussion

Study-I consisted of three phases. Phase-I was carried out to develop an indigenous problem solving test. There are numerous tests and inventories to assess problem solving ability in the West but all of them seek for a single correct answer or solution. Based on the Guilford's (1960, 1970) theory of creativity, and *The Creative Diamond*, a model proposed by Vidal (2004) to describe the divergent and convergent operations involved in creative problem solving, the present study was seeking for a test to assess the problem solving ability to answer test questions with alternate solutions. For this purpose an effort was made to devise a meaningful instrument to measure fluency of ideas while solving various problems. It is evident that for any specified problem there are more than one possible alternative path from an initial state to the end itself as mentioned by Newell and Simon (1972).

The operation factor of divergent production (*operation* a dimension of Guilford's structure of intellectual model) is vital to creative problem-solving. Therefore, the test measured the fluency of ideas; one of the distinct factors of divergent production (Guilford, 1960). Besides fluency of ideas, social values, rational appeal or rationality, and appropriateness of the ideas are also necessary

for effective problem solving. Therefore, to select and finalize the maximum number of best possible and appropriate answers for selected problems a pilot study was conducted.

As mentioned earlier the two important components of problem solving, i.e., divergent thinking and convergent thinking were also measured separately. For this purpose the study devised a short version of a creative thinking test originally developed by Wallach and Kogan (1965) to measure divergent thinking of the study's participants.

To devise the Problem Ability Test, an extensive literature review was carried out along with the reviewing of some insight problems originally used by Gestalt psychologists the later on by the contemporary researchers. Initially the test comprised some problems involved lateral thinking: a thinking proposed by Edward de Bono (1967) an indirect and creative advance to problem solving along with some spatial and insight problems.

First of all development and standardization of PSAT and WKCT was carried out. To assess how well a test battery has been structured, needs a validity of that test. Therefore, the study focused on computing the validity of problem Solving test and short version of creative thinking tests to assess that the tests were measuring the same constructs for which they were devised.

To measure the effectiveness of the instruments, the items included were validated for study I sample. For content and construct validity of both tests, the selected items required at first, a qualitative item analysis by the relevant experts. A set of selected items and open ended questions were analyzed by two judges. Based on their mutual consent, six lateral thinking puzzles and four spatial and insight problems were selected for the PSAT.

Similarly, to measure divergent thinking of the subjects the creative thinking test developed by Wallach and Kogan (1965) was reviewed and a short version of the test was devised. The test then finally comprised five open ended

questions for each subscale, i.e., alternate uses, instances and pattern meaning as suggested by the judges.

Phase I further comprised a pilot study to ensure the effectiveness and comprehension and understandability of scales. The sample of present study selected were adolescents from 15 to 20 years of age. The adolescence is a time of dramatic change. For example, change occurs in their physical appearance as puberty comes, relationships with parents, siblings and peers also change. Expectations at home, school and social life get increased as cognitive abilities expand. Thus, this age has its importance in respect that better understanding with these changes lead them to engage and maintain relationships and fulfill expectations. On the contrary, the absence of such quality causes failure to adjust and adapt to these changes and thus causes psychological problems and depression in the adolescents which can negatively affect their future lives.

The results of pilot study presented that participants could easily comprehend all the problem statements, puzzles and questions except for two items of the questionnaire. The judges were consulted for rephrasing of required items in the questionnaire. For the PSAT, the selection of number of alternate solutions (possible and appropriate responses) for each item was made with the agreement of the judges. Five out of 12 try out puzzles could not provoke multiple or alternate solutions by the sample subjects and were excluded from the scale. Remaining seven (7) items were then left to be computed for item total correlation.

Items included in the tryout of creative thinking tests were also found understandable and provoking ideas by the participants. Similar to the pilot study the test was decided to be administered untimed and a game like activity as suggested by the Wallach (1965).

Stage II of this phase was aimed at confirming the construct validity and determination of internal consistency of the scales through quantitative item analysis. The reliability estimates were computed using the Cronbach's alpha coefficients and item total correlations. For this purpose item total correlations and

Cronbach's alpha coefficients were calculated for PSAT and WKCT. As the questionnaire was to be used to dig out information regarding participants elementary art education and to form groups and it was not a scale to measure any ability or ideas of the participants thus it did not need quantitative analysis.

The findings of results showed that the subscales of the creative thinking test were internally consistent and all the items had their due share in the measurement of respective constructs. Similarly, the reduced seven (7) items of PSAT had significant positive total correlation with the total score on their scale. All the items had significant item total correlations at .01 and .001 levels. The significant correlations were suggestive of the fact that the scales were valid as they measured what they were designed to measure.

Another important characteristic of a psychological test is its reliability. To determine the reliability of the scale, internal consistency was computed through coefficient alpha, which yielded moderately to high reliability coefficients for each of the scaling ranging from .73 to .90. The values in Table 1 to 4 indicate that all the two scales PSAT and WKCT were highly consistent and reliable. The reliability analysis confirmed the sound psychometric properties of the instruments.

The results of phase-I provides good support for the reliability and validity for all three tests, hence showing that these are psychometrically sound instruments and can be used as measures for the next phase of the study.

4.2 Phase II: Relationship of Study Variables

4.2.1 Method

Before conducting the main study a retrospective study (study I) was conducted to explore the impact of different modes of visual art and its impact on the problem solving ability of those who have already reached a certain level of maturity. Study I was the analog of study II indicating the effect of all those variables which are being manipulated in study II. In this way study I facilitated study II. The main purpose of study I was to see the impact of childhood

experiences in later years of life, whereas, study II established relationship between learning and performance in present scenario.

In the case of a retrospective study, the data were collected to establish two groups – art students versus non art students at first. Three instruments were used (adult version) on adolescents and young adult sample (N=150) to see the impact of their past learning on their problem solving at a later stage of life. The two studies used information on events that had taken place in different time phases.

4.2.2 Objectives

The present study was conducted to achieve the following objectives:

1. To measure the long term effects of elementary visual art on problem solving ability in later years of life.
2. To investigate the effects of visual art pedagogies on the performance of adolescents on Problem Solving Ability Test, Creativity Test and Standard Progressive Matrices

4.2.3 Hypotheses

1. The visual art received at elementary level would have a positive impact on the problem solving ability of the participants in later years of life.
2. Those who received visual art at elementary level would obtain significantly higher score on Standard Progressive Matrices as compared to those who did not receive visual art (non-art students).
3. Those who received visual art during elementary school years would obtain significantly higher score on Creative Thinking Test as compared to those who did not receive elementary visual art.
4. Those who received student-centered visual art would obtain significantly higher score on PSAT as compared to those who received teacher-centered visual art and non-art students.

5. Those who received student-centered visual art would obtain significantly higher score on divergent thinking test as compared to those who received teacher-centered visual art and non-art students.
6. Those who received teacher-centered visual art would score significantly high on convergent thinking test (SPM) as compared to student-centered and non-art students.

4.2.4 Sample

The sample for study consisted of 150 college students both male ($n=81$, $M=3.40$, $SD=2.391$) and female ($n=69$, $M=3.06$, $SD=2.06$). All the subjects were recently enrolled students ranging in age from 18 to 20 years ($M = 19.31$, $SD = .636$). They were selected through purposive random sampling technique from National College of Arts Lahore and Rawalpindi Campuses.

4.2.5 Instruments

Questionnaire A dichotomous format of questionnaire with Yes or No options was used in this Phase.

Problem Solving Ability Test The final version of Problem Solving Ability Test retained seven (7) items through item total correlation (Phase I) was used in this phase (see Appendix D). The test required the generation of two to three alternate solutions to a problem instead of one correct answer. Every single solution was given one (1) point. Highest score on this scale means that the individual has an effective problem solving ability.

Wallach and Kogan's Creative Thinking Test (WKCT). Fifteen items creative thinking test confirmed through item total correlation was used in this phase. Fluency and originality were the two measures used for alternate uses, instances and pattern meaning. Fluency (the number of ideas generated) is thought to be related to originality, (the number of unique ideas) because many researchers have reported high correlations between fluency and originality. Some researchers have concluded that the more ideas are generated, the more likely original ideas

are generated (Runco & Steven, 1999). However, Torrance revealed that fluency might increase the possibility of generating more original ideas; nevertheless, this is not true in all cases (as cited in Kerr, 2009, p. 349). Further, Torrance, based on the proposition of Guilford, described that fluency and originality are distinct factors of divergent thinking and should be scored separately as it yields “independent meaning” otherwise using a single score misleads the results (Kerr, 2009). Thus in the present study the fluency and originality were scored and computed separately.

4.2.6 Procedure

After the final approval from the administration of National College of Arts Lahore and Rawalpindi Campuses, the newly admitted students were briefed about the purpose of the present research. On the first day the questionnaire was distributed among them and they were asked to read the questionnaire carefully. At first the whole class of 1st year (consisting of 200 students) was given the questionnaire and asked to report the required information. After filling out the demographic portion of the questionnaire the respondents were asked to recall their childhood education specially elementary school years and indicate whether they had received visual art at elementary level or not. If yes, then what type of art curriculum they had? They were required to answer in a Yes or No format. An open ended question was also included to identify any external source for inspiration to pursue art activities.

The participants who returned incomplete questionnaires or those who were confused to indicate response categories between yes and no were excluded from the study. Only 150 were retained in the final study based on their responses. The question “were you taught visual art at elementary level” with “Yes” and “No” options was sorted out to bifurcate the sample (N=150) initially into art and non-art group. The art group consisted of participants who had received visual art in their elementary school curriculum. The non-art group consisted of participants who had not received visual art during elementary school years.

Based on the information regarding the prevalent pedagogy of visual art in their elementary art classrooms, the art group was further divided into two groups i.e. group A and group B. Finally the following three groups, i.e., two experimental groups and one control group were formed. The purpose was to know which group performed well and under which condition.

Group A: (n=50) participants received student-centered visual art

Group B: (n=50) participants received teacher-centered visual art

Group C: (n=50) participants did not receive visual art (Control group)

All the three groups were then given PSAT, WKCT and SPM, to assess differences in their problem solving ability and divergent and convergent thinking. Besides the written instructions at the beginning of each test participants were also instructed verbally how to respond to various items in each test. The participants were assured about the confidentiality of the information provided by them. During the administration of all the three tests, peaceful and tranquil atmosphere was provided. These were administered under test conditions.

At first participants were given SPM and briefed that booklet consisted of 60 multiple choice questions, listed in order of difficulty. They were asked to identify the missing element for each item that completed a pattern. After the completion of SPM they were given a break of 20 minutes.

Afterwards WKCT was carried out. All the students were group tested. Besides written instruction participants were also guided verbally. For each task, examples were given to direct how to respond to specific item, e.g. for alternate task, the participants were given the example of brick with its alternate uses (the item *brick* was not included in the original test during this study). In the same way the participants were asked to come up with as many possible uses, instances and meaning for the given items and patterns. There was no time limit. Three research assistants were moving around during the test to facilitate the respondents whenever they needed to ask a question.

Finally PSAT was given to the participants. It was also administered in group setting. The participants were briefed about the problems given in the test and were guided how to respond to each problem. They were required to provide two to three alternate solutions for each problem.

Results

For the studying of differences among scores of the participants on WKCT, SPM and PSAT one way ANOVA and t-test was used. The scoring was same as reported in Phase-I.

Table 4***Descriptive Statistics for all the Study Measures (N=150)***

Scales	Items	α	M	SD	Skewness	Kurtosis
PSAT	7	.73	5.39	3.24	1.45	4.12
SPM	60	.89	51.85	5.64	-1.08	.776
WKCT	--	--	--	--	--	--
Fluency	15	.90	46.0	18.96	.810	.519
Originality	15	.62	6.84	7.93	2.12	6.18

Table 4 represents the degree of reliability of all the measures ranging from .73 to .90. In addition, the above table also illustrates the mean and standard deviations on all scales. The indices of skewness and kurtosis of all the scales show the normal distribution of the data. The results show that all the measures used in the present research were reliable and their items were internally consistent.

Elementary Visual Art as a Predictor of Effective Problem Solving Ability

Table 5

Regression Analysis of Visual Art Problem Solving Ability (N = 150)

Model	B	Std. Error	Beta	T	P
Constant	4.343	.406	--	10.706	.000
Visual Art	1.050	.314	.265	3.341	.001

$R^2 = .070$; *Adjusted R*² = .064; $F = 11.164$ *** $p < .001$

Table 5 shows significant predictive relationship between visual art and problem solving ability. As the finding shows that the visual art is positively and significantly predicting effective problem solving ability. This model accounted for 6 % of variance { $R^2 = .070$, $F(148) = 11.164$, $p < .001$ }.

Table 6***Regression Analysis of Visual Art for Divergent thinking (WKCT) (N=150)***

Model	B	Std. Error	β	<i>T</i>	<i>p</i>
Fluency					
Constant	41.100	2.401	--	17.121	.000
Visual Art	4.940	1.860	.213	2.657	.009
Originality					
Constant	-1.640	2.597	--	-.631	.529
Visual Art	6.680	1.643	.380	4.067	.000

$R^2 = .046$; *Adjusted R*² = .039; $F = 7.058$ *** $p < .001$

$R^2 = .144$; *Adjusted R*² = .136; $F = 16.539$ *** $p < .001$

Table 6 indicates significant predictive relationship between visual art and divergent thinking on the two measures of WKCT, i.e., fluency and originality. The findings of linear regression analysis produced a model accounting for 3% to 13 % of variance. The model for fluency suggested that visual art is positively related to the generation of fluent ideas and this model accounted for 3% of variance { $R^2 = .046$, $F(148) = 7.058$, $p < .001$ }. Similarly, the model for originality also indicated that visual art is highly positively related to the creation of original ideas this model accounted for 13% of variance { $R^2 = .144$, $F(148) = 16.539$, $p < .001$ }.

Table 7***Regression Analysis of Visual Art for Convergent thinking (SPM) (N = 150)***

Model	B	Std. Error	β	T	p
Constant	49.960	1.593	--	31.371	.000
Visual Art	1.800	1.007	.178	1.787	.077

$R^2 = .032$; *Adjusted R*² = .022; $F = 3.194$ *** $p < .001$

Table 7 shows the significant predictive relationship between visual art and convergent thinking on SPM. The finding indicates that visual art is a positive and significantly predicting effects on convergent thinking. This model accounted for 2% of variance { $R^2 = .032$, $F(148) = 3.194$, $p < .001$ }.

Table 8

Mean, Standard deviation and t test analysis showing differences in PSAT Scores (N = 150) between Art Group & Non-Art Group.

Variable	Art Group (n=100)		Non-Art Group (n=50)		t(148)	95 % CI	
	Mean	SD	Mean	SD		LL	UL
PSAT	5.82	3.289	4.54	3.065	2.298*	.179	2.381

* $p < .05$, ** $p < .01$

Table 8 indicates significant differences in total scores of PSAT test between two groups. Results show that on total score of PSAT ($t = 2.298$, $p < .05$) with the mean of ($M = 5.82$, $SD = 3.289$) art-students appeared to be significantly higher as compared to the non-art students. The figures indicate that art-students are better in problem solving ability than non-art students.

Table 9

Mean, Standard deviation and t test analysis of WKCT scores (N=150) between Art Group & Non-Art Group.

		Art Group (n=100)		Non-Art Group (n=50)		95 % CI		
Scale		Mean	SD	Mean	SD	t(148)	LL	UL
WKCT								
	Fluency	48.35	19.998	41.44	15.931	2.125*	.483	13.317
	Originality	8.60	8.893	3.92	4.580	3.493**	2.032	7.328

* $p < .05$, ** $p < .01$

Table 9 reflects the scores of art and non-art students on the measures of WKCT i.e. fluency and originality. It was found that art students were significantly higher on the scores of fluency ($t=2.125$, $p < .05$) and originality ($t=3.493$, $p < .01$) as compared to non-art students. The figures show that art students have good divergent thinking than non art students.

Table 10

Mean, Standard deviation and t test analysis of SPM scores (N=150) between Art Group & Non-Art Group.

Scale	Art Group (n=100)		Non-Art Group (n=50)		t(148)	95 % CI	
	Mean	SD	Mean	SD		LL	UL
SPM	52.73	5.103	50.24	6.365	2.589**	.590	4.390

* $p < .05$, ** $p < .01$

Table 10 shows significant difference between art and non-art students on scores of Standard Progressive Matrices (SPM). The figure indicates that art students scored significantly high ($t=2.589$, $p < .01$) than non-arts students. This exhibits that art students have sharp convergent thinking ($M=52.73$, $SD=5.103$) as compared to the non-art students ($M=50.24$, $SD 6.365$).

Table 11***One way ANOVA on PSAT Scores (N = 150)***

	Group A		Group B		Group C			i-j
	1		2		3			
	(n=50)		(n=50)		(n=50)			
Variable	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	
PSAT	6.76	3.054	4.88	3.274	4.54	3.065	7.283***	1>2,3

df=148, ***p* < .01, ****p* < .001

Table 11 shows one way analysis of variance among 3 groups of students and presents highly significant differences in the scores of PSAT for different samples ($F=7.283$, $p<0.01$). The Post Hoc Analysis showed that the participants from student-centered group scored significantly high as compared to the teacher-centered and non-art group. Whereas participants from non-art scored significantly a lower on PSAT scores as compared to the other two groups. The findings revealed that the deliverance of visual art through student-centered pedagogy had highly significant effects on the problem solving ability of art students.

Table 12***One way ANOVA on WKCT Scores (N=150)***

		Group A 1 (n=50)		Group B 2 (n=50)		Group C 3 (n=50)		F	i-j
		M	SD	M	SD	M	SD		
WKCT	Fluency	51.32	19.061	45.36	20.653	41.44	15.931	3.557**	1>2,3
	Originality	12.04	8.882	5.16	7.533	3.92	4.580	18.326***	1>2,3

*df=148, **p < .01, ***p < .001*

Table 12 shows significant group differences in the scores of WKCT on fluency ($F= 3.557$, $p<. 01$) and originality ($F= 18.326$, $p<.001$) measures. The Post Hoc Analysis showed that the participants from student-centered group scored significantly highest on fluency ($M=51.32$, $SD=19.061$), and teacher-centered group scored high ($M=45.36$, $SD=20.653$) as compare to non-art group ($M=41.44$, $SD=15.931$). For originality measure of WKCT student centered group scored significantly highest ($M=12.04$, $SD=8.882$) as compared to teacher-centered ($M=5.16$, $SD=7.533$) and non-art groups ($M=3.92$, $SD=4.580$) respectively.

Table 13***One way ANOVA on SPM Scores (N=150)***

	Group A		Group B		Group C			i-j
	1		2		3			
	(n=50)		(n=50)		(n=50)			
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	
SPM	53.72	4.743	51.74	5.302	50.24	6.365	5.016**	1>2,3

*df=148, *p < .05, **p < .01*

Table 13 indicates a highly significant difference among all the three groups on total score of SPM ($F=5.016$, $p < 0.01$). The results show that participants from the student-centered group had the highest mean ($M = 53.72$, $SD = 4.743$) than teacher-centered ($M = 51.74$, $SD = 5.302$) and non-art group ($M = 50.24$, $SD = 6.365$). The figures also indicate that non-art group score significantly lower as compared to other two groups. This shows that student-centered visual art can better foster convergent thinking as compared to teacher-centered.

Table 14***Correlation Matrix of PSAT, WKCT and SPM (N=150)***

Variables		I	II	III	IV
I	PSAT	1	.27**	.31**	.42**
II	SPM	.27**	1	.21*	.27**
	WKCT				
III	Fluency	.31**	.21*	1	.43**
IV	Originality	.42**	.27**	.43**	1

** $p < .01$, * $p < .05$

Table 14 shows the correlation matrix of all the scales. The matrix illustrated a pattern of significant positive relationships between different variables.

4.2.7 Discussion

The subjects of the current study were adolescents i.e., 18 to 20 years of age. This age selection has its importance in the fact that adolescence is an age when the youth faces challenges in many aspects of life that are quite different from those of the childhood; such as developing social relationships and making important decisions for their future lives (Tariq, 2012). Their knowledge very much depends on the information obtained from text books. Therefore they rarely think out of the box when faced with an unpleasant situation. It is only due to the problem solving skills that healthy and pro-social behavior can be promoted in a number of aspects that affect adolescent behavior, especially those conducts that have an effect on their interpersonal relationships. Gange (1980) asserted that good knowledge, intellectual proficiency, and cognitive competency is crucial for successful problem solving. He added that as these abilities are learned and will differ from adolescent to adolescent, these can be enhanced with appropriate training and guidance.

Art educationists foresee that training in art and creativity can be an effective source for the strengthening of cognitive abilities and attainment of higher level thinking, and are agreed upon its far reaching effects (e.g., Gardner, 1994; Lowenfeld & Brittin, 1987; Hurwitz, 2007 etc.). Philosophers and

psychologists have also related art activities with the ability of spatial and perceptual understanding of one's own surroundings, good mental health, successful interpersonal relationships and effective problem solving techniques (e.g., Gardner, 2004; Piaget, 1955).

Therefore, this study was set out to show the potential of using visual art to create learning environment that enhances student's thinking skills and problem solving ability. Besides it was also aimed to evaluate the role of instructional pedagogy to see if it affected the outcomes of art learning related to cognitive abilities? For this purpose the first hypothesis of the study proposed a positive relationship between visual art and problem solving ability and the results indicated very strong association between the two variables. It demonstrated that the students who were continuously involved in art activities during their elementary school years were better adult problem solvers than those who did not have such education. The second hypothesis proposed that art group would be good in convergent thinking as would score high on SPM. While third hypothesis was that the art group would score high on divergent thinking as well. As shown in Table 1 and 2 that art group superseded the non-art group on all three measures including SPM, WKCT and PSAT. So our first three hypotheses were confirmed. These findings are consistent with the earlier studies that art students perform better than the non-art students (Gardner, 2004). Dewey's (1916) argument that the role of education was to prepare students for present and later life supports this notion that ideas gathered in childhood are sustainable and helpful in overcoming and tackling adulthood problems. Eisner (2002) has argued more specifically in stating that art educators can readily create art making tasks as problem solving tasks for practice. Furthermore, as Jensen (2001) and Weisberg (2004) indicated, art learning prepares people to deal with the problems with multiple solutions.

The teachers have a strong social influence on their students with respect to ways they motivate and encourage students to enhance creativity. Development of student expression in a classroom (i.e., a constructivist approach) is more likely to promote variable opportunities to facilitate problem solving. Urgent consideration needs to be given to reflecting upon the current approaches as there

has been limited research on current practices and the best way to achieve skill in problem-solving. Hurwitz & Day (2007) defined student-centered art as an act of self expression which has a unique combination of emotions and intellect giving novel order and form to human reactions under permissive environment.

The finding confirms the third hypotheses that student-centered group was superior in problem solving as compared to teacher-centered and control groups. The student-centered approach was related positively to the development of cognitive competencies. Researchers have agreed that student-centered approach allows “creative freedom” in children art (Peers, 2000).

Convergent and divergent thinking were also investigated in the study. Among the most important findings of the study is that participants who scored high on divergent thinking also scored high on convergent thinking. Table 12 & 13 reflected that all these participants had received student-centered art education. So, it can be concluded that student-centered group was superior in convergent and divergent thinking as compared to teacher-centered and non-art groups. According to Lee and Johnson-Laird (2004) and Vidal (2004) problem solving is a creative process. Jaarsveld & van Leeuwen, (2005) stated that creativity requires both convergent and divergent thinking in order to arrive at a quality formulation.

Table 14 presents the correlation matrix between the three scales PSAT, WKCT and SPM. The results confirmed the convergent and discriminate validity of the scales as well as the underlying research assumption behind the development and utilization of these three scales. The proposed model of how visual art fosters problem solving ability mentioned earlier presents the relationship between visual art, problem solving ability, divergent thinking and convergent thinking. The existence of a relationship among the three scales was found to be essential. The three scales were assumed to be interrelated and hence was their correlation matrix. The correlation matrix of all the scales demonstrated a distinct pattern of significant positive relationships ($P < .01$ & $.05$) between study variables. The range of correlation lies from .21 to .43. The table presents a close analysis of the correlations that divergent thinking has a .31 and .43 correlation with Problem solving ability and convergent thinking has a .27

correlation with problem solving ability. This can be interpreted as the significant influence these two thinking types are exerting over problem solving ability.

The study findings revealed that elementary visual art education has far-reaching effects on the problem solving ability of the participants of the particular group. The results also revealed that student-centered visual art at elementary school years has a potential for fostering divergent as well as convergent thinking and retains its effects in later years of life as well.

Thus present study put emphasis on the importance of elementary visual art education in terms of cognitive competencies specifically problem solving ability. It also revealed that student-centered visual art in elementary school years has a potential to foster divergent thinking of students and retained its effects on later years of life. Thus the study proposes the visual art education as a domain to cultivate these constructs in the children and youth for their better mental, physical and social health.

CHAPTER – V

IMPACT OF ELEMENTARY VISUAL ART EDUCATION ON PROBLEM SOLVING ABILITY OF THE CHILDREN

CHAPTER-V

IMPACT OF ELEMENTARY VISUAL ART EDUCATION ON PROBLEM SOLVING ABILITY OF THE CHILDREN

To fulfill the research objectives, study II was conducted in three phases. Phase I dealt with the identification of visual art instructional pedagogies prevailing in the schools of Peshawar. Phase II dealt with the determination of psychometric properties of the instruments and carried out in three stages. Stage I dealt with the item selection of the instruments, stage II was the conduct of tryout, whereas stage III dealt with the validation of the instruments.

5.1 Phase I: Identification of Visual Art Pedagogies

5.1.1 Method

The target population of study II was children from elementary schools of Peshawar, Khyber-Pakhtunkhwa, Pakistan. The researchers made a couple of visits to different schools in order to ascertain the type of visual art being delivered. Subsequently, it was found that the government schools were not offering visual art in their respective curriculum, while the private schools were doing so. Among private schools it was further observed that two types of pedagogy of visual art was being practiced, i.e. child-centered and teacher-centered.

5.1.2 Sample

The study used stratified random sampling to form the relevant groups. The first step was to collect information regarding different types of instructional mode of visual art being practiced in different schools of Peshawar. The primary source of information was collected from the principals of the respective schools. On the basis of this gathered information, the population was divided into three different strata. One stratum included all those schools offering teacher-centered

visual art, the second comprised the schools practicing child-centered visual art while the third one consisted of schools that did not offer visual art at all i.e. government and semi government schools. Three schools from each stratum were randomly selected. Further, a sample of 180 (N=180) students, 60 from each stratum, were again randomly selected resulting in the following three groups.

Group A: (n=60) Students receiving child-centered visual art (freedom of expression)

Group B: (n=60) Students receiving teacher-centered visual art

Group C: (n=60) Students not receiving visual art at all, which is also known as the control group

Group A and B served as experimental, while group C served as a control group. Permission from the administration of the schools was taken through letters and personal visits.

5.1.3 Objective

To determine the prevalent pedagogy of pre-selected schools.

5.1.4 Instruments

1. Observation
2. Unstructured interview

1. Procedure

Before initiating the main study, the non participatory observation technique was used with the permission of the competent authority in order to ascertain the pedagogy of visual art being practiced.

2. Observation

For this purpose six pre-selected schools were observed, three with child-centered visual art and the rest of three with teacher-centered visual art. In the end, two schools were retained in the first group while the third one, not meeting the criterion, was dropped. Likewise, observation regarding schools offering teacher-centered visual art was also carried out in the same manner.

Observation of the art lessons of student-centered group. The criterion for the selection of the student-centered group was based on prescribed standard features derived from extensive review of literature (e.g., Brown, 2001; Burton, 2000; Herberholz and Hanson, 1990; Hickman 1994; Hurwitz, 2007; Lowenfeld and Brittain, 1964; Eisner 1972). In student-centered group the students are the centre of learning. In this instructional pedagogy the students are encouraged to accept responsibility for decisions they make about what to learn, how to learn and when to learn e.g. what colors they want to use on a handmade clay vessel, when they want to work on still life painting and how they want to assess their art work. Moreover, the child centered visual art facilitates the child to express himself according to his own vision i.e., how he feels, what he thinks and how he wants to represent his perception. Student-centered pedagogy allows peer communication and values each student's interest, abilities and learning styles. The observed features of child-centered art lessons are mentioned in the following table:

Table 15***Standard and observed features of student-centered art pedagogy***

Center of the learning process	Standard Features	Learning Outcomes	Observed Features	Role of the teacher
STUDENTS	Active learning	knowledge production, Improved student attitudes, effective student-teacher relationship student-student relationship	students were proactive healthy peers communication, student-teacher communication, guidance, appreciation and feedback from students	Facilitator
	Learning environment, e.g., inquiry-oriented-learning	meta-cognitive development, e.g. critical and creative thinkers	students were involved in hands on-activities and group work	
	Children's self-expression	Self-Actualization	students were involved in creative self-expression e.g. drawing and painting the most memorable event of their lives	
	Two way approach	respect and empathy towards others,	group discussion suggestions and appreciation from teacher	
	Students' motivation	brain storming, problem solving, responsibility for one's own learning	students were keenly involved in art projects, sharing of ideas, and helping other fellows to complete their work	
Concept: student-centered approach regards a child "as competent and full of potential".				

Observation of the art lessons of teacher-centered group. The criterion for the selection of the second group i.e., teacher-centered was based on extracted standard features from literature. The teacher-centered approach simply focuses on the teacher and keeps her in the lime light. The students are there merely as an audience listening and learning passively. The content of learning along with its methodology is in the hands of the teacher who also assesses and evaluates the students' response at his/her rare discretion. (Brown, 2001; Efland 1990; Herberholz and Hanson, 1990; Peers, 2002; Spidell et al.,1992). The observed features of teacher-centered art lessons are mentioned in the following table:

Table 16

Standard and observed features of teacher-centered art pedagogy

Center of the learning process	Standard Features	Outcomes	Observations	Role of student
TEACHER	learning by imitation	memorization of information	Teacher was standing in front of the room instructing students to copy images from the white board.	RECEPTIVE
	autocratic environment	directing students towards a narrowly defined goal,	students were passively engaged in copying images and color-in printed images	
	one-way approach	prepare students to passively wait for teacher's instruction	no peer communication, no feedback, no encouragement	
	cultivate stereotyped and dependent schemas	mimetic behavior	Students' drawings consisted on stereotyped fixed schemas e.g., for houses, trees, birds	
	mastery of skills	acquisition of motor skills	Students were assessed for a likeness or exactness, i.e how well they had copied the given image.	
		good working habits	drawings which were copied well were marked excellent or very good and good, where as weak copies of the given image received remarks such as, poor and untidy work from their teachers	
	Students are given extrinsic motivators like grades and rewards	achievement of academic success		
Concept: teacher-centered approach regard children as deficient and incapable.				

Besides classroom observation an informal discussion was also carried out with the teachers of both groups. The guiding questions that would direct the discussion were focusing on the aim of art lessons, teachers' perception about art, teaching pedagogy, arts curriculum and the evaluation process of children's art. Questions that emerged during the interview were also valuable (Hatch and Freeman, 1988) to explore the teaching pedagogy and to probe the information they were likely to have.

An informal discussion with art teachers of child-centered group

An informal discussion with art teachers was also carried out. The guiding questions that would direct the conversation were focused on the aim of art lessons, teachers' perception about art, teaching pedagogy, arts curriculum and the evaluation process of children's art.

During this informal discussion it was learnt that art teachers of child-centered group valued children's art and encouraged children's self expression. The art syllabus consisted of a variety of art activities ranging from clay molding to self portraits. Further, the syllabus was planned flexible enough to include prompt ideas shared by students. While asking about the evaluation of the art work the teachers told that student's art work is evaluated on their creativity. All the students receive good remarks for their art work in their report cards. In one of the schools music was also included in arts curriculum as an optional activity for interested ones.

An informal discussion with the teachers of teacher-centered group

The informal discussion with the teachers of second group revealed that they did not have enough knowledge about the subject and were assigned art lessons on their superficial interests. They considered art not more than a fun activity. Lack of interest in art by the school administration was also mentioned by the teachers. It was also observed that the school buildings had proper science and computer laboratories but no space for art activities. The curriculum was limited

to the text books e.g., drawing books and art workbooks (consisting of predetermined art activities). Teachers admitted a pressure of time-constrain and limited resources. Furthermore, children's art was graded on the bases of their perfectness and excellence rather than creativity.

Ironically the teachers of both groups were neither acquainted with the knowledge about schemata used by children at elementary years nor with creative developmental stages presented by Lowenfeld (1947) and Read (1956).

5.2 Phase II: Determination of Psychometric Properties

5.2.1 Method

The Phase II of present study dealt with the item generation, try out and determination of psychometric properties of the instruments. This phase consisted of multiple stages.

5.2.2 Stage I: Item Selection

Instruments

1. Short Version of Wallach and Kogan's Creative Thinking Test (WKCT)
2. Matchstick Problem Tasks (MPT)

Matchstick Problem Tasks. Instead of using PSAT that was developed for adult sample in study-I, Study-II utilized matchstick problems to measure problem solving ability of children. To retain the interest of young students the study preferred the tasks that involved pictures and images rather than the use of extensive verbal and written material. Many researchers have used matchstick problem tasks for problem solving. Laurie and Lynette (1996) used a set of matchstick problems to examine the multi-dimensional thinking in investigating the part of various brain organs when exposed to visual problem solving. Same method of incorporating matchstick problems as a gauge of adaptive flexibility (restructuring or set-breaking) was adopted by Guilford (1957). Knoblich, et al. (1999) also used this test for insight problem solving. Similarly, in his research "Creative Strategies in Problem Solving" Lee and Larid (2004) had used

matchstick problems to determine the way in which individuals shaped up strategies in solving problems. Influenced by these researchers the present study has used matchstick problems to test the diverse thinking and problem solving ability of elementary school students. Initially a number of matchstick problem tasks were picked out from web sources (e.g. http://www.learning-tree.org.uk/stickpuzzles/stick_puzzles.htm) for the first draft of the test. On the recommendations of the committee of experts eight puzzles were selected for the try out stage.

Wallach–Kogan Creative Thinking Tests (WKCT). As discussed earlier WKCT is considered as a convenient battery of reliable and valid instruments in order to measure divergent thinking of the respondents (Cheung et al., 2004; Runco & Albert, 1986; Runco, Okuda, & Thurston, 1987). Similar to study I the present study utilized the short version of WKCT comprising three sections:

1. Alternate Uses
2. Instances
3. Pattern Meaning

Each of these three sections comprised three questions. The children were asked questions by a team of trained researchers and responses were recorded in the blanks on the survey sheets.

Alternate Uses. This section asked three alternate uses questions. The participants were asked to generate all possible uses for a given object. For example, —tell me all the different ways you could use a brick.

Instances. The second section in the WKCT verbal test asked participants to produce responses for three instances questions of an everyday notion or object. For example, one of the questions was —name all of the things that can hurt.

Pattern Meaning. The third section contained three different patterns. The participants were shown images and asked what they thought they were.

5.2.3 Stage II: Try Out

Objectives

To evaluate the suitability, comprehension and cultural relevance of the instruments for the study sample.

Sample

A sample of (N=100) elementary school children from one public and one private school of Peshawar were randomly selected for the tryout of CPM and WKCT, whereas for MPT a sample of (N=46) elementary school children was separately selected due to the limited time allowed by the school administrations. The children's age ranged from 8 to 10 years.

Instruments

1. Raven's Colored Progressive Matrices (CPM)
2. Wallach and Kogan's Creative Thinking Test (WKCT)
3. Matchstick Problem Tasks (MPT)

Procedure

Random Sampling technique was used to select the sample (N=100) from two elementary schools of Peshawar. Permission was taken from the concerned authorities of selected schools. CPM and WKCT were distributed among students. The creative thinking test began with a warm up question. They were given the example of brick and asked how it could be used in a number of alternate ways. Colored progressive matrices were also administered in their original form. The tests were administered individually. Those who participated in the tryout were not included in the final data collection. The procedure of tryout of MPT consisting of eight (8) items was the same. The sample (N=46) selected randomly, from the same schools to accomplish the task of eight matchstick problem tasks in allotted time period by the school authorities as it took quite a lot time to think upon and to solve individually. A trial demo was also given to them to explain how to attempt these puzzles. Students were provided with images of matchstick

problem tasks along with the required number of matches. The task was to move or remove some matches to make other arrangements. For example, a matchstick problem required participants to rearrange the matchsticks in 3 squares by moving any 4 matchsticks.

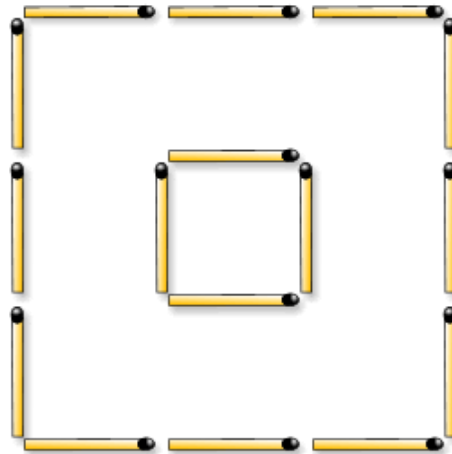


Figure 3: Matchstick Problem

They were advised to make the given puzzle image with real matchsticks at first so that they could easily move the matches to see if their trial worked out or not. Every student was given three chances at the most to solve a matchstick problem. After that they were asked to proceed to the next problem.

The responses collected from participants were reviewed and compiled by the researcher and later a committee of 2 experts was contacted to finalize the instruments. For problem solving test, the matchstick problems that could not provoke answers along with those that took too much time to solve were discarded. Consequently total of four matchstick problem tasks remained to calculate the construct validity. A coding sheet was also added to mark the solution generated by the participants, whether right or wrong.

All the nine (9) items in WKCT were reported sound and thought provoking as were 60 items of CPM therefore the committee concluded that the items were general in nature and globally acceptable.

5.2.4 Stage III: Determination of the Psychometric Properties of Instruments

Determination of psychometric properties was computed to check the suitability and comprehensibility of test items for Pakistani sample. As the test was used for the first time for this population it was necessary to check its psychometric properties.

Results

Descriptive Analysis. This stage was conducted to ensure the psychometric properties of the instruments used in present research for measuring problem solving, along with convergent and divergent thinking skills. This is an important step in establishing the usefulness of any scale. SPSS version 18 was used for the purpose. For the current study matchstick problem tasks MPT were used to measure problem solving ability of children for the first time in Pakistan whereas very few earlier studies had used Raven's Progressive Matrices (e.g., Sabah, Gillani & Iftikhar, 2012) and Wallach & Kogan Creative Thinking Test (Riaz, 1978) on children in the country. Therefore, there was a strong need to establish the reliability of these instruments. As the CPM was used in its original form therefore the test did not require the construct validity, whereas the construct validity of MPT and WKCT was calculated and is given as following.

Table 17***Frequency and percentages of Matchstick Problem Tasks MPT (N=46)***

Items	Frequency	Percentage (%)
Box	37	80
Fish	24	52
Glass	22	47
Math Equation	17	37

Table 17 shows frequency and percentages of responses for four items on MPT.

Item total correlations. After the exclusion of unsatisfactory items the Item total correlations of MPT were calculated to analyze each item in order to check whether all the items significantly measured the respective construct. For this purpose, the items of each scale were individually correlated with the total score of their corresponding scale for internal consistency.

Table 18***Item total correlations of Matchstick Problem Tasks MPT (N=46)***

Item No.	<i>R</i>
1	.38**
2	.60**
3	.57**
4	.46**

**P < .05 **P < .01*

Table 18 shows that all the items are significantly positively correlated with the total score of the scale. The results suggest that the scale is internally consistent and all the items have their due share in the measurement of causality orientations. The highly significant correlations are also suggestive of the fact that all the items are measuring one construct.

Table 19

Item total correlations of fluency and originality measures on WKCT Test 9 items (N=100)

Fluency		Originality	
Item	R	Item	R
1	.34**	1	.19*
2	.42**	2	.26*
3	.49**	3	.48**
4	.63**	4	.23*
5	.59**	5	.41**
6	.55**	6	.34**
7	.81**	7	.29*
8	.81**	8	.26*
9	.81**	9	.48**

* $p < .05$, ** $p < .01$

Table 19 shows item total correlations of fluency and originality variables of WKCT. All the items have highly significant correlation with the total score and hence suggest that the scale is internally consistent and all the items have their due share in the measurement of divergent thinking. This indicates that all items are measuring one construct.

Table 20***Reliability Estimate of MPT (N = 46)***

<i>Scale</i>	<i>No. of items</i>	<i>α</i>
MPT	4	.71

Table 20 demonstrates the alpha co-efficient for MPT. The finding suggests that scale is internally consistent and a reliable measure of the construct it is supposed to measure.

Table 21***Reliability Estimate of CPM & WKCT (N = 100)***

<i>Scales and subscales</i>	<i>No. of items</i>	<i>A</i>
CPM	36	.85
WKCT		.86
Fluency	9	.86
Originality	9	.61

Table 21 demonstrates the alpha co-efficient for CPM & WKCT. The finding suggests that the scales and sub scales are internally consistent and reliable measures of the constructs they are supposed to measure.

Discussion

The psychometric properties of MPT, CPM and child version of WKCT were established in Phase-I of this study. Reliability estimates of all three instruments were calculated for the sample of pilot study. The alpha coefficients presented from moderate to high magnitude of reliability coefficients for all measures ranging from .61 to .86 (see Table 20 & 21). In addition to this, the findings for item total correlations showed that the scales were internally consistent and all the items had their due share in the measurement of respective variables i.e., problem solving performance and divergent thinking . The

significant correlations were also suggestive of the fact that the scales were valid as they were measuring what they were designed to measure.

5.3 PHASE III

5.3.1 Sample

The sample of study II (N=180) was selected from elementary classes of selected schools of Peshawar.

5.3.2 Objectives:

The specific objectives were:

1. To investigate the role of visual art in enhancement of problem solving ability of students.
2. To examine the impact of different teaching pedagogies of visual art being practiced at elementary school level on problem solving ability of the participants.

5.3.3 Hypotheses:

1. The students receiving visual art at elementary level will obtain significantly higher score on Problem Solving Test as compared to those who did not receive visual art at all.
2. The students receiving visual art at elementary level will obtain significantly higher score on Creative Thinking Test as compared to those who did not receive visual art at all.
3. The students receiving visual art at elementary level will obtain significantly higher score on Colored Progressive Matrices as compared to those who did not receive visual art at all.
4. There will be a significant difference in problem solving ability of students exposed to different teaching pedagogies in visual art at elementary school level.

5. Visual art focused at “student-centered pedagogy” will enhance divergent thinking of students.
6. Visual art provided through teacher-centered pedagogy will foster convergent thinking.

5.3.4 Instruments

1. Demographic Data Sheet
2. Raven’s Colored Progressive Matrices (CPM)
3. Wallach and Kogan’s Creative Thinking Test (WKCT)
4. Matchstick Problem Tasks (MPT)

5.3.5 Procedure

The concerned authorities of public, private and privilege schools were contacted and permission was taken to conduct research work. Students of class three, four and five were randomly selected. The tests were administered on three consecutive days. Demographic information was collected and all the three tests were administered individually by a team of researchers and well trained surveyors from the field of psychology. In introductory session rapport was developed so that children could feel free if they had any query regarding the tests’ items. Standard instructions from CPM manual were followed. The first item of the test was used as an example to demonstrate how to attempt other matrices in the test.

The MPT were administered on the following day. These comprised four different matchstick problem tasks (Appendix G). Children were required to re-arrange them by moving specified number of sticks to form a specified new pattern. Trained surveyors were there to attend each participant individually. Besides written and verbal instructions, the demo trial was also given. Children were given three trials to solve a problem and if they failed to do so they were asked to move on to the next matchstick problem.

The next day children were briefed about Creative Thinking Test. The team of trained surveyors attended six children at a time. At first the participants were asked three questions from *alternate Uses* section. The test began with a sample question e.g., the participants were asked —tell me all the different ways you could use a brick. At first, they were provided with the examples of its functional use e.g., for making houses and schools. In order to evoke creative responses they were encouraged and praised by saying ‘*well done, now can you think of something more unique? Can’t you use a brick as a paper weight or a door stop etc*’. This probing helped the children to give unique and unusual responses. Similarly the participants were asked to generate responses for three questions from *Instances* section. For example, they were asked to ‘*name all the things you can think of that produce noise*’. In pattern meaning section participants were shown three geometrical patterns and asked to come up with as many possible meanings as they could think of.

The general instructions for administering WKCT were based upon instructions provided by Wallach and Kogan (1965). No time bar was set as suggested by Wallach. Responses of the participants were measured for originality i.e., unique responses and fluency i.e., total number of responses. Two judges were consulted to determine the original responses generated by the sample subjects.

Scoring and Data Analysis

Scoring of CPM. Scoring was done according to the standard method of scoring given in the manual of Raven’s Colored Progressive Matrices. The analyses were carried out using SPSS version 18.

Scoring of MPT. To analyze the problem solving ability of a participant on Matchstick Problem Tasks, a total number of correct responses was taken as the participants’ total score. Each correct response was given ten points thus the maximum possible score was 40.

Scoring of WKCT. In scoring WKCT questions, units of fluency and originality were made functional. *Fluency* is defined as the total number of given responses by a participant when he is asked a question. All the responses produced by a participant are then summed up to yield his fluency score for that particular question. *Originality* (a unique or novel response) was obtained by scoring unusual and unique responses. Unusualness and uniqueness were further gauged on relative frequency (or percentage P) of responses given by participants of particular group.

The computation of unusualness and uniqueness was based on the relative frequency or percentage P of a particular response lets say x produced by participants of a particular group. The formula is as follow:

$$P = \frac{\text{frequency of response x produced by participants of a particular group} \times 100\%}{\text{Number of participants of a particular group}}$$

Responses that were given by only 5% of a group were unusual and were given 1 point. Responses that were given by only 1% of a group were unique and scored 2 points. Sum of all the points made the participant's originality score for a particular question (Lee & Laird, 2004). For example a participant generated 2 unusual responses and 1 unique response for alternate uses of a shoe; he got 2 points for unusualness and 2 points for the uniqueness. Therefore, for the shoe item his originality score is 4.

Therefore,

$$\text{Originality} = 1(X) + 2(Y)$$

where, X= total number of unusual responses of a particular question

and Y= total number of unique responses of that particular question

Results

In this section descriptive statistics are presented and general trends are discussed. Mean scores were calculated for each of the three instruments i.e., WKCT, CPM and matchstick problems. The scores obtained by different groups showed that elementary students who were receiving visual art performed better on all the three tests than those who were not exposed to art experiences in their schools. Similarly the student-centered group scored high on all three tests as compared to teacher-centered and control group. While, the mean score of control group was less than that of other two groups. The following tables present this information in detail.

Table 22

Descriptive Statistics of all study measures (N=180)

Scales & Subscales	Item	<i>A</i>	<i>M</i>	<i>SD</i>	Skewness	Kurtosis
CPM	36	.85	22.72	7.524	-.507	-.748
MPT	4	.66	13.06	10.089	.214	-1.044
WKCT						
Fluency	9	.86	32.11	12.097	.262	-.856
Originality	9	.61	3.24	2.578	1.173	-1.044

Table 22 represents the degree of reliability of all the measures ranging from .61 to .86. In addition, the above table also illustrates the mean and standard deviations of all variables. The indices of skewness and kurtosis of all the scales show the normal distribution of the data. The above finding confirmed that all the measures used in the present research were reliable and their items were internally consistent.

Table 23

Percentiles corresponding to raw score of the standardization sample on Matchstick Problem Tasks MPT (N=180)

Percentile	Raw score of student-centered group	Raw score of teacher-centered group	Raw score of control group
5	10	50	0
10	10	0	10
25	20	10	10
50	30	20	10
75	-	-	20
90	40	30	20
95	40	40	30

Table 23 shows the difference of percentiles and their corresponding scores attained by student- centered, teacher-centered and control groups on MPT. Student-centered score group scored higher than teacher-centered and control group.

Table 24

Frequencies corresponding to raw score of the sample on Matchstick Problem Tasks MPT (N=180)

Score	Group A F (%)	Group B F (%)	Group C F (%)
0	1 (1.6)	3 (5)	21 (35)
10	6 (9.8)	18 (30)	20 (33.3)
20	11 (18.0)	24 (40)	14 (23.3)
30	27 (44.3)	10 (16.7)	5 (8.3)
40	15 (24.5)	5 (8.3)	0 (0)

Table 24 indicates the frequencies and percentages of given responses by three groups. The calculated median of group A was 30, for Group B it was 20 and for Group C it was 10.

Table 25***Regression Analysis of visual art on Matchstick Problems Tasks (N = 180)***

Model	B	Standard Error	β	T
Constant	14.588	3.041		4.797
Visual Art	6.619	1.993	.312	3.321

MPT, $R^2 = .098$; *Adjusted R*² = .089; $F = 11.026$ *** $p < .001$

Table 25 indicates significant predictive relationship between visual art and problem solving ability. The findings show that elementary visual art is positively and significantly predicting effective problem solving ability.

Table 26

Mean, Standard deviation and t test analysis of score wise differences on MPT between art & non-art group (N=180)

Variable	Art Group (n=120)		Non-Art Group (n=60)		<i>t</i> (178)	95 % CI	
	Mean	SD	Mean	SD		LL	UL
MPT	2.41	1.081	2.00	1.089	2.383**	.070	.746

* $p < .05$, ** $p < .01$

Table 26 indicates significant differences in total scores of MPT between two groups. Results show that on total score of MPT ($t = 2.383$, $p < .01$) with the mean of ($M = 2.41$, $SD = 1.081$) art-students appeared to be significantly high as compared to the non-art students. The figures indicate that art-students are better in problem solving ability than non-art students.

Table 27

Mean, Standard deviation and t test analysis of differences among fluency and originality scores on WKCT between art & non-art group (N=180)

		Art Group (n=120)		Non-Art Group (n=60)		95 % CI		
Variables		Mean	SD	Mean	SD	t(178)	LL	UL
WKCT	Fluency	36.43	11.322	23.45	8.436	7.855***	9.722	16.245
	Originality	3.79	2.710	2.15	1.876	4.212**	.873	2.411

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 27 reflects differences in the scores of art and non-art students on the two measures of WKCT i.e. fluency ($t=7.855$, $p<.001$) and originality ($t=4.212$, $p<.01$). It was found that art students were significantly high on the scores of fluency ($M=36.43$, $SD=11.322$). Similarly the above findings showed significant differences for originality scores ($M=3.79$, $SD=2.710$) as compared to non-art students. The figures show that art students have good divergent thinking than non art students.

Table 28

Mean, Standard deviation and t test analysis showing differences on CPM between art & non-art group (N = 180)

	Art Group (n=120)		Non-Art Group (n=60)				95 % CI	
Scale	Mean	SD	Mean	SD	t(178)	p	LL	UL
CPM	23.28	7.359	21.60	7.788	1.412	.160	-.666	4.016

Table 28 indicates no significant difference ($t=1.412$, $p > .1$) between art and non-art students on scores of Colored Progressive Matrices (CPM). Although the mean values of art students are greater ($M=23.28$, $SD=7.359$) than the mean value of non-arts students ($M=21.60$, $SD=7.788$) but the difference is not significant.

Table 29

One way analysis of variance (ANOVA) among three groups of students on the scores of MPT (N = 180).

	Group A 1 (n=60)		Group B 2 (n=60)		Group C 3 (n=60)			<i>i-j</i>
Variable	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	
MPT	2.82	.983	2.00	1.025	2.00	1.089	12.493***	1>2,3
<i>df</i> = 178, *** <i>p</i> < .001								

Table 29 shows one way analysis of variance among 3 groups of students and presents highly significant differences in the scores of MPT for different groups ($F=12.493$, $p < .001$). The Post Hoc Analysis showed that the participants from student-centered group scored significantly high ($M=2.82$, $SD=.983$) as compare to the teacher-centered and non-art group. Mean values of teacher-centered group and non-art group show no difference between these two groups. The findings revealed that the deliverance of visual art through student-centered pedagogy has highly significant effects on the problem solving ability of art students.

Table 30***One way ANOVA on WKCT Scores (N=180)***

	Group A 1 (n=60)		Group B 2 (n=60)		Group C 3 (n=60)			<i>i-j</i>
Variables	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	
Fluency	37.73	10.113	35.13	12.362	23.45	8.436	31.932***	1>2,3
Originality	4.52	2.734	3.07	2.503	2.15	1.876	14.850***	1>2,3

$df = 178$, *** $p < .001$

Table 29 indicates significant differences in fluency and originality scores for different groups. The figures show that participants from different groups score differently on WKCT. As for fluency measure ($F=31.932$, $p < .001$) student-centered group (A) ($M=37.73$, $SD=10.113$) scored highest from teacher-centered (B) ($M=35.13$, $SD=12.362$) and control group (C) ($M=23.45$, $SD=8.436$) respectively. Similarly, figures in above table indicate significant differences ($F=14.850$, $p < .001$) on originality measures for sample from different groups. Student-centered group ($M=4.52$, $SD=2.734$) scored highest from teacher-centered ($M=3.07$, $SD=2.503$) and control group ($M=2.15$, $SD=1.876$).

The Post Hoc Analysis showed that the participants from student-centered group scored significantly high as compare to the teacher-centered and non-art group. The findings revealed that the deliverance of visual art through student-centered pedagogy has highly significant effects on the problem solving ability of art students.

Table 31***One way ANOVA on CPM Scores (N=180)***

	Group A 1 (n=60)		Group B 2 (n=60)		Group C 3 (n=60)			<i>i-j</i>
Variable	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	
CPM	25.02	6.10	21.5	8.11	21.6	7.78	4.364**	1>2, 3
		2	3	2	0	8		

$df = 178$, ** $p < .01$

Table 31 indicates a significant difference among all the three groups on total score of CPM ($F=4.364$, $p < 0.01$). The results show that participants from the student-centered group (A) have highest mean ($M = 25.02$, $SD = 6.102$) than teacher centered (B) and non-art group (C). The mean values of teacher-centered and non-art group indicate no difference between these two groups. The findings show that student-centered visual art better foster convergent thinking as compared to teacher-centered pedagogy.

Table 32***Correlation Matrix on all the study measures (N=180)***

	Fluency	Originality	CPM	MPT
WKCT				
Fluency	1	.550**	.231**	.193**
Originality	.550**	1	.196**	.238**
CPM	.231**	.196**	1	.220**
MPT	.193**	.238**	.220**	1

** $p < .01$, * $p < .05$

Table 32 shows the correlation matrix of all the scales. The matrix illustrated a distinct pattern of significant positive relationships between different variables. The figures revealed that the strong positive relationships exist among variables including problem solving ability with divergent thinking and convergent thinking.

5.4 Discussion

Art learning plays potentially a fundamental role in the education of our children. A child's drawing, painting or making of an art piece not only exposes his personality but also helps others around him to understand his perception as well as his aptitude. The present study identifies the relationship of two variables i.e. elementary visual art and problem solving ability. The study hypothesized that the students receiving elementary visual art will perform better on problem solving along with convergent and divergent thinking tests as compared to control group. A comparison was made initially between two groups of elementary school students. The first group comprised those students who were exposed to visual art (art group) while the other group consisted of those who had not been exposed to visual art (non-art group). The mean differences were calculated to explore the differences between art group and non-art group. To measure problem solving ability of the participants a test comprising four matchstick problem tasks was administered. The t test analysis revealed significant differences on the dependent variable. The findings of table 26 show that the mean score of art group on MPT

is significantly high as compared to the non-art group and hence supported the first hypothesis that “the students receiving visual art at elementary level would obtain significantly higher score on MPT as compared to those who (control group) had not received visual art at all”.

To assess divergent thinking of the participants, the WKCT was used with dependent variables of fluency and originality. The results revealed that art group was more fluent and original on creative thinking test and scored high as compared to non art group as shown in table 27. The findings confirmed the second hypothesis that “the students receiving visual art at elementary level would obtain significantly higher score on WKCT as compared to those who had not received visual art at all”.

On the other hand the third hypothesis that “the students receiving visual art at elementary level will obtain significantly higher score on Colored Progressive Matrices as compared to those who did not receive visual art at all” could not be confirmed from the data, although difference did exist but it was not significant. This can be attributed to the fact that the positive effect of this variable could be seen after a long time. If the results of same variables, dependent and independent, in study I are analyzed in the same context the findings indicate highly significant difference between the two groups (see table 10). This may be due to the fact that the study I measured the long term effect of elementary visual art on convergent thinking, whereas study II measured both the variables right after the occurrence of independent variable.

The above findings exhibit that art group remained at high rank on MPT and WKCT thus it can be concluded that students who were getting art experiences in their elementary school were better in problem solving than the non-art students. Further, figures indicated that art group and non-art group were equally good in convergent thinking. Convergent and divergent thinking are the two constructs of visual art. However, the results revealed a significantly strong relationship of visual art with divergent thinking. Art learning fosters creativity and makes the children flexible, fluent, elaborate, and original. These traits are also required for an effective problem solving behavior. Furthermore, the results revealed that children from art group were good in both types of thinking i.e.,

convergent and divergent, this also provided evidence that they were good problem solvers. The findings are in line with previous researches that the people who utilize both types of thinking are good problem solvers (Verma & Vohra, 2012). These findings can be ascribed to the fact that art learning prepares children to tackle problems with multiple solutions (Jensen, 2001; Weisberg, 2004). Uptis (2011) believed that art education contributes in the development of the “whole child”. Farrell & Meban, (2003) stated that a “child who is exposed to the arts in school has the potential to become more creative, imaginative, expressive, confident, self-reliant or critically thinking individual” (p.5). Given these types of findings it seems inequitable not to provide the same opportunities to all groups of students.

The study also found a significant difference in problem solving ability of students exposed to different teaching pedagogies of visual art i.e., student-centered and teacher-centered in their elementary schools and the students who were not receiving visual art at all. One-way ANOVA revealed that student-centered group scored higher than teacher-centered and control group.

Another hypothesis of study supported by findings was that visual art focused on student-centered pedagogy will enhance divergent and convergent thinking of students. ANOVA showed significant differences among all the three groups. This assumption was based on the creative self expression allowed by student-centered pedagogy. Literature provides sufficient empirical support for this idea that creativity and self expression which are the core features of student centered-art are the components of a positive personality (Efland, 1990; Hurwitz, 2001) and it's due to this freedom of self expression that Burton (2000) argued that this pedagogy had framed the ‘naturalist’ vision of a child.

The difference in the scores between student-centered and teacher-centered visual art groups in this study sample highlight the fact that student-centered art learning calls upon children's creativity, imagination and involves thought provoking process that is crucial for reasoning and critical thinking. It directs the learners to seek multiple solutions to bring their ideas into existence, making them a part of this real world. The freedom of expression provided by permissive

environment is more superior in bringing out multiple channels to approach problem situations. When children get involved in art experiences, find variety of ways to make an art piece and accomplish creative tasks they learn to seek for alternate ways to tackle their routine matters. This adorns them with self confidence and makes them self reliant and capable to deal with their daily problems.

The concepts like convergent and divergent thinking were also investigated in the study. Interestingly it was found that participants who scored high on divergent thinking task also scored high on convergent thinking task (see Table 30 and 31). Another hypothesis of study supported by findings was that the “visual art provided through teacher-centered pedagogy will foster only convergent thinking”. Though it fostered convergent thinking in the students, but results of table 34 were astonishing that student-centered group scored higher on convergent thinking as compared to teacher-centered and control groups. Therefore, it is concluded that student centered group was superior both in convergent and divergent thinking as compared to teacher- centered and non-art group. It supported the idea that the provision of art through freedom of self expression excels the human brain in both types of thinking.

The present research also assumed the predictive positive relationship between convergent thinking and Divergent thinking and effective problem solving ability. The findings of the study show that positive correlation between these three variables.

The overall findings revealed that student-centered art group scored high on all the three tests and hence these variables have a strong positive relationship with each other. According to Lee & Larid (2004) problem solving is a creative process. It requires both convergent and divergent thinking “in order to arrive at a quality formulation” (Jaarsveld & Leeuwen, 2005). In this challenging world where people daily meet lots of multi-faceted problems it is very crucial to prepare the nations to face these challenges in a befitting manner. For this reason, the youth and the

children should be trained enough to be confident enough to take risks and initiative; make bold decisions, and revolutionize the unpleasant and uncertain situations into the satisfying and desired one; for the well being of themselves as well as for the whole society.

The study suggests that visual art should be brought at par with other conventional basic skill subjects. It also recommends the student-centered pedagogy to be regulated in art class rooms to value, support and reward the creative thoughts. Further the study findings deserve special attention of educators and policy makers to equally emphasize both types of thinking i.e., convergent and divergent while planning the curriculum so that it can equally foster both modes of thinking particularly during elementary school years which are considered to be the most important and crucial times in a child life. These years have an everlasting impact on one's life. Therefore care should be taken while devising educational plans for these years, which are crucial and serve as a concrete stage having long term effects on the nation's life (Dewey, 1916; Piaget, 1973; Shakoor, 2011).

Finally, this study suggests that the role of visual art as we look to the future lies with the policy makers and educators who have the vision to see beyond the apparent and superficial meaning of education.

CHAPTER – VI

GENERAL DISCUSSION

CHAPTER-VI

GENERAL DISCUSSION

To ascertain the crucial role of elementary visual art, the study hypothesized that young students who are receiving visual art at the elementary school level will obtain a significantly higher score on problem solving test, as compared to those who are not receiving visual art at all. Art experiences have always been considered the basis of creative activity within schools since ages. Visual art not only enables children in developing their imaginative capabilities and enhancing their analytical thinking, but also enhances their creative thinking. It helps them in analyzing situations at a broad spectrum by allocating better solutions for problems. However, this influential outcome of visual art can be influenced by the instructional pedagogy either to diminish or achieve this end result. Therefore, the present study also examined the role of elementary visual art with a special emphasis on how visual art pedagogies can influence the problem solving skills. The literature supports the relationship between visual art learning and problem solving approach based on a common construct shared by both variables and that is the creativity. However, no evidence based research was found primarily to confirm the existence of this relationship through standardized tests.

The present study examined the convergent and divergent thinking of elementary school students with respect to measure their problem solving ability. The study defines the problem solving with respect to convergent and divergent thinking (Guilford 1965). As discussed earlier (chapter I) convergent and divergent thinking divide problem solving into two types. Convergent thinking is seen as finding one particular answer to a given problem, involving one definite answer. Divergent thinking, on the other hand, does not have one correct answer, but a number of different possible solutions. Thus the study used Ravens' Progressive Matrices to measure convergent thinking and WKCT to measure divergent thinking of the participants.

The present study was also concerned with the long term effects of elementary art education on problem solving ability at a later stage of life (at adolescence and young adult age). For this purpose, instead of a longitudinal study a retrospective study was conducted.

The over reaching questions here are when and how art education should be introduced in human life to attain its maximum advantages to develop social, emotional, intellectual, and physical skills and competencies. The question, *when* deals with the issue of suitable time period of one's life. Piaget recommends elementary years of life appropriate for learning. According to him creativity can be best cultivated in early years of life. Elementary school years are considered crucial for developing a child's intellectual, emotional, physical and social skills in order to lead a healthy and active life (Graber, Locke, Lambdin & Solmon, 2008).

In a study regarding the importance of a child's drawings, Gardner (1980) opined that around the age of 7 or 8 the artistic expressiveness seemed to be at an end. Therefore, to recognize the appropriate time for cultivating art experiences the present study selected elementary school years. The study not only examined its impact on young students' performance in present scenario but also studied its long term effects on later life as adolescents because the role of education is not only to prepare students for present life but for later life as well (Dewey 1916).

The second question *how* deals with the issue as to what type of visual art pedagogy is more appropriate in nurturing the two types of thinking to foster problem solving skills of young children. The two most prevalent pedagogies in schools of Peshawar, were:

1. Teacher-centered
2. Student-centered

The other important related issues that influence the art education outcomes are: The course contents, class room environment, teacher's implicit and explicit behavior towards arts learning and assessment procedure. The art education being delivered through first approach was termed in this study as teacher-centered art education, whereas the art education being delivered through second approach was known as student-centered art education. To critically evaluate the prevalent procedure of two pedagogies being exercised in different schools of Peshawar observational technique was used.

The initial in-depth analysis revealed different schooling systems functioning in Peshawar. These systems included government, semi government, army public, missionary and private school systems, where the private schools systems can be further categorized in local, national and international school systems. During this research, it was found that government, semi government, army public, missionary and private schools at local were practicing teacher centered pedagogy, whereas different national and international schools offering Cambridge system were following student-centered approach. Ironically, government and semi government schools did not include visual art in their curriculum and this was the fact which motivated the researcher to conduct this research. The government and semi government schools were then retained in the control group, whereas, the schools offering visual art were further divided in two experimental groups i.e., group A consisting of students studying in schools offering student-centered visual art, whereas the students receiving teacher-centered visual art made up group B.

6.1 Conclusion

The present study explored the relationship between visual art and problem solving ability. The study extended these relations to two thinking types i.e., divergent thinking and convergent thinking. The hypothesis was based on the fact that visual art fosters creativity and creativity is a divergent production process

that leads to the generation of multiple and innovative ideas. Besides this, visual art experiences also expand cognitive abilities and hence strengthen the analytical and critical thinking skill as well. Solving problems also entails both analytical and creative skills to evaluate the problem situations and to make decisions.

Three major findings came forth from this body of research: 1) There are performance differences in one's ability to be original, fluent and problem solver when exposed to visual art experiences. 2) Teaching pedagogy plays a major role in minimizing or maximizing advantages of visual art in terms of cognitive abilities. The study found student-centered pedagogy to be the most effective one in achieving desired outcomes. 3) Art group scored higher on both convergent and divergent thinking measures as compared to non-art group which shows that divergent thinking compliments convergent thinking.

The current research provides empirical evidence that the instruments used to measure the constructs were reliable and valid. The study findings revealed that elementary visual art was significantly related to and predicted effective problem solving ability of children and adolescents. Problem solving is a component of mental health of a person and its significance cannot be ignored specially at the age of adolescence when they undergo a number of changes occurring in their physical, mental, social and interpersonal relationships. It was found that elementary visual art learning had a positive and everlasting effect on the thinking skills and problem solving ability of adolescents.

Introduction of visual art at elementary level in schools revealed a marked difference in the performance of the respective participants on all the three instruments. The results showed that the joint venture of divergent and convergent thinking could make people better problem solvers.

Results also revealed that the effect of class room environment can either be positive or negative depending on what teaching pedagogy has been used. The freedom of self expression, freedom of sharing ideas and conducting experiments with art material, enriched the innocent minds with creative experiences. It fostered not only their divergent thinking but convergent thinking too and

ultimately strengthened their mental health. Results revealed that the students receiving student-centered art were more responsive and creative. They also produced unique and unusual responses. Creativity helped them in provoking unique and unusual ideas as compared to non-art students. The findings showed that student-centered pedagogy stimulated better problem solving performance. Contrary to this, the teacher-centered group had restrictions on these constructs which limited the creativity to be productive and innovative. So we can safely hypothesize that under the same circumstances, teacher-centered art could not evoke the same level of creativity.

To conclude, the present research provides empirical evidence and better understanding of how visual art can contribute in developing better problem solving ability and when it should be introduced academically to achieve its best, far reaching and long lasting effects and maximum advantages. The research also exposes how the two thinking types are equally related to visual art and problem solving ability and how student-centered pedagogy can play an important role in strengthening these relationships. Apart from this, the research opens new arenas of research and enhances the understanding of significance of visual art and its provision on an equal footing to other academic subjects. Looking at the scores obtained by non-arts group on all the measures in this study it is strongly suggested that an equal opportunity should be provided to every child to receive art education in order to bring them at par with students receiving visual art. This study also highlights the importance of developing convergent and divergent thinking early in the life. Along with the direct impact of study variables, visual art learning encourages the critical and creative thinking by infusing the desire to inquire and seek for alternatives to justify more than one correct answer in their lives. Creativity puts an end to rote learning and makes them come up with original ideas. These findings deserve the special attention of teachers, educationists and policy makers to give importance to visual art on equal footing while planning the curriculum so that both modes of thinking can be equally fostered particularly during formative elementary school years.

6.2 Limitations and Recommendations

Limitations

In order to generalize the applicability of the findings of present study, it is important to acknowledge and highlight the limitations of this study. Given below are some of its salient features.

- i) The present study was concerned with the problem solving performance of students on different tests and aimed to measure their differences. The research consisted of two studies. Study I was a retrospective study and dealt with the past art experiences of adolescents and the impact on their problem solving ability. Study II was carried out on elementary school children and measured the effect of visual art education in the present scenario. Although the data of study I and II were collected simultaneously, facilitating each other yet they could not be considered equal. To address this concern the researcher intends to utilize the sample being used in study-II as a base line for a longitudinal study in future. For this very purpose the researcher has planned to collect data year after year from the same sample.
- ii) The sample of study I was selected from the 1st year of National College of Arts Lahore and Rawalpindi. The purpose of selecting NCA was to incorporate a national data as creative students come to this institute from different provinces of Pakistan. The sample was selected through purposive sampling to develop three different groups comprising 50 students each. Initially the whole strength of 1st year comprising 200 students was selected. Later the research was carried out on 150 students because 50 of them failed to meet the criteria of the study. In future it is recommend to increase the sample size of each group.
- iii) To develop a better perspective of the relationship among study variables the sample of study II was selected from different educational systems. For this purpose elementary schools of Peshawar were approached but due to the law and order situation in the province of KPK, the schools' administrations were not willing to facilitate the researcher. After frequent

visits and requests the researcher was reluctantly allowed for data collection for a limited time period. Therefore, both studies could not manage a large sample size. The future researchers should incorporate large sample size from a particular age group to increase the generalization of the study. This would also help in increasing the external validity of the study.

Recommendations

Despite its limitations, this study broadens the awareness about visual art education and its positive impact on cognitive abilities, and opens new vistas for future researches. The recommendations stated here should be well thought-out while planning a research design on study variables.

The following recommendations should be considered before designing any research on study variables.

- i. The scales used in present study must be applied on a large sample to be validated.
- ii. Other relevant instruments should also be investigated and used to measure the study variables.
- iii. The future study should also take in its fold the role that a family (parents and siblings) plays in supporting a child's interest towards art activities.
- iv. The teacher's explicit and implicit beliefs about visual art education are other interesting variables in order to discover what contribution each of these aspects make in the development of a child's artistic and creative abilities.

REFERENCES

REFERENCES

- Ahmed, R., Khanam, S. J., Riaz, Z. & Lynn, R. (2008). Gender differences in means and variance on the Standard Progressive Matrices. *Mankind Quarterly*, 49(1), 50-57.
- Ajwani A.J., Vohra M., & Verma S. (2012). Problem solving abilities of cognitively high intelligent Adolescents, *Journal of Indian Academy of Applied Psychology*, 38(1), 126-137.
- Alencar, E., & Fleith, D. (2003). Criatividade: multiplas perspectivas. *Brasília: Editora da Universidade de Brasília*, 23, 45 - 49.
- Allison, B., & Hausman, J. (1998). The limits of theory in art education. *Journal of Art and Design Education*, 17(3), 121-127.
- Alter, F. 2008, Artful Thinking: Critical and Creative Thinking in Primary and Secondary Visual Arts Education, Doctoral Thesis, University of New England.
- Amabile, T. M. (1983). The Social Psychology of Creativity: A Componential Conceptualization. *Journal of Personality and Social Psychology*, 45(2), 357-376.
- Amburgy, P. M. (1990). Culture for the masses. In D. Soucy and M. A. Stankiewicz (Eds.) *Framing the past: Essays in art education* (pp.101-113). Reston, VA: The National Art Education Association.
- Anderson, L.W., Krathwohl, D.R., Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J., & Wittrock, M.C. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. New York: Longman.
- Arthur, C. (2006). In Praise of Convergent Thinking, *Creativity Research Journal* 18(3), 391–404.
- Baer, J. (1993). *Creativity and divergent thinking: A task-specific approach*. Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc.
- Basadur, M. (1994). *Simplex: A Flight to Creativity*. Creative Education Foundation, Buffalo, NY.
- Batchelder, W. H. & Alexander, G. E. (2012). Insight Problem Solving: A Critical Examination of the Possibility of Formal Theory, *The Journal of Problem Solving*, 5(1), 56-100.

- Benedek, M., Mühlmann, C., Jauk, E., & Neubauer, A. C. (2013). Assessment of divergent thinking by means of the subjective top-scoring method: Effects of the number of top-ideas and time-on-task on reliability and validity, *Psychology of Aesthetics, Creativity, and the Arts*, 7, 341-349.
- Berk, L. E. (2007). *Development through the Lifespan*, (4th ed), Boston: Allyn & Bacon.
- Bies, J. (1972). The Relationship between Environment Factors and Problem-Solving Ability in Three Demographic Groups. Ph.D. Dissertation, University of Missouri Columbia.
- Boughton, D. (1989). The changing face of Australian art education: New horizons or sub-colonial politics? *Studies in Art Education*, 30(4), 197-211.
- Brody, L.R., Park, S.H. (2004). Narratives, Mindfulness, and the Implicit Audience. *Clinical Psychology: Science and Practice*, 11(2), 147-154.
- Broudy, H. (1972). *Enlightened Cherishing: An Essay on Aesthetic Education*. Urbana, IL: University of Illinois Press.
- Brown, D. (2006). Teachers' implicit theories of expression in visual arts education: A study of Western Australian teachers. Ph.D. Dissertation, Edith Cowan University.
- Brown, N. (2001). The meaning of transfer in the practices of arts education. *Studies in Art Education* 43(1), 83-102.
- Bullock, A., & Galbraith, L. (1992). Images of art teaching: Comparing the beliefs and practices of two secondary art teachers. *Studies in Art Education*, 33(2), 86-97.
- Burton, J. (2000). The configuration of meaning: Learner-centered art education revisited. *Studies in Art Education*, 41(4), 330-339.
- Burton, J. M., Horowitz, R., & Abeles, H. (1999). Learning in and through the arts: Curriculum implications. In E. Fisk (Ed.), *Champions of change: The impact of the arts on learning*, pp. 35-46. Washington, DC: The Arts Education Partnership and the President's Committee on the Arts and the Humanities.
- Bussis, A. M., Chittenden, E. A., and Amarel, M. (1976). *Beyond surface curriculum*. Boulder, Colorado: West view Press.
- Carpenter, P. A., Just, M. A., & Shell, P. (1990). What one intelligence test measures: A theoretical Account of the processing in the Raven's Progressive Matrices test. *Psychological Review*, 97(3), 404-431.

- Carson, S. H., Peterson, J. B., & Higgins, D. M. (2003). Decreased latent inhibition is associated with increased creative achievement in high functioning individuals. *Personality and Individual Difference*, 85, 499-506.
- Chase, C. I. (1985). Review of the Torrance Tests of Creative Thinking. In J. V. Mitchell, Jr. (Ed.), *The ninth mental measurements yearbook* (pp. 1631–1632). Lincoln: University of Nebraska, Buros Institute of Mental Measurements.
- Chein, J. M., Weisberg, R. W., Naomi L. Streeter, N. L., & Kwok, S. (2010) Working memory and insight in the nine-dot problem, *Memory & Cognition*, 38 (7), 883-892.
- Chermahini, A. S., Hickendorff, M., & Hommel, B. (2012). Development and validity of a Dutch version of the Remote Associates Task: An item-response theory approach. *Thinking Skills and Creativity*, 7, 177–186.
- Chermahini, S. A., Hickendorff, M., & Hommel B. (2012) Development and validity of a Dutch version of the Remote Associates Task: An item-response theory approach. *Thinking Skills and Creativity*, vol. 7. 177–186. Retrieved from <http://www.elsevier.com/locate/tsc/>, 12/23/2012
- Cheung, P. C., Lau, S., Chan, D. W., & Wu, W. Y. H. (2004). Creative potential of school children in Hong Kong: Norms of the Wallach–Kogan Creativity Tests and their implications. *Creativity Research Journal*, 16, 69–78.
- Chi, M. T. H., & Glaser, R. (1985). Problem-solving ability. In R. J. Sternberg (Ed.), *Human abilities: An information processing approach* (pp. 227–250). New York: Freeman.
- Chu, Y. (2009). *Human Insight Problem Solving: Performance, Processing, and Phenomenology*. VDM Verlag.
- Chu, Y., & MacGregor, J. N. (2011). Human performance on insight problem solving: A review. *The Journal of Problem Solving*, 3(2), 119-150.
- Clapham, M. M. (2004). The convergent validity of the Torrance Tests of Creative Thinking and Creative Interest Inventories. *Educational and Psychological Measurement*, 64, 828-841.
- Clark, G. A., & Zimmerman, E. (1984). *Educating artistically talented students*. Syracuse, NY: Syracuse University Press.
- Cole, N. R. (1960). *The arts in the classroom*. New York: The John Day Co.
- Csikszentmihalyi, M. (1996). *Creativity, flow and the psychology of discovery and invention*. New York, NY: Harper Collins.

- de Bono, E. (1970). *Lateral Thinking: Creativity Step By Step*, Harper & Row, NY.
- Domino, G. (2007). *Psychological Testing: An Introduction*, (2nd ed) New York: Cambridge University Press.
- Dorn, C. M. (1999), *Mind in art: Cognitive foundations in art education*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Dow, G. T., & Mayer, R. E. (2004). Teaching students to solve insight problems: Evidence for domain specificity in creativity training. *Creativity Research Journal*, 16, 389–402.
- Dunbar, K. (1998). Problem solving. In W. Bechtel, & G. Graham (Eds.). *A companion to Cognitive Science*. London, England: Blackwell, (pp 289-298).
- Dunbar, K., N. (2008). Arts Education, the Brain and Language. *The Dana Consortium Report on Arts and Cognition*, 81-92. New York, Dana Press.
- Duncker, K. (1945). On problem-solving. *Psychological Monographs*, 58, Whole No. 270. American Psychological Association.
- Efland, A. 2002, *Art and Cognition*, Teachers College Press, New York.
- Efland, A. D. (1990). *A history of art education: Intellectual and social currents in teaching the visual arts*. New York: Teachers College Press.
- Egan, K., Stout, M., & Takaya, K. (ed) (2007). *Teaching and Learning Outside the Box: Inspiring Imagination Across the Curriculum*, Teachers College Press.
- Eisner, E. (1972). *Educating artistic vision*. New York: Macmillan.
- Eisner, E. W. (1972). *Educating artistic vision*. New York, NY: Macmillan Publishing.
- Eisner, E. W. (1994). Revisionism in art education: Some comments on the preceding articles. *Studies in Art Education*, 35(3), 188-191.
- Eisner, E. W. (2002). The state of the arts and the improvement of education. *Art Education Journal*, 1(1), 2–6.
- Entwhistle, H. (1970). *Child-Centered Education*. London: Methuen.
- Essa, E. (2010). *Introduction to Early Childhood Education*, (6th ed), Cengage Learning.

- Faste, R. 1994. *Ambidextrous Thinking, Innovations in Mechanical Engineering Curricula for the 1990s*, American Society of Mechanical Engineers.
- Fleck, I. J. & Weisberg, R. W. (2004). The use of verbal protocols as data: An analysis of insight in the candle problem, *Memory and Cognition*, 32(6), 990-1006.
- Florida, R., & Goodnight, J. (2005). Managing for creativity, *Harvard Business Review*, 83(7), 124-131.
- Fox, M. (2008). *da Vinci and the 40 Answers*, Wizard Academy Press.
- Freedman, K., & Popkewitz, T. S. (1985). Art education and the development of the academy: The ideological origins of the curriculum. In B. Wilson and H. Hoffa (Eds.), *The history of art education: Proceedings from the Penn State Conference* (pp.19-27). Pennsylvania: National Art Education Association.
- Freire, P. (1993). *Pedagogy of the Oppressed*. New York, Continuum.
- Funch, B. S. (1997). *The psychology of art appreciation*. Museum Tusculanum Press
- Chegenizadeh, A., Nikraz, H., & Zadeh, H. H., (2012). Student Centered Class. International Proceedings of Economics Development and Research (IPEDR), 47(32), 144-148. Retrieved from <http://www.ipedr.com/vol47/032-ICERI2012-S10034.pdf/5/5/2014>.
- Furnham, A. F., & Bachtiar, V. (2008). Personality and intelligence as predictors of creativity. *Personality and Individual Differences*, 45, 613–617.
- Gange, R. M. (1980). Learnable aspects of problem solving. *Educational Psychologist*, 15, 84-92.
- Gardner, H. (1980). *Artful scribbles: The significance of children's drawings*. New York: Basic Books.
- Gardner, H. (1990). *Art Education and Human Development*. Los Angeles: The Getty Education Institute for the Arts.
- Gardner, H. (1993). *Multiple intelligences: the theory in practice*. New York, New York: Basic Books.
- Gardner, H. (1999). *Intelligence Reframed: Multiple Intelligences for the 21st Century*. New York: Basic Books.
- Gardner, H., & Wolf, D. (1983). Waves and streams of symbolization. In D. R. Rogers & J. A. Sloboda (Eds.), *The acquisition of symbolic skills* (pp. 19–42). London: Plenum Press.

- Getzels, J. W. (1987). Creativity, intelligence, and problem finding: Retrospects and prospect. In S. G. Isaksen (Ed.), *Frontiers of creativity research: Beyond the basics* (pp. 88- 102). Buffalo, NY: Bearly Limited.
- Gladwell, M. (2008). *Outliers: the Story of Success*. New York: Little Brown.
- Goel, V., Vartanian, O., (2005). Dissociating the roles of right ventral lateral and dorsal lateral prefrontal cortex in generation and maintenance of hypotheses in set-shift problems. *Cerebral Cortex*, 15(8), 1170–1177.
- Gondal, U. H., and Ali, Z., (2013). Does Intelligence Always Guarantee Performance? *Asian Journal of Business Management* 5(2), 229-237.
- Gonzalez, C., Thomas, R.P., & Vanyukov, P. (2005). The relationship between cognitive ability and dynamic decision making. *Intelligence*, 33, 169-186.
- Gowan, J. C. (1972). *Development of the Creative Individual*. San Diego, CA: R. K. Knapp.
- Graber, K. C., Locke, L. F., Lambdin, D., & Solmon, M. A. (2008). The landscape of elementary school physical education. *The Elementary School Journal*, 108, 151–159.
- Griffith, M. A., Dubow, E. F., & Ippolito, M. F., (2000). Developmental and Cross-Situational Differences in Adolescents' Coping Strategies, *Journal of Youth and Adolescence*, 29(2), 183-204.
- Guilford, J. P. (1950). Creativity. *American Psychologist*, 5, 444-454.
- Guilford, J. P. (1967). *The Nature of Human Intelligence*. New York: McGraw-Hill.
- Guilford, J. P. (1954) Factor in Problem Solving. *ARTC Instructor Journal*, 4, 197-204.
- Hammond, G. (1978). Changes in art education ideologies; Victoria 1860's to mid 1970's. PhD. Dissertation, Monash University.
- Hardin, L. E. (2002). Problem Solving Concepts and Theories. *Journal of Veterinary Medical Education*, 30(3), 227-230.
- Hatch, J. A., & Freeman, E. B. (1988). Kindergarten philosophies and practices: Perspectives of teachers, principles, and supervisors. *Early Childhood Research Quarterly*, 3, 151-166.
- Herberholz, B., & Hanson, L. (1995). *Early childhood art* (5th edition). Dubuque: Brown.

- Hickman, R. (1994). A student-centered approach for understanding art. *Art Education*, 47(5), 47-51.
- Hickman, R. (2004). *Art Education 11-18: Meaning Purpose & Direction* (2nd ed.). London: Continuum.
- Hota, A. K. (2000). *Encyclopaedia of New Media and Educational Planning*, (1st ed.). Darya Ganj New Delhi, Sarup & Sons.
- Runco, M. A, & Steven R. (1999). *Encyclopedia of Creativity*, Academic Press, California, USA.
- Houtz, J. C., & Krug, D. (1995). Assessment of creativity: Resolving a mid-life crisis. *Educational Psychology Review*, 7, 269–300.
- Hudson, L. (1966). *Contrary imagination*. London: Penguin Books.
- Hudson, L. (1967). *Contrary Imaginations*. Penguin Books, Harmonds worth, UK.
- Hudson, L. (1968). *Frames of mind*. London: Methuen.
- Isaksen, S.G. and Treffinger, D.J. (2004). Celebrating 50 years of Reflective Practice: Versions of Creative Problem Solving. *Journal of Creative Behavior*, 38, 75–101.
- Isaksen, S.G., Dorval, K.B. and Treffinger, D.J. (1994). *Creative Approaches to Problem Solving*. Kendall/Hunt, Dubuque, IA.
- Jaarsveld, S., Lachmann, T., & van Leeuwen, C. (2012). Creative reasoning across developmental levels: Convergence and divergence in problem creation. *Intelligence*, 40, 172-188.
- Jaarsveld, S., Lachmann, T., & van Leeuwen, C. (2013). The Impact of Problem Space on Reasoning: Solving versus Creating Matrices. In M. Knauff, M. Pauen, N. Sebanz, & I. Wachsmuth (Eds.), *Proceedings of the 35th Annual Conference of Cognitive Science Society*, (pp. 2632-2638). Austin, TX: Cognitive Science Society.
- Jensen, E. (2001). *Arts with the brain in mind*. Alexandria, Va., Association for Supervision and Curriculum Development.
- Johnson, P. E., & Ranson, B. (1990). The Effect of a Traditional Secondary School Geometry Course on Problem-Solving Ability, *The Mathematical Gazette*, 74(468), 114-120. Retrieved from <http://www.jstor.org/stable/3619352/16/12/2013>.
- Jonides, J. (2008). Musical Skill and Cognition. *The Dana Consortium Report on Arts and Cognition*, (pp. 11-16). New York, Dana Press.

- Kavac, G., Knafo, A., Gilboa, A., (2010). The rise and fall of word retrieval across the lifespan. *Psychology and Aging* 25(3), 719–724.
- Kelly, E. P. (2000). When Sparks Fly: Igniting Creativity in Groups. *The Academy of Management Executive* 14(1), 157-159.
- Kennedy, D. (1988). Images of the young child in history: Enlightenment and romance. *Early Childhood Research Quarterly*, 3, 121-137.
- Kerr, B. (Ed.). (2009). Encyclopedia of giftedness, creativity, and talent. Thousand Oaks, CA: Sage.
- Kershaw, T. C., & Ohlsson, S. (2004). Multiple causes of difficulty in insight: The case of the nine-dot problem. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 30(1), 3–13.
- Kim, K. H. (2006) Is Creativity Unidimensional or Multidimensional? Analyses of the Torrance Tests of Creative Thinking. *Creativity Research Journal*, 18(3), 251–259.
- Kindler, A. (1992). Discipline based art education in secondary schools: A possible approach. *Journal of Art and Design Education*, 11(3), 345-354.
- Kleibeukera, S. W., Cédric, P., Koolschijna, M. P., Jollesa, D. D., Schela, M. A., Carsten K.W. D., & Cronea, E. A. (2013). Prefrontal cortex involvement in creative problem solving in middle adolescence and adulthood. *Developmental Cognitive Neuroscience*, 5, 197– 206, Reterived from h t t p : / / www.elsevier.com/locate/dcn/6/12/2013.
- Knöblich, G., Ohlsson, S., Haider, H., & Rhenius, D. (1999). Constraint relaxation and chunk decomposition in insight problem solving. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 25(6), 1534–1555.
- Lamb, A. (2003). Critical and Creative Thinking - Bloom's Taxonomy. A. Lamb.
- Laurie, M, A., & Lynette, T. J. (1996). Effects of focal brain lesions on visual problem-solving, *Neuropsychologia*, 34(5), 387-398
- Lee, N. L., & Johnson-Laird, P. N. (2013). Strategic changes in problem solving. *Journal of Cognitive Psychology*, 25(2), 165-173.
- Lee, N.Y.L., & Johnson-Laird, P.N. (2004). Creative strategies in problem solving. In K. Forbus, D. Gentner & T. Regier (Eds.). *Proceedings of the Twenty-Sixth Annual Conference of the Cognitive Science Society*, Chicago, IL (pp.813-818). Mahwah, NJ: LEA.
- Lewn, M. (1986). *Principles of effective problem solving*, unpublished manuscript, State University of New York at Stony brook.

- Lovett, M. C., & Anderson, J. R. (1996). History of success and current context in problem solving: Combined influences on operator selection. *Cognitive Psychology*, 31, 168-217.
- Lowenfeld, V. (1954). *Your child and his art*. New York: Macmillan.
- Lowenfeld, V. and Brittain, W. L. (1970). *Creative and Mental Growth* (5th ed.). London: Collier-Macmillan Limited, The Macmillan Company.
- Lytton, H. (1971). *Creativity and Education*, London: Routledge & Kegan Paul.
- MacGregor, J. N., Ormerod, T. C., & Chronicle, E. P. (2001). Information processing and insight: A process model of performance on the nine-dot and related problems. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 27(1), 176–201.
- Maier, N. R. F. (1931). Reasoning in humans, II: The solution of a problem at its appearance in consciousness. *Journal of Comparative Psychology*, 12, 181-194.
- Maier, N. R. F. (1931): Reasoning in Humans: II. The Solution of a Problem and its Appearance in Consciousness. *Journal of Comparative Psychology*, 12, 181-194. Retrieved from <http://www.kent.ac.uk/careers/sk/puzzles.htm>
- Mandelson, L. (1984). From drawing to art in Australian state primary schools. *Journal of the Institute of Art Education*, 9(1), 35-45.
- Marché, T. A. (2002). Discipline before discipline-based art education: Federal support, curricular models, and the 1965 Penn State seminar in art education. *Arts Education Policy Review*, 103(6), 25-33.
- Metcalfe, J. & Wiebe, D. (1987). Intuition in insight and non-insight problem solving, *Memory & Cognition*, 15(3), 238-246
- Michael, J. A. (1983). *Art and adolescence: Teaching art at the secondary level*. New York: Teachers College Press.
- Michael, W. B., & Wright, C. R. (1989). Psychometric issues in the assessment of creativity. In J. A. Glover, R. R. Ronning & C. R. Reynolds (Eds.), *Handbook of creativity* (pp. 33–52). New York, NY: Plenum.
- O' Farrell, L. & Meban, M. (2003). Arts education and instrumental outcomes: an introduction to research methods and indicators. Paper commissioned by UNESCO under contract with the Faculty of Education at Queens University, Kingston, Ontario
- O'Leary, U., Rush, K. M., & Guastello, S. J. (1991). Estimating age-stratified WAIS-R IQ's from scores on the Raven's Standard Progressive Matrices. *Journal of Clinical Psychology*, 47(2), 277-284.

- Parsons, M. J. (1998). Integrated curriculum and our paradigm of cognition in the arts. *Studies in Art Education*, 39(2), 103-116.
- Peers, C. (2002). Tracing an approach to art teaching: A historical study of an art education documentary film. *Studies in Art Education*, 43(3), 264-277.
- Perrin, S. (2008). Why arts education matters. *Education Week*, 27(21), 26–27.
- Phillips, R. D., Gorton, R. L., Pinciotti, P., Sachdev, A. (2010). Promising Findings on Preschoolers' Emergent Literacy and School Readiness In Arts-integrated Early Childhood Settings. *Early Childhood Education Journal*, 38(2), 111-122
- Piaget, J. (1955). *The child's concept of reality*. London: Routledge.
- Piaget, J. (1970). *Genetic Epistemology*. New York: W .W. Norton.
- Piaget, J. (1973). *Main Trends in Psychology*. London: George Allen & Unwin.
- Polya G. (1954). *Mathematics and Plausible Reasoning*. Princeton, NJ: Princeton University Press.
- Polya, G. (1973). *How to Solve It: A new aspect of mathematical method* (2nd ed.). USA: Princeton University Press.
- Posner, Rothbart, Sheese & Kieras. (2007). How Arts Training Influences Cognition. In C. Asbury & B. Rich (Eds.), *Learning, arts, and the brain: The Dana consortium report on arts and cognitio*, 1–10. New York, NY: Dana Press.
- Puccio, G. J., & Murdock M. M. (2005). Current Developments in Creative Problem Solving for Organizations: A Focus on Thinking Skills and Styles. *The Korean Journal of Thinking & Problem Solving*, 15(2), 43-76.
- Puccio, G.J., Murdock, M.C. and Mance, M. (2007) *Creative Leadership: Skills that Drive Change*. Sage, Thousand Oaks, CA.
- Raths, J., & Wittrock, M.C. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's Taxonomy of Educational Objectives*. New York: Longman.
- Raven, J. & Court, J. H. (1989). *Manual for Raven's Progressive Matrices*. Oxford Psychology Press.
- Raven, J. (2000). The Raven's Progressive Matrices: Change and Stability over Culture and Time. *Cognitive Psychology*, 41, 1-48.

- Raven, J., Raven, J. C. Raven, & Court, J. H. (2004) Raven's Progressive Matrices and Vocabulary Scales Manuals. In J. Rust, (2008) *Coloured Progressive Matrices and Crichton Vocabulary Scale*. NCS Pearson, Inc.
- Ree, M. J., & Carretta, T. R. (2002). g2K. *Human Performance*, 15, 3-23.
- Reynolds, C. R. (Ed.), Fletcher-Janzen, E. (Ed.), (2002). *Concise Encyclopedia of Special Education: A Reference for the Education of the Handicapped and Other Exceptional Children and Adults*, (2nd ed.). John Wiley & Sons, Inc., Hoboken, New Jersey
- Riaz, M. (1978). A study of distinction between intelligence and creativity and some of the correlates among a group of Pakistani Children. PhD Dissertation. University of Peshawar, Pakistan.
- Roue, L.C. (2011). A study of grade level and gender differences in divergent thinking among 11th grades. University of Midwestern.
- Rousseau, J. J., Kelly, C. & Bloom, A. D. (ed) (2010). *Emile, Or, On Education* Volume 13. The collected writings of Rousseau, UPNE.
- Rousseau, Jean-Jacques Rousseau. (1979). *Emile, or On Education*. Trans. Allan Bloom. New York: Basic books
- Runco, M. A. (1990). Implicit theories and ideational creativity. In M. Runco, & R. Albert (Eds.), *Theories of creativity*, (pp. 234-254). Newbury Park, CA: Sage.
- Runco, M. A., Plucker, J. A., & Lim, W. (2000–2001). Development and psychometric integrity of a measure of ideational behavior. *Creativity Research Journal*, 13, 393–400.
- Ruppert, S. S. (2006). *Critical Evidence: How the ARTS benefit student achievements*. Washington, DC: National Assembly of State Arts Agencies.
- Sabah, S. S., Gilani, N., & Iftikhar, R. (2012). Ravens Progressive Matrices: Psychometric evidence, gender and social class differences in middle childhood, *Journal of Behavioural Sciences*, 22(3),
- Sadaf Tariq, S. (2011). Identity Styles, Causality Orientations and Psychological Well-being Among Adolescents: A Cross-cultural Comparison, PhD Thesis. National Institute of Psychology, Centre of Excellence, Quaid-i-Azam University, Islamabad – Pakistan

- Sadker, D. M. & Zittleman, K. R. (2010). *Teachers, Schools and Society: A Brief Introduction to Education*. Mc-Graw Hill Company; 2nd edition.
- Schickedanz, J. A., York, M. E., Stewart, I. S., & White, D. A. (1983). *Strategies for teaching young children* (2nd edition). Englewood Cliffs, NJ: Prentice Hall.
- Schirmacher, Robert. (1993). *Art and creative development for young children*. Delmar Publishers Inc.
- Shakoor, A., Azeem, M., Dogar, A. H., Khatoon, Z. (2011). 1947-2008 Evaluation of Elementary Education in Pakistan , *International Journal of Humanities and Social Science*, 1(15), 270-276
- Sherman & Poirier. (2007). *Educational equity and public policy: comparing results from 16 countries*. Retrieved on 1/8/2012 from <http://unesdoc.unesco.org/images/0014/001495/149523e.pdf>
- Shimamura, A. P. (2012). Towards a Science of Aesthetics: Issues and Ideas. In Shimamura, A. P. & Palmer S. E. (Eds.), *Aesthetic Science: Connecting Minds, Brains and Experiences* (pp. 3-28), Oxford University Press.
- Silvia, P. J. (2008). Creativity and intelligence revisited: A latent variable analysis of Wallach and Kogan (1965). *Creativity Research Journal*, 20, 34-39.
- Silvia, P. J., Winterstein, B. P., Willse, J. T., Barona, C. M., Cram, J. T., Hess, K. I., et al. (2008). Assessing creativity with divergent thinking tasks: Exploring the reliability and validity of new subjective scoring methods. *Psychology of Aesthetics, Creativity, and the Arts*, 2, 68–85.
- Singer, D.G. & Revenson, T.A. (1997). *A Piaget Primer: How a Child Thinks* (Revised Edition). Madison, Connecticut: International Universities Press Inc.
- Smith F. N. (2000). Babel: A reminder. *Arts Education Policy Review* 101(3), 13-14.
- Smith, P. J. (2003) Visual Culture Studies versus Art Education, *Arts Education Policy Review* Volume 104, Issue 4, pp 3-8.
- Smith, R. A. (2000b). Phases in aesthetic learning. In R. A. Smith (Ed.), *Readings in discipline-based art education* (pp.295-303). Reston, VA: National Art Education Association.
- Spidell-Rusher, A., McGrevin, C. Z., & Lambiotte, J. G. (1992). Belief systems of early childhood teachers and their principals regarding early childhood education. *Early Childhood Research Quarterly*, 7(2), 277-296.

- Stankiewicz, M. A. (2007). Capitalizing art education: Mapping international histories. In L. Bresler (Ed.), *International Handbook of Research in Arts Education*, Series: Springer International Handbook of Education, Vol. 16, 7-30. Berlin; Heidelberg; New York: Springer.
- Sternberg, R. J. (2005a). Creativity or creativities? *International Journal of Human-Computer Studies*, 63(4-5), 370-382.
- Sternberg, R. J. (2005b). WICS: A model of positive educational leadership comprising wisdom, intelligence, and creativity synthesized. *Educational Psychology Review*, 17, 191-262.
- Sternberg, R. J. (2005c). The Theory of Successful Intelligence, *Inter-American Journal of Psychology*, 39(2), pp. 189-202
- Sternberg, R. J. (2006). The Nature of Creativity, *Creativity Research Journal*, 18(1), 87–98
- Sternberg, R. J. (Ed.) (1999). *Handbook of Creativity*, Cambridge: Cambridge University Press
- Osborn, A. F. (1963). *Applied imaginations: Principles and Procedures of creative problem-solving*. New York: Charles Scribner's Sons.
- Sternberg, R. J., & Lubart, T. I. (1996). Investing in creativity. *American Psychologist*, 51(7), 677–688.
- Torrance, E. P. (1966). *The Torrance Tests of Creative Thinking-Norms-Technical Manual Research Edition-Verbal Tests, Forms A and B-Figural Tests, Forms A and B*. Princeton, NJ: Personnel Press.
- Travers, K. J., Dalton, L. C., Bruner, V. F., & Taylor, A. R. (1976). *Using advanced algebra*. Toronto: Doubleday.
- Treffinger, D. J. (1985). Review of the Torrance Tests of Creative Thinking. In J. V. Mitchell, Jr. (Ed.), *The ninth mental measurements yearbook* (pp. 1632–1634). Lincoln: University of Nebraska, Buros Institute of Mental Measurements.
- Umphrey, D. (2004). *Developing Creative & Cognitive Skills through a Comprehensive Art Education*. [PowerPointSlides]. National Art Education Association, National Visual Arts Standards, Reston: VA. Retrieved from <http://education.ucf.edu/arted/docs/Deborah%20Umphrey>.
- Upitis, R. (2011). *Arts Education for the Development of the Whole Child*. Prepared for the Elementary Teachers' Federation of Ontario.
- Vidal, R.V.V. (2004). Creativity and Problem Solving, *Economic Analysis Working Papers*, 3(14), 1-29.

- Villalba, E. (2008) Report on Creativity Towards an Understanding of Creativity and its Measurements, European Commission, Joint Research Centre
- Wallach, M. A., & Kogan, N. (1965). *Modes of thinking in young children: A study of the creativity-intelligence distinction*. New York: Holt, Rinehart & Winston.
- Wandell, B., Dougherty, R. F., Ben-Shachar, M., Deutsch, G. K., and Tsang, J. (2008). Training in the Arts, Reading, and Brain Imaging. *The Dana Consortium Report on Arts and Cognition*, 51-60. New York, Dana Press.
- Weimer, M. (2013). *Learner-centered teaching: Five key changes to practice*. (2nd ed.). San Francisco: Jossey-Bass.
- Weisberg, R. W. (2006). Creativity: Understanding innovation in problem solving, science, invention, and the arts. Hoboken, NJ: Wiley.
- Wolf, D. E. (1992). Becoming knowledge: The evolution of art education curriculum. In P. W. Jackson (Ed.), *Handbook of research on curriculum*. New York: Macmillan.

APPENDICES

APPENDICES

Appendix A

Pilot Survey Instrument (Questionnaire)

The purpose of this research questionnaire is to evaluate the mode of art education used to teach you during elementary years.

Note: the term 'art' as used in this questionnaire denotes visual art.

Name:

Area of Specialization:

Name of School:

Primary/Elementary: _____ Secondary: _____

Type of Primary/Elementary School

☐ Public ☐ Private ☐ Oxford ☐ Cambridge

Location of Primary/Elementary School

☐ Rural ☐ Suburban ☐ Urban ☐ Inner City

Please recall your primary/elementary education days and answer the following questions.

Were you taught art education at elementary level? ☐ **Yes** ☐ **No**

If no, please proceed on page 4 (Personal Development).

If yes, please rate the quality of art education according to the following scale.

Please put a tick mark (✓) in the relevant box.

	Poor	Fair	Good	V. Good	Excellent
The Art Education program was	☐	☐	☐	☐	☐
The Art classroom was	☐	☐	☐	☐	☐
Mode of Art Education was	☐	☐	☐	☐	☐

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The Art Education Program					
was enjoyable	☐	☐	☐	☐	☐
was a worthwhile learning experience	☐	☐	☐	☐	☐
improved my artistic skills	☐	☐	☐	☐	☐
involved students in such activities that enhance creative thinking	☐	☐	☐	☐	☐
facilitated me in learning other subjects	☐	☐	☐	☐	☐
fostered my interest in visual arts	☐	☐	☐	☐	☐

The Art Curriculum

was well-organized	☐	☐	☐	☐	☐
allowed communication of original ideas	☐	☐	☐	☐	☐
encouraged students to explore a variety of sources for making an art project	☐	☐	☐	☐	☐
provided opportunities to exhibit students' talent	☐	☐	☐	☐	☐
helped me in selecting my career today	☐	☐	☐	☐	☐

Most of My Art Teachers

were creative	☐	☐	☐	☐	☐
allowed freedom of expression	☐	☐	☐	☐	☐
encouraged outdoor art activities	☐	☐	☐	☐	☐
provided variety of art material	☐	☐	☐	☐	☐
inspired my interest in arts	☐	☐	☐	☐	☐

Strongly Disagree **Disagree** **Neutral** **Agree** **Strongly Agree**

My Art Program made me productive

at school	☐	☐	☐	☐	☐
at home	☐	☐	☐	☐	☐
in social gatherings	☐	☐	☐	☐	☐

Pease describe some of art projects you still remember you made in your elementary art class:

What do you wish there had been more of?

If you have not received art education at primary/elementary level, please indicate your opinion about the following items by putting a tick mark (✓) in the relevant box.

	Never	Often	Sometimes	Usually	Always
Personal Development					
I involved in arts through personal development	☐	☐	☐	☐	☐
I was apprentice with an artist	☐	☐	☐	☐	☐
I Joined an art academy	☐	☐	☐	☐	☐
I think my creativity is inborn	☐ Yes		☐ No		

Who helped you most in enhancing your creativity?

Appendix B

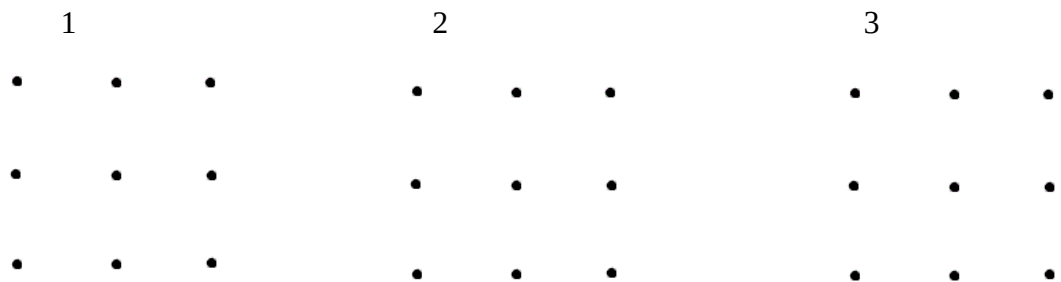
Pilot Survey Instrument (Problem Solving Ability Test)

Instruction:

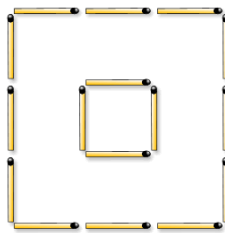
Imagine the following situations and try to solve them in as many ways as you can.

1. A girl who was just learning to drive went down a one-way street in the wrong direction, but didn't break the law. How come?
2. A prisoner was attempting to escape from a tower. He found in his cell a rope, which was half long enough to permit him to reach the ground safely. He divided the rope in half and tied the two parts together and escaped. How could he have done this?
3. There is a flash of light and a man dies. The man is not killed by any other person and he does not die of any illness like a heart attack etc. it's not a case of suicide either. Can you suggest logical explanations?
4. There is blood on the ceiling of my bedroom. There has been no murder or killing of any person. Nobody has played any trick with me. Can you suggest logical explanations?
5. How can you throw a ball as hard as you can and have it come back to you, even if it doesn't hit anything, there is nothing attached to it, and no one else catches or throws it?
6. Two students are sitting on opposite sides of the same desk. There is nothing in between them but the desk. Why can't they see each other?
7. A hunter aimed his gun carefully and fired. Seconds later, he realized his mistake. Minutes later, he was dead.

8. Join all the 9 dots using four lines or less, without lifting your pen and without tracing the same line more than once.



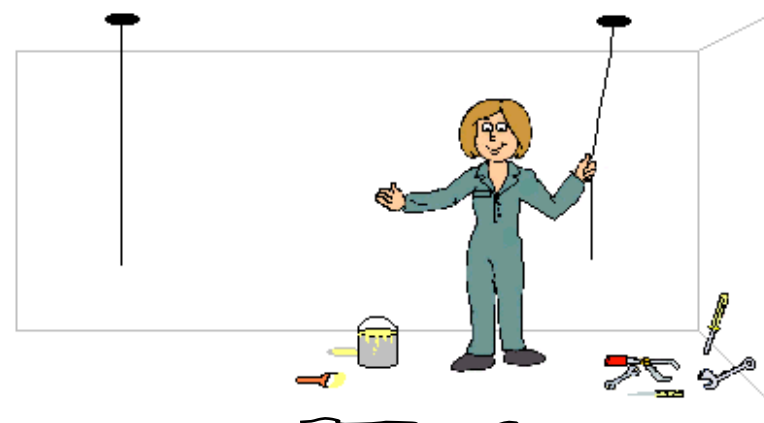
9. Rearrange the matchsticks in 3 squares by moving any 4 matchsticks. No loose ends should be left behind.



10. A man is wearing black: Black shoes, socks, trousers, coat, gloves and ski mask. He is walking down a back street with all the street lamps off. A black car is coming towards him with its light off but somehow manages to stop in time. How did the driver see the man?

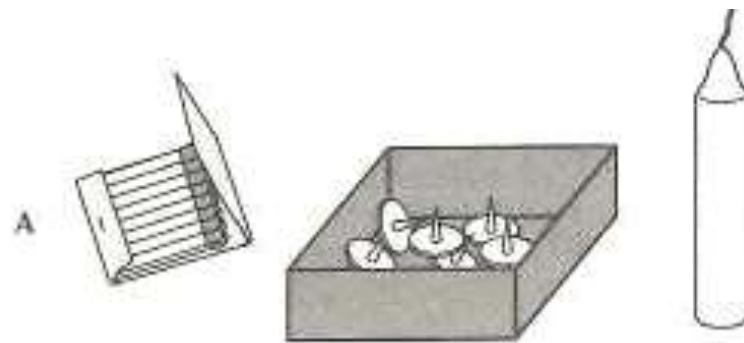
11. The string problem:

- There are two strings hanging from a ceiling but are too far apart to allow a person to hold one and walk to the other.
- On the floor are a paint box, a paint brush, a piece of cord, and screwdrivers.
- The goal is to tie the two pieces of string together.



12. Candle stick problem

- You have
 - A candle
 - A box of tucks
 - A pack of matches
- Your goal: Attach the candle to the wall so that, when lit, it does not drip wax on the table below.



Appendix C

Final Survey Instrument (Questionnaire)

The purpose of this research questionnaire is to evaluate the mode (method of teaching) of art education used during elementary years.

Name: _____ Area of Specialization: _____

Name of Primary/Elementary School: _____

Type of Primary/Elementary School

☐ Public ☐ Private ☐ Oxford ☐ Cambridge

Location of Primary/Elementary School

☐ Rural ☐ Suburban ☐ Urban ☐ Inner City

Please recall your primary/elementary education days and answer the following questions.

Were you taught art education at elementary level? ☐ Yes ☐ No

If no, please proceed on page 3 (Personal Development).

If yes, please answer the following questions in Yes or No by putting a tick mark (✓) in the relevant box.

2. The Art Education Program (including art activities, art room, art material and teachers)

Q2.1 was a worthwhile learning experience ☐ Yes ☐ No

Q2.2 made me productive ☐ Yes ☐ No

Q2.3 involved students in such activities
that enhances creative thinking ☐ Yes ☐ No

3. The Art Activities

- | | | | |
|------|--|------------------------------|-----------------------------|
| Q3.1 | were creative | ☐ Yes | ☐ No |
| Q3.2 | allowed communication of original ideas | ☐ Yes | ☐ No |
| Q3.3 | provided opportunities to exhibit students' talent | ☐ Yes | ☐ No |

4. Most of My Art Teachers

- | | | | |
|------|------------------------------------|------------------------------|-----------------------------|
| Q4.1 | were creative as well as inspiring | ☐ Yes | ☐ No |
| Q4.2 | allowed freedom of expression | ☐ Yes | ☐ No |
| Q4.3 | encouraged outdoor art activities | ☐ Yes | ☐ No |

5. Personal Development

- | | | | |
|-------|---|------------------------------|-----------------------------|
| Q 5.1 | I joined an art academy because of my personal interest | ☐ Yes | ☐ No |
| Q 6. | I was an apprentice with an artist | ☐ Yes | ☐ No |
| Q 7. | I think my creativity is inborn | ☐ Yes | ☐ No |
| Q 8. | Who helped you most in enhancing your creativity? | | |

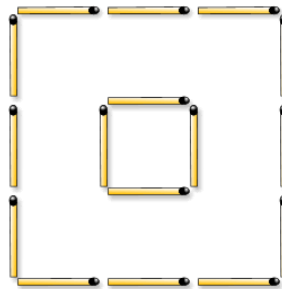
Appendix D

Problem Solving Ability Test

Name: _____

Solve the following problems in as many ways as you can:

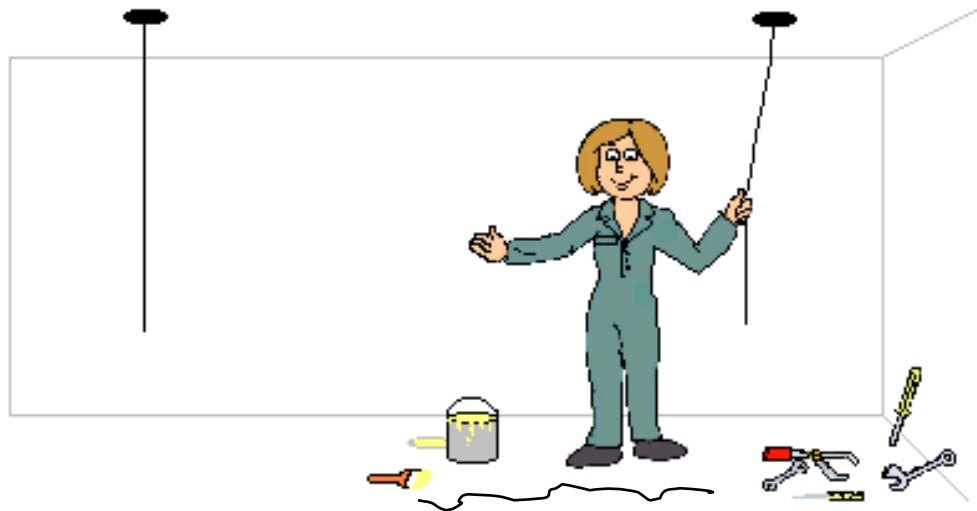
1. There is a flash of light and a man dies. The man is not killed by any other person and he does not die of any illness like a heart attack etc. it's not a case of suicide either. Can you suggest logical explanations?
2. There is blood on the ceiling of my bedroom. There has been no murder or killing of any person. Nobody has played any trick with me. Can you suggest logical explanations?
3. A hunter aimed his gun carefully and fired. Seconds later, he realized his mistake. Minutes later, he was dead.
4. Rearrange the matchsticks in 3 squares by moving any 4 matchsticks. No loose ends should be left behind.



5. A man is wearing black: Black shoes, socks, trousers, coat, gloves and ski mask. He is walking down a back street with all the street lamps off. A black car is coming towards him with its light off but somehow manages to stop in time. How did the driver see the man?

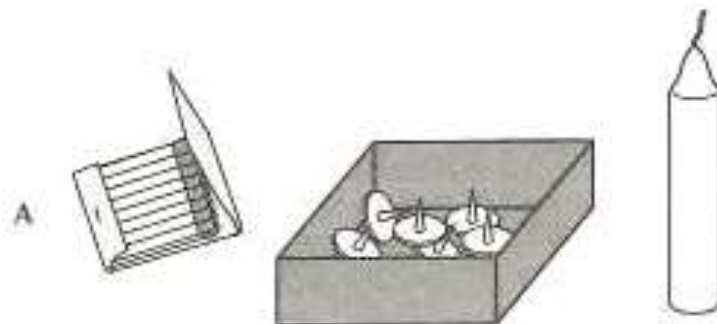
6. The string problem:

- There are two strings hanging from a ceiling but are too far apart to allow a person to hold one and walk to the other.
- On the floor are a paint box, a paint brush, a piece of cord, and screwdrivers.
- The goal is to tie the two pieces of string together.



7. Candle stick problem

- You have
 - A candle
 - A box of tacks
 - A pack of matches
- Your goal: Attach the candle to the wall so that, when lit, it does not drip wax on the table below.



Appendix E

Adult version (Creative Thinking Test)

Name: _____ Gender: _____ Age _____

Instructions:

It is a fun activity. Try to be as creative as you can when you answer. For each question, try to provide as many responses as you can.

Alternate uses

This section comprises five items. Tell all the different ways you could use them.

Knife

Newspaper

Shoe

Key

Nail

Instances

This section comprises five things. For each thing, provide as many examples as possible.

Name all the things you can think of that will make **Noise**.

Name all the things you can think of that are **Round**.

Name all the things you can think of that **Move on Wheel**.

Name all the things you can think of that **Hurt**.

Name all the things you can think of that are **Square**.

Pattern Meanings

What comes to your mind when you look at the given patterns?

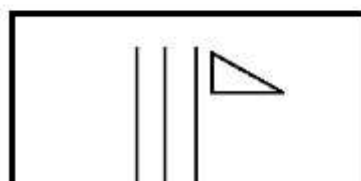
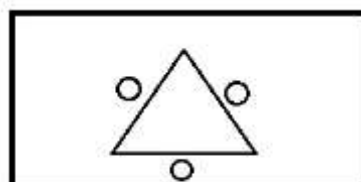
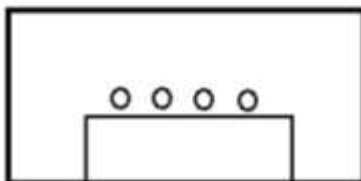
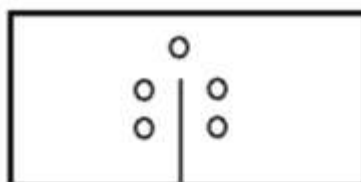
Pattern 1

Pattern 2

Pattern 3

Pattern 4

Pattern 5



Appendix F

Child version (Creative Thinking Test)

Name: _____ Gender: _____ Age _____

School: _____ Class: _____

Instructions:

It is a fun activity. Try to be as creative as you can when you answer. For each question, try to provide as many responses as you can.

Alternate uses

Tell all the different ways you could use the following things.

Knife

Shoe

Nail

Instances

Name all the things you can think of that will make **Noise**.

Name all the things you can think of that are **Round**.

Name all the things you can think of that **Hurt**.

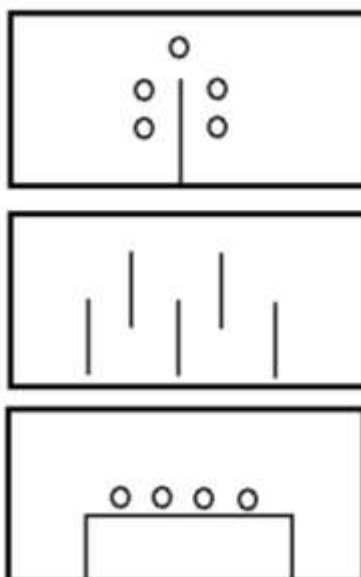
Pattern Meanings

What comes to your mind when you look at the given patterns?

Pattern 1

Pattern 2

Pattern 3



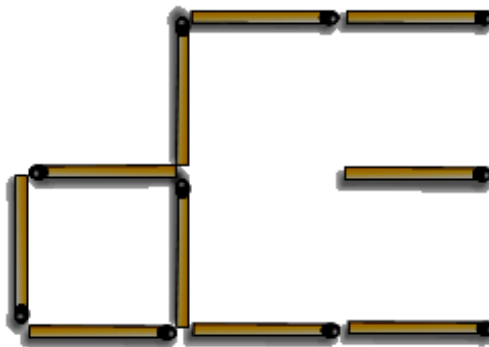
Appendix G

Matchstick Problem Tasks MPT

The participants are required to rearrange the following matchstick problems by moving specified number of matchsticks to form a specified new pattern.

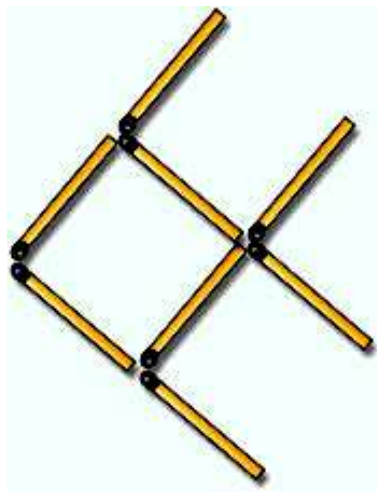
1. Squares

Move only 3 matchsticks to make 3 squares.



2. Swimming Fish

Move only 2 matchsticks to turn the fish around.



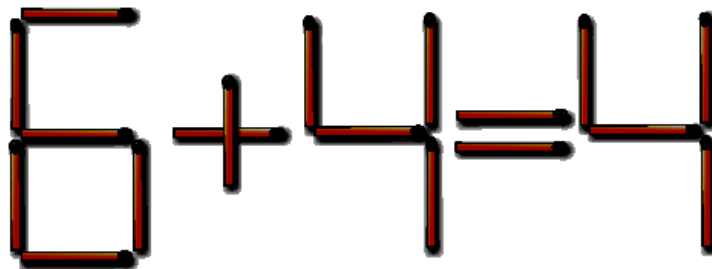
3. Ice in Glass

Re-make the glass by moving 3 matchsticks with the ice outside.



4. Equation

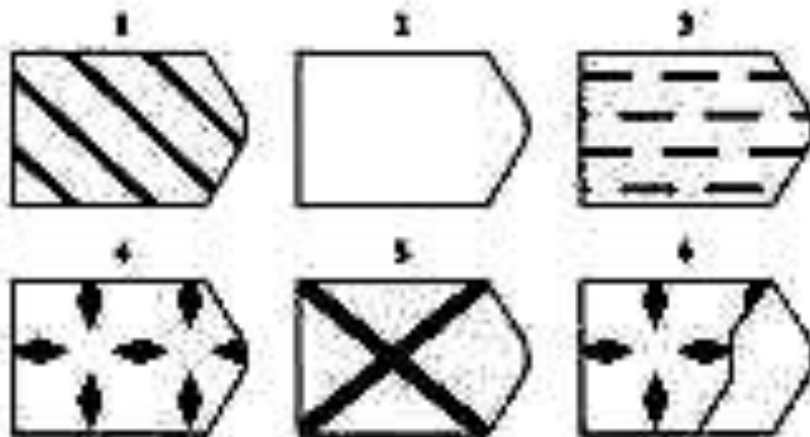
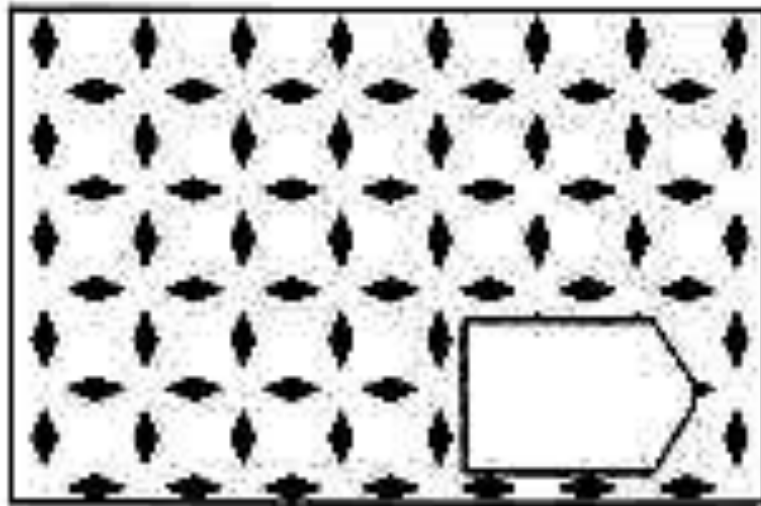
Move one match to make this equation correct



Appendix H

Sample Picture from Raven's Progressive Matrices

A1



**RESEARCH
PAPER
PUBLISHED**

Positive Effects of Elementary Visual Art on Problem Solving Ability in Later Years of Life

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Home Economics College for Women

Farhana Jehangir

Shaheed Benazir Bhutto Women University

The aim of this study was to examine the retrospective effect of elementary visual art in enhancing problem solving ability in later life. Further, the study also explored the impact of different teaching pedagogies. For this purpose 150 college students were selected from the National College of Arts Lahore and Islamabad. The sample was further divided into three groups. Group A (n=50) comprised students who had been exposed to student-centered visual art, group B (n=50) consisted of students who had received teacher-centered visual art and group C (n=50) comprised students who had received no visual art curriculum during elementary school years. The Raven's Standard Progressive Matrices, Wallach & Kogan Creativity Test and the Problem Solving Ability Test were administered to measure the participants' problem solving ability. One-way ANOVA and t-test revealed that visual art received at elementary level did have a positive impact on the problem solving ability of the students in later life. There were also significant differences in problem solving abilities of students exposed to different art teaching pedagogies at elementary level. The findings highlight the importance of visual art for developing a higher level thinking skill that is transferred to later life. It is hoped that this study would contribute to the advocacy for the inclusion of visual art in the national curriculum.

Key words: visual art, creativity, problem solving, convergent thinking, divergent thinking

A problem is "an unpleasant situation, a difficulty" (Rusbult, 2001) that needs consideration and a solution. Many research studies have shown that visual art supports the problem finding and solving approach of individuals. (Jensen, 2001; Perrin, 2008; Chicola, & Smith, 2006; Weiss, 2004). Problems are multi-faceted and each person has a different sensitivity and perception about problems as well as varying intentions about how to solve it. Effective problem solving requires a balance of both analytical and creative thinking skills: analytical or logical thinking is a convergent process while creative thinking is deemed divergent (Arthur, 2006; Guilford, 1967). Convergent process limits the solution to one precise answer whereas divergent process offers a number of possible solutions to one problem depending upon its application on the basis of suitability. Analytical and creative thinking are the skills that each side of the brain or hemisphere is particular in serving, as shown by research. These skills have different origins in brain functioning: the left brain is associated with convergent thinking and right brain imparts and promotes divergent thinking (Luftig, 2000; Murfee 1995). However, the extent to which each hemisphere specializes is different in all people but individuals who use both hemispheres are fast problem solvers (Vohra & Verma, 2012).

The early experiences with visual art might be the most influential for attaining cognitive abilities, such as creative and problem solving. In visual art, problem solving approaches are taught to students to assist them to become familiar with a thinking process that promotes problem solving (Gardner, 2004). Gardner further stated that different classroom environments will impact upon the student's way of approaching problems. Hence, there is an important issue about whether different pedagogies of visual art make any difference in the outcomes of arts learning in respect of problem solving ability. In broad term, pedagogies can be classified into teacher-centered pedagogy and student-centered pedagogy. In student-centered pedagogy, student learning is the focus of the class. In this approach, the focus of teaching is facilitation of student's voice and understanding with an emphasis upon creativity and innovation. In the teacher-centered approach there is an emphasis upon teacher transmission of content and control of the learning (Weimer, 2013). Alter (2010) indicated that the teacher-centered approach diminishes the extent of students' thinking and minimizes opportunity for independent and innovative vision.

For attaining the desired effects of visual art, a student-centered approach should predominate.

The work of John Dewey, Jean Piaget, Maria Montessori and Lev Vygotsky focused on how students learn, was a basic motive for promoting student centered approach (Chegenizadeh, Nikraz & Zadeh, 2012). Following on

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from these eminent educationalists, this study utilized a quantitative approach to examine the impact of student-centered pedagogy in contrast to teacher-centered in the context of examining the value of visual art to problem-solving.

It is clear that visual art has an impact upon the academic, social and psychological well-being of an individual (Haanstra, 2007; Smith, 2006). Never-the-less some countries (e.g., Pakistan) are under-estimating its worth by minimizing its significance or omitting it from the curriculum. The formative concrete operational stage of development (Piaget & Inhelder, 1973) stresses not only the importance of developing a logic when using concrete events but also consider multiple parts of a problem at once. This is a time (3rd to 6th grade approximately 7-11 years) when some of the critical foundations of problem solving are emerging. There are clear indications however that visual art at this time can promote higher level thinking but little research has been undertaken about the generalizability of this learning to later life.

This research study undertaken in Pakistan examined whether an elementary visual art could promote problem-solving in later life and evaluated the impact of using different pedagogies in the teaching of art. There is no other known research of this type in Pakistan. The main purpose related to the examination of the impact of visual art on problem-solving abilities later in life and the relationship of this finding to teacher-centered and student-centered approaches. It was speculated that each pedagogical approach could have a different impact on problem-solving.

The educational system and curriculum in Pakistan favors convergent thinking and often overlooks divergent thinking. However, both types of thinking are equally essential for a well-rounded personality. Thus, the study focuses on visual art as a domain for fostering divergent as well as convergent thinking promoting problem solving skills in students. Such a carefully designed curriculum can inculcate creativity, imagination, expressiveness, confidence and self-reliance in an individual with a benefit to the individual, society and nation.

Method

Sample

The sample for the study consisted 150 college students both males (n=81) and females (n=69). All the participants were selected through purposive random sampling technique from National College of Arts Lahore and Islamabad campuses, ranging in age from 18 to 20 years ($M = 19.31$, $SD = .636$).

Hypotheses

1. The visual art received at elementary level will have a positive impact on the problem solving ability of the participants in later life.

2. The visual art received at elementary level will foster the divergent and convergent thinking of the participants in later life.
3. The participants who received student-centered visual art at elementary level will generate multiple solutions on PSAT in comparison to teacher-centered and control group.
4. The participants who received student-centered visual art at elementary level will score significantly high both on divergent (WKCT) and convergent thinking tests (SPM) as compared to teacher-centered and control group.

Instruments

Questionnaire

A questionnaire was devised to collect relevant information regarding demographic characteristics and to acquire information whether the participants had received visual art at the elementary level. Another purpose of the questionnaire was to collect data regarding teaching pedagogy used during the elementary school years of the participants.

Standard Progressive Matrices, SPM (Raven, 1936)

SPM is a reliable test to measure the level of convergent thinking (Jaarsveld, Lachmann, & Leeuwen, 2013). The participants were required to identify the missing elements of all the 60 matrices in order to complete a pattern. The booklet was consisted of five sets (A to E) of 12 matrices each that were given in order of difficulty. The calculated reliability coefficient of the scale in this study was .89 indicating that the scale is highly reliable.

Wallach and Kogan Creativity Tests WKCT (1965)

WKCT is one of the most widely used divergent thinking test (Cheung, Lau, Chan, & Wu, 2004) and is useful in gathering data quickly and effectively. The study utilized three out of five tests from Wallach and Kogan Creativity Test i.e., Alternate Uses, Instances and Pattern Meaning. The study further selected five items for each test. The participants were required to generate alternate uses, instances and meanings for each item. For example, they were asked to identify alternate uses of a brick, different instances of objects that make noise, and unusual meanings of a given pattern. In the present study, reliability coefficient of WKCT was found to be .90 for fluency measure and .62 for originality measure, indicating the scale as a dependable measure.

Problem Solving Ability Test

In addition to the above tests, another technique of measuring problem solving was also developed. Problem Solving Ability Test (PSAT) was comprised of seven (7) items. The four out of seven items described the day to day problem situations. Example: "There is blood on the ceiling of my bed room. There has been no murder or killing of any

person. Nobody has played any trick with me. Can you suggest logical explanations?"

The rest of the three items selected were: a matchstick problem, a string tie problem and a candle stick problem. These three problems were presented in picture form.

Example: The matchstick problem required participants to "rearrange the matchsticks in 3 squares by moving any 4 matchsticks".

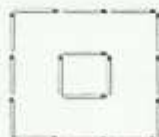


Figure 1: Matchstick Problem

The participants were asked to read the problems carefully, imagine the situation and develop a maximum of three logical explanations or solutions. In this test the maximum score for each item ranged from 0 to 3, subsequently the maximum score for this test or for seven (7) items ranged from 0 to 21. Higher the score on this scale indicated that the participant had an effective problem solving ability. The calculated reliability coefficient of PSAT in the present study is found to be .71 indicating satisfactory internal consistency.

Procedure

The main purpose of the study was to examine the impact of childhood art experiences in later years of life. In this retrospective study, the necessary information regarding the elementary visual art was collected through questionnaire to establish two groups i.e., art students versus non-art students at first. Later on, three different types of instruments were used on sample (N=150) to see the impact of their past learning on their problem solving at later stage of life.

After the final approval from the administration of National College of Arts Lahore and Islamabad Campuses, the newly admitted students were briefed about the purpose of the present research. At first, the whole class of 1st year (consisting of 200 students) was given the questionnaire and asked to report the required information carefully. After filling out the demographic portion of the questionnaire respondents were asked to recall their childhood education specially elementary school years and indicate whether they had received visual art at elementary level or not. If yes, then what type of art curriculum they had? They were required to answer in a Yes or No format. An open ended question was also included to identify any external sources for inspiration to pursue art activities.

The participants who returned incomplete questionnaires or those who gave confused responses were excluded from the study. Only 150 were retained in the final study. The remaining participants were divided into two groups: those who received visual art and those who did not.

Those who did not receive visual art became the control group. Based on the information regarding the mode of prevalent visual art in their elementary art classrooms, the art group was further divided into two groups (i.e., group A and group B) dependent upon the teaching pedagogy. Thus, there were the three groups:

Group A: (n=50) participants received student-centered visual art

Group B: (n=50) participants received teacher-centered visual art

Group C: (n=50) participants who did not receive visual art in their elementary school (Control group)

All the three groups were given PSAT, WKCT and SPM, to assess differences in their problem solving ability. These were administered under test conditions.

Statistical Analysis

Scoring of Raven's Standard Progressive Matrices was undertaken according to the standard method of scoring indicated in the manual. In scoring WKCT items, measures of fluency and originality were used. Fluency is defined as the total number of given responses by a participant for a particular question. Given responses of a participant were summed up to yield participants fluency score for a particular question. Originality (a unique or novel response) was obtained by scoring unusual and unique responses. Responses that were given by 5% of a group were unusual, while responses that were given by 1% of that particular group were unique. An unusual response received 1 point while a unique response received 2 points. The total points were then summed up. The higher scores indicated creativity (Wallach and Kogan, 1965). To score the PSAT, the total number of logical responses for all the problems was taken as the participant's total score (each logical response was given 1 point). The analyses were carried out using standard statistical package of SPSS.

Results

The findings of the study revealed that the participants who received visual art at elementary level were better at problem solving in adulthood than those who had not received visual art.

The results indicated significant differences ($p < .01$) in the scores of Problem Solving Ability Test between two groups. Table 1 shows that art group scored significantly high on Problem Solving Test as compared to non-art group. The findings of the study supported the first hypothesis that "the visual art received at elementary level will have a positive impact on the problem solving ability of the participants in later years of life".

Table 1
Mean, Standard deviation and t test analysis showing differences in PSAT Scores (N = 150) between Art Group & non-Art Group.

Variable	Art Group (n=100)		Non-Art Group (n=50)		t(148)	p	95 % CI	
	Mean	SD	Mean	SD			LL	UL

PSAT

Variable	Mean	SD	Mean	SD	t(148)	p	LL	UL
PSAT	5.82	3.289	4.54	3.065	2.298	.023	.179	2.381

The WKCT was used to measure divergent thinking whereas SPM was administered to measure convergent thinking. There were significant differences ($p < .01$) between scores obtained on these two tests by art and non art group. The results demonstrated that art group was more fluent and original on WKCT and scored high as compared to non art group as shown in table 2. Similarly the same group also obtained significantly high score on SPM which strongly supported the 2nd hypothesis that "the art education received at elementary level will have a positive impact on the divergent and convergent thinking of the participants in later years of life".

Table 2
Mean, Standard deviation and t test analysis of WKCT & SPM scores (N=150) between Art Group & non-Art Group.

Variables	Art Group (n=100)		Non-Art Group (n=50)		t(148)	p	95 % CI	
	Mean	SD	Mean	SD			LL	UL

Variables	Mean	SD	Mean	SD	t(148)	p	LL	UL
Fluency	48.35	19.998	41.44	15.931	2.125	.035	.483	13.027
Originality	8.68	8.893	3.92	4.540	3.453	.002	1.032	7.328
SPM	52.73	5.103	58.24	6.365	1.589	.111	.390	4.390

The study also aimed at investigating the impact of two different pedagogies i.e., student-centered and teacher-centered visual art on the problem solving performance of the participants. For this reason the study had divided the art group further into two groups i.e., student-centered and teacher-centered to see the difference between these two groups and the control group i.e., non-art group. One-way ANOVA exhibited a similar pattern of responses on all three tests i.e., PSAT, WKCT and SPM amongst all three groups. The findings revealed that scores of student-centered group were the highest, the teacher centered group were moderate whereas the non-art group were the lowest.

The results show that in PSAT the student-centered group generated multiple explanations and solutions to the problems that were logical and practical as compared to other two groups as indicated by table 3. Thus it can be concluded that the deliverance of visual art through student-centered pedagogy has a positive impact on the problem solving ability in later life. The findings supported our 3rd hypothesis that "the participants who received student-centered visual art will generate multiple solutions on PSAT in comparison to teacher-centered and control group".

Table 3
One way ANOVA on PSAT Scores (N = 150)

Variable	A Student-Centered Group (n=50)		B Teacher-Centered Group (n=50)		C Non-Art Group (n=50)		F	p	H
	M	SD	M	SD	M	SD			

Variable	M	SD	M	SD	M	SD	F	p	H
PSAT Scores	6.76	3.054	4.88	3.274	4.54	3.065	7.283	.002	A>B,C

The Post Hoc Analysis showed that the participants from student-centered group scored significantly high on fluency and originality measures of WKCT as well as on SPM scores as compared to teacher-centered and non-art groups as indicated by table 4. This shows that student-centered group was good in divergent and convergent thinking than the other two groups. Results show that the student-centered visual art during elementary school years can better foster convergent and divergent thinking and has a potential for higher level thinking skills in later years of life. These findings confirmed the fourth hypothesis that "the participants who received student-centered visual art will score significantly high on divergent thinking (WKCT) and convergent thinking test (SPM) as compare to teacher-centered and control group".

Table 4
One way ANOVA on WKCT & SPM Scores (N=150)

Variable	A Student-Centered Group (n=50)		B Teacher-Centered Group (n=50)		C Non-Art Group (n=50)		F	p	H
	M	SD	M	SD	M	SD			

Variable	M	SD	M	SD	M	SD	F	p	H
Fluency	51.32	19.061	45.36	20.053	41.44	15.931	3.557	.035	A>B,C
Originality	12.84	8.882	5.16	7.533	3.92	4.540	18.325	.008	A>B,C
SPM	53.72	6.743	51.74	5.382	58.24	6.365	5.816	.008	A>B,C

Discussion

This study set out to show the potential of using visual arts to create learning environment that enhances student's innovation and problem solving ability. The first hypothesis proposed a positive relationship between visual arts and problem solving ability and the results indicated very strong association between the two variables. It demonstrated that students who were continuously involved in art activities during their elementary school years were better adult problem solvers than those who did not have such education. The second hypothesis proposed that art group would be good in convergent and divergent thinking. Table 1 and 2 indicate that art group superseded the non-art group on all three measures including SPM, WKCT and PSAT. These findings are consistent with the earlier studies that also specify that art students perform better than the non-art students (Gardner, 2004). Dewey's (1916) argument that the role of education was to prepare students for present and later life supports this notion that ideas gathered in childhood are sustainable and helpful in overcoming and

tackling adulthood problems. Eisner (2002) has argued more specifically in stating that art educators can readily create art making tasks as problem solving tasks for practice. Furthermore, as Jensen (2004) and Weiss (2004) indicated, art learning can prepare the children to deal with the problems with multiple solutions.

Previous researches have confirmed the far-reaching effects of an art-rich learning environment. Uptis (2011) believes that visual art contributes in the development of the "whole child". Farrell & Meban (2003) stated that a "child who is exposed to the arts in school has the potential to become a more creative, imaginative, expressive, confident, self-reliant or critically thinking individual" (p.5). Given these types of findings it seems inequitable not to provide the same opportunities to all groups of students.

The teachers represent a strong social influence on their students with respect to ways they motivate and encourage students to enhance creativity. Development of student expression in a classroom (i.e., a constructivist approach) is more likely to promote variable opportunities to facilitate problem solving. Urgent consideration needs to be given to reflecting upon the current approaches as there has been limited research on current practices and the best way to achieve skill in problem-solving. Hurwitz & Day (2007) defined student-centered art as an act of self expression which has a unique combination of emotions and intellect giving novel order and form to human reactions under permissive environment.

The finding confirms the third hypotheses that student-centered group was superior in problem solving as compared to teacher-centered and control groups. The student-centered approach was related positively to the development of cognitive competencies. Many researchers have agreed that student-centered approach allows "creative freedom" in children art (Peers, 2000).

Convergent and divergent thinking were also investigated in the study. Interestingly it was found that participants who scored high on divergent thinking also scored high on convergent thinking. Table 4 reflected that all these participants had received student-centered art education. So, it can be concluded that student-centered group was superior in convergent and divergent thinking as compared to teacher-centered and non-art groups. According to Lee and Larid (2004) problem solving is a creative process. Jaarsveld & van Leeuwen, (2005) stated that creativity requires both convergent and divergent thinking "in order to arrive at a quality formulation" (as cited in Jaarsveld, Lachmann, & Leeuwen, 2013). This study highlights the importance of the development of convergent and divergent thinking and the development of both of these qualities early in life. These findings deserve the special attention of educators, policy makers and managers in planning the curriculum so that both modes of thinking are

fostered particularly during formative elementary school years. (Azeem, 2011; Dewey, 1916)

Conclusion

It seems that Pakistan's current education system emphasizes academic progress and regards visual art only as a frill. Art programs are being reduced or even removed from the curriculum particularly in the public schools. Unfortunately, if this tendency is not curbed many students will be denied an education that promotes early development of higher level thinking skills such as problem-solving.

Pakistan is suffering from economic, social and political crisis that has also brought alarming challenges to our youth. Healthy development of youth is crucial for the future and that is only possible by providing a rounded education that includes development of self-realization, problem solving, and decision making skills. The earlier this is done in a child's life the more is the likelihood of sustained and quality growth. Cognitive growth in children is nurtured early in life and yet the education system is overlooking the framework that can achieve this growth.

References

- Alter, F. (2010). Using Visual Arts to Harness Creativity. *The University of Melbourne Refereed E-Journal*, 1 (5). Retrieved on December 3, 2013 from <http://web.education.unimelb.edu.au/UNESCO/pdfs/ejournals/alter-paper.pdf>
- Brown, D. (2006). Teacher's implicit theories of expression in visual arts education: A study of Western Australian teachers. PhD Thesis, Edith Cowan University, Faculty of Community Services, Education and Social Sciences.
- Dewey, J. (1916/1966). *Democracy and education: An introduction to the philosophy of education*. New York, NY: Free Press.
- Chegenizadeh, A., Nikraz, H., & Zadeh, H. H., (2012). Student Centered Class. *International Proceedings of Economics Development and Research (IPEDR)*, 47(32), 144-148. Retrieved from <http://www.ipeidr.com/vol47/032-ICERI2012-510034.pdf> May 5, 2014
- Cheung, P. C., Lau, S., Chan, D. W., & Wu, W. Y. H. (2004). Creative potential of school children in Hong Kong: Norms of the Wallach-Kogan Creativity Tests and their implications. *Creativity Research Journal*, 16, 69-78.
- Chicola, N.A., & Smith, B.J., (2006). Integrating visual arts into instruction. *International Journal of Learning*, 12(5), 169-175.

- Eisner, E. (2002). *The arts and the creation of mind*. New Haven, CT: Yale University Press.
- Folkert Haanstra, D. W. (2007). *Evaluation Research in visual Arts Education* (Vol. 16). International handbook of Research in Arts Education. HYPERLINK[™]http://www.amazon.com/HowardGardner/e/B000APAQWW/ref=dp_byline_cont_book_1
- Howard Gardner, (2004). *Changing Minds: The Art And Science of Changing Our Own And Other People's Minds*. Harvard Business Press.
- Hurwitz, A., & Day, M., (2007). *Children and their Art: Methods for the Elementary School* (Eighth ed.). USA: Thomson Wadsworth.
- Jaarsveld, S., Lachmann, T., Harmel, R., & van Leeuwen, C. (2010). Solving and creating Raven Progressive Matrices: Reasoning in well and ill defined problem spaces. *Creativity Research Journal*, 22, 304-319.
- Jaarsveld, S., Lachmann, T., & van Leeuwen, C. (2013). The Impact of Problem Space on Reasoning: Solving versus Creating Matrices. In M. Knauff, M. Pauen, N. Sebanz, & I. Wachsmuth (Eds.), *Proceedings of the 35th Annual Conference of Cognitive Science Society*, (pp. 2632-2638). Austin, TX: Cognitive Science Society
- Jensen, E. (2001). Arts with the brain in mind. Alexandria, VA: Association of Supervision and Curriculum Development. Retrieved from <http://www.ecs.org/clearinghouse/49/91/4991.pdf> March 10, 2013
- Lowenfeld, V. (1987). *Creative and mental growth* (8th ed.). New York: Macmillan Publishing Company.
- Luftig, R.L. (2000). An investigation of an arts infusion program on creative thinking and academic achievement of children at three grade levels. *Studies in Art Education*, Vol. 41, No. 3, pp. 208-227.
- Murfee, E. (1995). *Eloquent evidence: Arts at the core of learning*. Washington, DC: President's Committee on the Arts and Humanities.
- O'Farrell, L., Meban, M. (2003). A paper commissioned by UNESCO under contract with the Faculty of Education at Queen's University, Kingston, Canada.
- Peers, C. (2002). Tracing an Approach to Art Teaching: A Historical Study of an Art Education Documentary Film. *Studies in Art Education*, 43 (3), 264-277.
- Perrin, S. (2008). National symposium on arts education: School leaders sound alarm about the relevance of arts education to student achievement. *Noed News*, 50, No. 1. P. Retrieved on March 10, 2013 from <http://www.arteducators.org/news/NAEANews>
- Piaget, J., & Inhelder, B. (1973). *Memory and intelligence*. London: Routledge and Kegan Paul.
- Rashid K. (2004). Education, Lahore, Urdu Bazaar, Carvan book house
- Raven, J. C. (1938/1998). *Standard Progressive Matrices, Sets A, B, C, D & E*. Oxford, Great Britain: Oxford Psychologists Press.
- Ruppert Sandra. S. (2006). Critical Evidence; How the Arts benefit student achievement, National Assembly of State Arts Agencies
- Rusbult, C. (2001). Problem-Solving Skills In Education and Life. Retrieved July 07, 2009 from <http://www.asa3.org/ASA/education/think/methods>
- Shakoor, A., Azeem, M., Dogar, A. H., Khatoon, A. (2011). 1947-2008 Evaluation of Elementary Education in Pakistan, *International Journal of Humanities and Social Science*, 1(15), 270-276
- Uplitis, R. (2011). *Arts Education for the Development of the Whole Child*. Prepared for the Elementary Teachers' Federation of Ontario
- Wallach, M. A., & Kogan, N. (1965). *Modes of thinking in young children: A study of the creativity-intelligence distinction*. New York: Holt, Rinehart, & Winston.
- Weiss, S. (2004). The progress of education reform, 5(1). Education Commission of the States, <http://www.ecs.org/clearinghouse/69/42/6942.pdf>
- Weimer, M., (2008). *Learner-Centered Teaching: Five Key Changes to Practice*, John Wiley & Sons.

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