EFFECTIVENESS OF KHATENA TRAINING METHOD ON THE CREATIVITY OF FORM FOUR STUDENTS IN A SELECTED SCHOOL

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A Thesis Submitted to the Faculty of Education, University of Malaya in Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Education

2009
ACKNOWLEDGEMENTS

I am indeed grateful to the many people who helped in one way or another to make this thesis possible and my dream a reality. I would like to extend my sincere gratitude, appreciation, and heartfelt thanks to:

The Dean of the Faculty of Education, Prof. Dr. Noraini Idris for attending meetings organized for PhD students and motivating them.

The Dean of the Institute of Postgraduate Studies, University Malaya for organizing seminars, workshops and talks which benefited PhD students.

The members of the vetting panel and the viva voce panel of the Faculty of Education, for their probing questions, insightful suggestions, and constructive comments that undoubtedly improved the quality of my thesis.

My supervisor Prof. Madya Dr. Ananda Kumar Palaniappan to whom I am indebted. One of his areas of expertise is “creativity” and his astute observations, constructive comments, and critical evaluation helped me to make substantial progress in my research proposal and in the completion of this thesis.

The Educational Planning and Research Division, Ministry of Education, Malaysia, and the Selangor State Education Department, Shah Alam, Selangor, for granting permission for the research experiment to be carried out in schools.

The staff and students of the secondary schools concerned in the state of Selangor, for their cooperation, assistance, and participation in the pilot study as well as in the research proper that were carried out in 2007.

Prof. Emeritus Dr. J. Khatena from Pensacola, Florida, United States of America, for his comments, suggestions, and permission to use his creative training strategies and
testing measures in this study. It is indeed a privilege to be assisted by a renowned researcher who is an international figure in the field of creativity.

The many writers and researchers especially in the field of creativity who have provided knowledge and inspiration in my journey of learning and whose theses, dissertations, books, and articles are listed in the reference section of this thesis.

The independent readers who were selected to read my thesis and provide insightful feedback to further advance the thesis.

My friends Dr. Logeswary Doraisamy and Danial Maniam from the Federal School Inspectorate, Malaysia; Mangalam Gopala Iyer; Chandrakumari Krishnan; Usha Dianne Earnest; and Ph.D students from University of Malaya for their help, assistance, and moral support.

My family especially Margaret Rose, Catherine, Cecily, and Florence Clare for their encouragement, concern, inspiration, and prayers which provided me with the energy, concentration, and dedication needed for this study from its inception to its completion.

Thank you God
for bringing all these people,
who like a binding cord
gave support and made me humble.
My life has been enriched
by these unforgettable people.
SYNOPSIS

This study investigated the effectiveness of creativity training through an adapted Khatena Training Method (KTM) treatment (experimental variable) on a sample of Form Four Subjects \(N = 153\) in a typical secondary school in the state of Selangor in relation to their initial creative level, gender category, and academic stream (control variables). The first objective was to determine the effectiveness of the KTM on the experimental and control groups as assessed by the Thinking Creatively with Sounds and Words (TCSW) test battery with its sub-measures of Sounds and Images (S&I) and Onomatopoeia and Images (O&I). The second objective was to determine the effectiveness of the KTM on the high creative, low creative, male, female, science, and arts subjects in the experimental and control groups as assessed by the TCSW. The third objective was to determine if there were educational transfer effects as a result of the KTM on the experimental and control groups as assessed by the Using Modality and Imagery in Writing (UMIW) checklist. The TCSW (pretest & posttest) and UMIW (pretest & delayed posttest) were the dependent variables. This study utilized an experimental (pretest-posttest, control group) design. Stratified random sampling was employed to form the experimental and control groups. Before that, to differentiate the high creatives and low creatives, the Something About Myself (SAM) inventory was used and the principle of extreme scores was adhered to. Creativity training was based on the creative thinking strategies of the KTM, namely, Breaking Away from the Obvious and Commonplace, Synthesis-Destructuring-Restructuring, Transposition, and Analogy-Imagery. The thinking strategies were supported by the Creative Imagination Imagery...
model. A number of statistical analyses were used to analyse the data obtained such as descriptive statistics (means & standard deviations) and inferential statistics (Independent-samples t-tests, Pearson product-moment correlations, & Analyses of Covariance). A summary of the findings is given below:

The KTM treatment provided evidence of the significant gains in the experimental subjects’ verbal originality skills compared to the control subjects as measured by the S&I and O&I measures of the TCSW. Experimental subjects from the high creative, low creative, male, female, science, and arts, groups had significant gains compared to the control subjects as measured by the S&I and O&I measures of the TCSW. Overall, experimental subjects from the experimental, high creative, low creative, male, female, science, and arts, groups performed better in the O&I measure compared to the S&I measure. The KTM treatment made a greater impact on the experimental subjects in the S&I measure, low creative experimental subjects in the S&I and O&I measures, female experimental subjects in the S&I measure, male experimental subjects in the O&I measure, and arts experimental subjects in the S&I and O&I measures; The KTM treatment provided evidence of the significant gains in the experimental subjects’ retention of creativity skills learned after two weeks as assessed in their written compositions and measured by the UMIW. The results have indicated that the KTM is a viable creativity training programme that can be used with confidence to train adolescents to enhance their creative thinking abilities and skills. This study has significant implications for educational practice in the school context in Malaysia.
Keberkesanan Kaedah Latihan Khatena ke atas Kreativiti Pelajar
Tingkatan Empat di Sekolah Terpilih

SINOPSIS

Kajian ini menghuraikan keberkesanan latihan kreativiti melalui rawatan sebuah adaptasi Khatena Training Method (KTM) (pemboleh ubah eksperimental) ke atas sampel pelajar Tingkatan Empat (N = 153) di sebuah sekolah menengah di negeri Selangor. Keberkesanan tersebut di kaji dari segi daya kreatif asas, kategori jantina, dan aliran akademik pelajar (pemboleh ubah tetap). Objektif pertama adalah untuk menentukan keberkesanan KTM ke atas kumpulan eksperimental dan kawalan menggunakan ujian Thinking Creatively with Sounds and Words (TCSW) dan pengukur yang merangkumi Sounds and Images (S&I) dan Onomatopoeia and Images (O&I). Objektif kedua adalah untuk menentukan keberkesanan kaedah KTM ke atas subjek yang amat kreatif, kurang kreatif, lelaki, perempuan, sains dan sastera dalam kumpulan eksperimental dan kawalan melalui pentaksiran TCSW. Objektif ketiga adalah untuk menentukan sama ada terdapat kesan pemindahan pengajaran berikutan penggunaan KTM dalam kumpulan eksperimental berbanding dengan kumpulan kawalan seperti ditaksir menggunakan senarai semak Using Modality and Imagery in Writing (UMIW). TCSW (ujian pra dan pasca) dan UMIW (ujian pra dan pasca lewat) dijadikan sebagai pemboleh ubah. Kajian ini menggunakan kaedah eksperimental (ujian pra-ujian pasca, kumpulan kawalan). Kaedah sample rawak berlapis digunakan untuk membina kumpulan eksperimental dan kawalan. Sebelum itu untuk mengkategorikan responden yang berkreativiti tinggi dan berkreativiti rendah, inventori Something About Myself (SAM) telah digunakan dan
prinsip skor ekstrem diguna pakai. Latihan kreativiti yang digunakan adalah berasaskan strategi pemikiran kreatif KTM, iaitu, Breaking Away from the Obvious and Commonplace, Synthesis-Destructuring-Restructuring, Transposition, dan Analogy-Imagery. Strategi pemikiran disokong oleh model Creative Imagination Imagery. Beberapa cara analisis statistik digunakan untuk menganalisis data yang diperolehi seperti statistik deskriptif (min dan sisihan piawai) dan statistik inferensi (ujian-\(t\) sampel bebas, korelasi Pearson dan analisis kovarian). Rumusan dapanan kajian seperti berikut:

Rawatan KTM menunjukkan bukti peningkatan signifikan yang dimiliki oleh subjek eksperimental dari segi kemahiran originaliti verbal berbanding dengan subjek kawalan mengikut ukuran S&I dan O&I dalam instrument TCSW. Subjek kumpulan eksperimen dari kumpulan kreativiti tinggi, kreativiti rendah, lelaki, perempuan, sains dan sastera, menunjukkan peningkatan signifikan dalam kreativiti berbanding dengan kumpulan kawalan apabila ditaksir melalui pengukur S&I dan O&I dalam instrument TCSW. Secara keseluruhan, subjek eksperimental daripada kumpulan eksperimen, kreativiti tinggi, kreativiti rendah, lelaki, perempuan, sains dan sastera, menunjukkan pencapaian yang lebih tinggi dalam pengukuran O&I berbanding dengan pengukuran S&I. Rawatan KTM telah memberi impak yang lebih ketara ke atas subjek eksperimental dalam pengukuran S&I, subjek eksperimental kurang kreativiti dalam pengukuran S&I dan O&I, subjek eksperimental perempuan dalam pengukuran S&I, subjek eksperimental lelaki dalam pengukuran O&I, dan subjek eksperimental sastera dalam pengukuran S&I dan O&I. Rawatan KTM menunjukkan bukti perubahan signifikan dalam daya ingatan kemahiran kreativiti yang dipelajari dalam kalangan subjek eksperimental selepas dua minggu seperti ditaksir melalui karangan bertulis dan pentaksiran dengan UMIW.
Dapatan menunjukkan bahawa KTM adalah program latihan kreativiti yang boleh
digunakan dengan keyakinan untuk melatih para remaja mempertingkatkan daya
kreativiti dan kemahiran mereka. Kajian ini memberi implikasi yang signifikan untuk
praktis pengajaran dalam konteks sekolah di Malaysia.
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CHAPTER ONE

Creativity: An Overview

1.0 Introduction

Research on creativity as well as its many correlates has been gaining popularity since the 1950’s especially in the United States of America. Psychologists, sociologists, and educators among others have conducted empirical research and contributed immensely to our knowledge and understanding of the complex subject of human capability called creativity (Keller, Lavish, & Brown, 2007). This is because creativity plays a crucial role “in the fulfilment of human potential” (Sternberg & Dess, 2001, p. 332). The credit goes mainly to J. P. Guilford and this is because in his Presidential Address at the Annual Meeting of the American Psychological Association in 1950, he highlighted the fact that less than 0.2 percent of the literature in psychology between 1920 and 1950 was concerned with creativity. His address sensitized, energized, and synergized popular and professional interest in creativity and creativity research. Later, Guilford reported that within nine years of his address, creativity investigation had increased to 1.4 percent, that is, a seven-fold increase (cited in Sternberg & Lubart, 1999). Guilford is reportedly one of the first psychologists to define and measure creativity. He is often referred to as the pioneer and outstanding contributor in the area of empirical research on creativity (Huang, 2005).

In the latter half of the fifties, research into creativity shifted its focus from the identification of creative individuals to the conscious development of creative behaviour especially when it was realised that creative ability could be developed by deliberate training programmes and interpretations of research
findings could be attempted (Ansburg & Dominowski, 2000; Chan, Jiang, & Hsu, 2005; Cunningham & MacGregor, 2008). Thus this study intends to test the effectiveness of the Khatena Training Method (KTM), (Khatena, 1978c, 1992, 2000), in enhancing the creative thinking abilities of Form Four students in a typical school in the state of Selangor. The bioecological model “posits that individuals genetically inherit creative potential that is actualized in a varying degree depending on the quality of the environmental stimuli” (Schoenfeldt & Jansen, 1997, p. 74). In keeping with what is posited in the bioecological model, training students in creative thinking skills should further enhance their creative potential and their creative thinking abilities. We are also reminded that “if we provide training, structures, and systematic techniques, then we can raise the general level of creative ability” (De Bono, 1993, p. 31).

This chapter gives a bird’s eye view of definitions, facets, dimensions, theoretical approaches, and models of creativity that will directly or indirectly guide this study.

1.1 Definitions of Creativity

Creativity has been thought to be a fascinating and challenging subject from the ancient Greeks to the modern geeks. It is considered a complex (Petrowski, 2000; Ward, 2005), vibrant (Osborne, 2005), mysterious (Ford & Harris, 1992; Harnad, 2006), elusive (Prabhu, Sutton, & Sauser, 2008; Van Tassel-Baska, 2004), and multi-faceted (Hasirci & Demirkan, 2003; Kitto, Lok, & Rudowicz, 1994) cognitive concept.

The literature is replete with numerous definitions of creativity (Aleinkov, 2002) and after an extensive literature review, Welsch (1981) concluded that “the literature contains such a variance of definitional statements
that the task of defining the concept of creativity is a challenging one” (quoted in Parkhurst, 1999, p. 2). Thus researchers find it impossible to come to a consensus over a single or standard definition (Blair & Mumford, 2007; Ebert, 1994; Slavkin, 2004, cited in Clemons, 2006). Besides, what is regarded as creative in one culture and in one point of time may not be in another. This drives home the point that there can be no unambiguous or absolute way to define creativity (Keating, 1980; Murdock & Puccio, 1993). There can only be various strands to this fascinating but mind-boggling concept. Though the term “creativity” is used as if there is general agreement on the concept’s definition, definitions can only be specific to particular authors and researchers than a matter of consensus (Ebert, 1994).

Definitions of creativity have been viewed as unitary or multilevel in nature. The unitary view of creativity implies that creativity is the ability to bring forth something new and unique into existence through the process of association of mental states (Wheatley & Kellner-Rogers 1999; Wycoff 1991), cited in Walonick (2006). However, to Barron and Harrington (1981), “Creativity is not a single unitary characteristic but instead can be thought of as an imprecise category of behaviour” (quoted in Woodman & Schoenfeldt, 1990, p. 280). In this they are supported by two of the well-known personalities in creativity, namely, the late E.P. Torrance and J.P. Guilford who have looked upon creativity as a multilevel phenomenon.

Torrance (1988b) put forward his multilevel definition of creativity which has been well received. Firstly, the element of newness or originality of ideas and viewpoints serves as an important component in creativity. Secondly, creativity also includes elements of surprise, truth, and generalizability. Thirdly, the mental ability of seeing and creating relationships is also an important aspect
of creativity. Fourthly, creativity is contrasted with conformity. Conformity is doing what is expected and predicted while creativity is doing what is unexpected and not thought of. Finally, there are levels of creativity that can be considered as expressive, inventive, innovative, emergenative, and productive.

Guilford’s (1967) definition of creativity is in keeping with his concept of divergent thinking as expressed in his Structure of the Intellect model. His definition seems to be concrete and viable. According to Guilford (1950), creativity comprises four specific thinking abilities or dimensions, namely, fluency, flexibility, elaboration, and originality. This is to say that everyone has the ability to manipulate ideas in fluent, flexible, elaborate, and original ways. Guilford is supported by Khatena and Torrance (1998b). However, they define creativity in terms of originality for they believe in the power of the imagination to break away from the usual way of thinking so as to produce new and unique ideas.

In this study, the focus is on the creative dimension of originality. Originality has been found to be a significant predictor of creative achievements (Kim, 2006a) and “originality is measured via unusualness, innovativeness and statistical rareness” (Memmert, 2007, p. 287), (the dimension of originality is further discussed in this Chapter, 1.3).

1.2 Facets of Creativity

The discussion above of the definitions of creativity makes it clear that creativity has been viewed as a multi-faceted phenomenon. However, Slabbert (1994) has stated that to arrive at a proper definition of creativity, its many components have to be integrated as facets or aspects of one and the same totality. Chen, Kasof, Himsel, Dmitrieva, Dong, and Xue (2005) lend support to
Slabbert’s view for they too believe that creative performance is a result of interactions among several important facets or components of creativity which were first described by Rhodes (1961) as the 4-Ps or the chief strands of the concept of creativity. Terms such as aspects or components and facets or creativity elements as suggested by Seyed Hossein and Khatena (1985) are often used interchangeably to refer to the 4-Ps that stand for the creative Person, the creative Press (or environment), the creative Process and the creative Product. Similar descriptions have also been put forward by many other researchers (Csikszentmihalyi, 1988; Isaksen, Dorval, & Treffinger, 1994; MacKinnon, 1978b; Sen & Hagtvet, 1993; Urban, 1995). Amabile (1983a) tied up neatly the importance of the 4-Ps of creativity when she said, “Creativity is best conceptualized not as a personality trait or as a general ability but as a behaviour resulting from particular constellations of personal characteristics, cognitive abilities and social environment” (p. 358). Amabile’s (1983a) holistic view of the 4-Ps seems an attractive approach to the complex concept of creativity. Perhaps it is for this reason that the ubiquitous 4-Ps approach is often used for studying creativity (Huang, 2005; Lubart, 1994; Sternberg, 1999).

The 4-Ps of creativity is described below with special emphasis on the creative process. This is because creativity, in this study, is looked upon as a process that integrates mental and emotional forces. It has been said that creative development is dependent upon both the cognitive and emotional well-being of an individual (Cross, 2001; Khatena, 2000; Lesner & Hillman, 1983; Starko, 1995).

Creativity is a critical aspect of a person’s life starting from inside the womb and right through adulthood (Gale, 2005). Gale’s view suggests that everyone is born with creative potential which can be enhanced throughout life.
His view concurs with a similar view put forward by Gute, Gute, Nakamura, and Csikszentihalyi (2008). Research done has indicated that positive traits such as intelligence and ingeniousness (Barron, 1990; MacKinnon & Hall, 1972), tolerance for ambiguity and mistakes (Cramond, 2001; Dacey, 1989b; Torrance, 1993), imagination, intuition, and perception (Myers, 1962; Petrowski, 2000), independence and autonomy (Lee, 2005; Rea, 2001; Van Tassel-Baska, 2004), cognitive flexibility (Lindstrom, 1997; Raina, 1990), intellectual curiosity and verbal skilfulness (Gale, 2005; Kashdan & Fincham, 2002; Martindale, 2001) as well as dedication, commitment, and intensity (Abra, 1997, cited in Selby, Shaw & Houtz, 2005; Amabile, 1989) are associated with creative persons and this distinguishes them from non-creative persons. However, the above mentioned positive traits or characteristics do not necessarily apply to all creative persons. Creative persons could also be different from other people, perhaps even abnormal. They could be described as volatile, temperamental, stubborn, and uncooperative (Fernald, 1987; Kiechel, 1983). Alluding to this, Gale (2005) too has said that creative persons can be egotistical, believing in their own greatness and not being perturbed by social approval or rejection. Thus creative persons can also possess negative or malevolent characteristics (Eisenman, 2008; Feist, 1999).

The creative press or environment which includes the situations, events and circumstances that a creative person finds himself in is indispensable (Birdi, 2005; Bullinger, Auernhammer, & Gomeringer, 2004; Hunter, Bedell, & Mumford, 2007). This is because creativity is a function of the interaction between personality and environment (Harrington, 1990; Schoenfeldt & Jansen, 1997). Hence it could be assumed that creativity basically emerges from the interaction between an individual and the environment he is in. We are further
enlightened by Gale (2005) that researchers have found the environment to be even more important than hereditary in influencing creativity. However, the environment made up of people, events, circumstances or materials can be an influencing or an inhibiting factor. It can provide conditions to facilitate and foster or deflate and deter an individual’s creativity. Creativity requires stimulation and nurturing from the environment such as peer contact (Gute et al., 2008; Torrance, 1988a), parental approval (Csikszentmihalyi, 1999; Miller & Gerard, 1979), and sufficient time and space to grow and flourish. A favourable environment especially in the educational scene such as encouraging unusual questions and answers, accepting unique ideas, and providing a supporting or unthreatening environment could greatly foster creativity and increase productivity (Gruber & Wallace, 1999; Mclaughlin, 2001; Mellou, 1996; Sternberg & Lubart, 1991; Torrance, 1967; Zimmerman & Zimmerman, 2000).

Researchers are aware that neither physiology nor psychology has yet been able to give a definitive explanation about how creativity works. However, they are also aware that creative processes are definitely involved (Honig, 2006; Rubenstein, 2000) and that they aid creative persons to come up with creative solutions to problems and create worthwhile products. To Davidovitch and Milgram (2006) and Milgram (1990), creativity may be defined as a cognitive process of problem solving, a process by means of which original products can be generated. Original means unusual and of high quality, and a product can be a response, an idea, a solution or an actual product. Gale (2005) too views creativity as a process which can result in something tangible that is unique, new, and valuable.
Wheatley and Kellner-Rogers (1999) have attested to the fact, that in life everything is in motion and in a constant process of creating. This is to say that we are hard-wired for creativity. In this they are supported by Van Tassel-Baska (2004). To Nuernberger (1984) both the conscious and sub-conscious minds are involved in the creative process which to Torrance (1974) is elaborate and dynamic. It a process of:

- becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies and so on;
- identifying the difficulties; searching for solutions, making guesses or formulating hypotheses about the deficiencies;
- testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results (Torrance, 1974: 8).

Torrance’s definition of the creative process has been supported by Langley, Simon, Bradshaw, and Zytkow (1987). To them creativity is a form of problem-solving especially in the context of scientific discovery. However, to Parkhurst (1999), Torrance’s definition is more a listing of stages in problem-solving than a definition of a psychological construct. Besides, it does not explain artistic creativity. Torrance defended himself by saying that his definition of creativity is a suitable definition for research purposes. Udall (1996) like Torrance views creativity as a dynamic process that is the combination of interaction, transformation, imagination, and fantasy operating at the same time. Besides, creative thinking to him is vital and central to all disciplines as it is the mother of all ideas, concepts, principles, and theories. In this he is supported by Piirto (2004) who also views the creative process as including imagery, imagination, intuition, insight, incubation, and improvisation.

In view of the diverse thoughts on creativity as a process, it is perhaps safe to say that there is no specific process that can be described as the creative
process; for it is the choices made during the process that will characterise the process as creative. Generally, studies on the creative process reveal that characteristics such as problem sensitivity as well as fluency, flexibility, originality and elaboration of thought can be nurtured and developed to some extent in any individual (Guilford, 1967; Khatena, 2000). We are also informed that the creative process is the only facet of creativity that is trainable (Kobe, 2001). Besides, “the creative process in human beings can be concretely described and further, that sound description should be usable in teaching methodology to increase creative output of both individuals and groups” (Gordon, 1961), quoted in Smith (1998, p. 108). Guilford’s (1967) Structure of Intellect model and Khatena’s (1979) Creative Imagination Imagery model, which are discussed later in this chapter, are cognitive process models that support this study.

The creative product usually attracts much more interest compared to the creative person, creative press or creative process for it is usually the concrete, visible outcome of creativity (Joy, 2005, 2008). According to Clemons (2006), researchers (Mayer, 1999; McLaughlin, 2001; Qureshi & Qureshi, 1990; Sternburg & Lubart, 1999) have emphasized that a creative product has to be both novel and valuable. This is because novelty and value can be equated with unusualness, originality, statistical infrequency, and usefulness of a product (Gale, 2005). However, to Harnad (2006), novelty and value are not sufficient criteria for the outcome must also be unexpected or surprising. Besides, some researchers (Jalongo, 2006; Yuan & Zhou, 2008; Zhou & Shalley, 2003) have said that apart from being novel, a product should also be appropriate and fit its context in terms of what the thinker or creator has in mind and what the situation, culture or the world at large demands. Furthermore, to Walonick
(2006) no creative product is entirely new or original, for a creative product is actually a unique combination of elements that already exist.

1.3 Dimensions of Creativity

According to Guilford (1967), the mental operation of divergent production is linked to creativity for it is the exercise of divergent thinking that improves the function of creative imagination for productive manifestation. Divergent thinking tasks are usually used to determine the potential for creative problem solving (Runco, 2006; Runco, Dow, & Smith, 2006).

To Guilford (1967), the divergent processes have four major dimensions or components, namely, fluency, flexibility, elaboration, and originality which are cognitive abilities that underlie creative behaviour. Torrance (1966, 1995) has a similar view as he too operationally defined creativity as including fluency, flexibility, elaboration, and originality. To Torrance (1966), though the “dimensions do not cover the whole concept of creativity, they are easy to measure and thus make it easy to predict creative potential” (cited in Oral, 2006, p. 67).

Fluency is the ability to generate many ideas and concepts per unit of time, using words or figures in response to a task involving the imagination. To Gelade (1995) and Runco, Illies, and Eisenman (2005), fluency is scored by counting the number of relevant responses or ideas given by a respondent. The emphasis is on the quantity and not so much on the quality of ideas for according to Gudmund and Smith (2008), “Fluency implies speed of association at one and the same level of representation …” (p. 386). Fluency does not guarantee creative ideas but research has shown that the greater the quantity of
ideas and responses, the greater the chances of good solutions and right decisions.

Flexibility is the individual’s ability to use many strategies or approaches to produce a variety of ideas using words or figures in response to a task which can be categorized according to the diversity of responses. To Runco et al. (2005), flexibility is scored by counting the number of different themes or categories used by a respondent. Flexibility involves the ability to rearrange freely stored masses of information without blockage and thereby see hidden connections among ideas. Palaniappan (2005) too has a similar view for he has said that a person displays flexibility of thought when he is willing to change directions voluntarily or adaptively to solve problems. Adaptive behaviour also involves using the imagination freely to get away from ideas that are habitual and to branch out in new and different ways (Bowd, McDougall, & Yewchuk, 1994; Gudmund & Smith, 2008; Petrowski, 2000).

Elaboration refers to the ability to sense deficiencies and take appropriate steps to redefine and elaborate. It is the individual’s ability to embellish, embroider, add details or new structures to basic ideas produced verbally (semantically) or non-verbally (figurally) so as to make them original, feasible, and viable (Petrowski, 2000; Plucker & Renzulli, 1999). Elaboration is scored by counting the number of additional details used by a respondent (Gelade, 1995).

Originality as a dimension of creativity is generally given more prominence than the dimensions of fluency, flexibility, and elaboration. This is because originality is the key factor in creative behaviour (Ford & Harris, 1992; Mayer, 1999). It is the ability to produce novel, clever, rare, unusual, unique, dramatic, and appropriate responses and solutions, using words or figures in
response to a task. To Runco et al. (2005), originality is scored by counting the number of unique or novel ideas given by a respondent and Gelade (1995) refers to originality scores as weighted scores because statistically rare responses are given higher weights. Originality is also the ability to find new ways to adapt existing ideas to new conditions and circumstances. Yong (1994) has said that to produce original ideas, we need to challenge the obvious. This means that to be original, we have to change our mind-set and take a mental leap as it were to break loose from the mundane way of thinking. Originality may range from low levels, that is the idea or product is new only to the person or persons concerned, to high levels where an idea or product is new to the world (Finke, Ward, & Smith, 1992).

In this study, during the creativity training sessions, the subjects will be exposed to divergent thinking strategies through the Khatena Training Method (KTM), (Khatena, 1978c, 1992, 2000). They will be given the opportunity to stretch their thinking faculties through appropriate activities. Activities carried out will give ample scope for them to be original in their thinking for the focus of the KTM and the creative testing measure, namely, Thinking Creatively with Sounds and Words (TCSW), (Khatena & Torrance, 1973, 1981, 1998b; Torrance, Khatena, & Cunnington, 1973, 1990) used in this study is on the dimension of verbal originality (justification for the dimension of originality in this study is discussed in Chapter Two, 2.7).

1.4 Theories and Models of Creativity

There is no shortage of theoretical approaches to creativity that vary widely in their scope and methods. However, none of the many approaches can provide a comprehensive or a convincing theoretical explanation of creativity
which is a complex phenomenon (Plucker, Beghetto, & Dow, 2004; Prabhu, Sutton, & Sauser, 2008; Runco & Albert, 1990) with multi-dimensions (Guilford, 1967; Keller et al., 2007). Thus, categorising the various theoretical approaches to creativity can be a daunting and sometimes misleading task as there are no clear-cut and systematic approaches that do not overlap. However, we are reminded that in the absence of a well-elaborated and well-accepted theory, creativity research can only be atheoretical and pragmatic (Pickard, 1990).

There have been many attempts to classify creativity theories but Gowan’s (1972) classification has been well received. He classified the theories into five areas that range from the rational to the non-rational. Firstly, theories that are cognitive, rational, and semantic in nature. Secondly, theories that touch on personality and environmental factors. Thirdly, theories which emphasize creativity as a result of sound mental health and psychological adjustment. Fourthly, theories that place importance on the preconscious as the source of creativity. Finally, theories which have connections with psychedelic phenomena such as extra-sensory perception. While Gowan tried to classify creativity theories along a rational (controlled) - psychedelic (uncontrolled) continuum, others like Roweton (1972) tried to unify theories of creativity into a coherent schema. Roweton suggested six theoretical approaches to the interpretation of creative behaviour: definitional, behavioristic, dispositional, humanistic, psychoanalytic, operational.

The psychoanalytic, humanistic, and operational approaches put forward by Roweton are quite similar to Gowan’s preconscious, mental health, and cognitive classifications respectively (Khatena, 1992). Briefly, according to psychoanalysts, creative behaviour is guided by internal unconscious processes
Creativity also results from the freeplay of preconscious and conscious processes (Kris, 1952; MacKinnon, 1962b; Rothenberg, 1990; Walonick, 2006) that can transform fantasies into realities. The conscious processes have to work in tandem with the unconscious and preconscious processes so that problems can be looked at in new and fresh ways that can result in creative ideas and solutions. While the psychoanalytic approach to creativity emphasizes awareness of inner aspects of the self and psychic processes, the humanistic approach places greater emphasis on the awareness of the external world, individual development and growth towards psychological maturity. Although both the theories give different accounts of the motivation for creativity, they actually complement each other. Humanists like Maslow (1962, 1968) equate creativity with the state of self-actualization (cited in Van Tassel-Baska, 2004), for the drive to create can lead to novel and original ideas (Selby et al., 2005). To cognitivists (Guilford, 1967, 1977; Smith, 1998; Ward, Smith, & Finke, 1999), creativity is essentially a mental phenomenon for it is thought that people perceive and think about things and events according to their cognitive structure and style. Thus, their intent is to probe into how creative ideas are generated and to explore the mental processes and structures that underlie creative thinking.

Over the years not only theories but also models of creativity have sprung up with multiple facets and diverse perspectives. Most models of creativity can be looked upon as problem-solving models since creativity has been defined as a process of problem solving (Moon, Feldhusen, & Dillon, 1994). One of the earlier models of creativity that looked at creative problem solving as a series of linear or sequential stages was the model put forward by Wallas (1926). According to Wallas, the creative process which is continuous
and discontinuous, as well as conscious and unconscious, seems to evolve in four stages when forming a new thought. The first stage is the preparation or information-gathering stage when the conscious mind is concerned with the thorough inspection of the problem and collection of pertinent information and material. The second stage is the incubation or gestation stage which is a period of unconscious or subconscious activity when no deliberate attempt is made to solve the problem. However, during this critical period, there is the ripening or germinating of the solution within the individual. It is like taking a break to allow unrelated ideas to get the individual’s attention. Incubation is regarded as a higher dimension of the thought process (Torrance, 1979a; Ovlet, 2008) which operates in the subconscious mind of the right hemisphere of the brain and is often associated with intuition (Ornstein, 1975). The third stage is the illumination stage when the solution to the problem is grasped. This “intuitive leap” is the big moment of insight and inspiration that cannot be consciously controlled and is accompanied by a feeling of certainty and exhilaration (Walonick, 2006). The final stage is the revision, verification, or evaluation stage, when an attempt is made to verify the solution either through observation or experimentation. We are informed that Wallas’s stages of preparation and verification in the creative process are connected with the conscious mind but the stages of incubation and illumination are the province of the preconscious mind (Councill, 1988). Councill’s view of the creative process is in keeping with Freud’s (1924, 1947) theory that the mind is divided into the conscious, preconscious, and unconscious areas.

The theoretical model of creativity by Wallas has been supported by researchers (De Bono, 1992; Finke et al., 1992; Isaksen, 1987; Khatena, 2000; Lytton, 1972; Perkins, 1981; Plsek, 1996; Smith, 1998). Though Fryer (1996)
criticized the model of Wallas as being too rigid, Torrance (1988b) asserted that the model is the basis for most of the creativity training programmes available today. We are also reminded that the stages involved in the creative process model of Wallas overlap and are not meant to occur in an orderly, sequential manner (Runco, 1993; Stein, 1983). Theoretical models which refined the conceptualization of Wallas include the creative problem solving models advocated by Getzels (1980), Osborn (1953, 1963), Parnes (1967, 1992), and Vargiu (1977). Most models of creativity are similar in that they give attention and importance to divergent and convergent thinking as both forms of thinking are prerequisites for effective thinking. Theoretical models of creativity that are more multi-dimensional focus not only on the creative process but also on the other facets of creativity. Two of these models that are of interest in this study, apart from the models of Wallas and Vargiu, are the models put forward by Khatena (1979) and Guilford (1967), (these generic process models are briefly described below and further explained in Chapter Two, 2.5 & 2.6).

Khatena’s (1979) Creative Imagination Imagery (CII) model fits into his Multidimensional Interactive Creative Imagination Imagery Model (1992), which is an attempt “to put creative imagination and its imagery correlates in a broader perspective” (Khatena, 1992, p. 320). The CII model provides support for the creativity training programme, namely, the Khatena Training Method (Khatena, 1978c, 1992, 2000) utilized in this study. To Khatena, the creative imagination which is viewed as a right brain activity organizes the intellectual and emotive systems in diverse ways in order to process informational content as images. Thus, of central importance to the workings of creative imagination is the integration of intellectual abilities that are energized by magnetic forces of mental and emotive forces. Khatena has stressed that for the creative
imagination to work constructively, thinking and feeling must be synthesized to trigger incubation, imagery, and illumination. Other researchers (Averill, 2005; Cross, 2001; Russ & Schafer, 2006; Starko, 1995) have supported the close link between the intellect and emotion in the creative process.

Khatena (1979) has informed us that his CII model is a synthesis of the process models propounded by Wallas (1926), Vargiu (1977) and Guilford (1967). To Wallas, to solve problems, the creative process goes through a number of stages such as preparation, incubation, illumination, and verification. Vargiu too proposed several problem-solving stages that are quite similar to that suggested by Wallas. The stages are preparation, frustration, incubation, illumination, and elaboration. To Khatena (2000), the “frustration” stage in Vargiu’s model strengthens Wallas’s model. This is because the energy that builds up due to frustration can aid the incubation process by giving it focus and direction. Wallas, Vargiu, and Khatena believe that when a problem needs to be processed, incubation can be induced to produce imagery that can result in illumination of thoughts and ideas. Khatena (2000) regards the faculty of imagination “as the highest aspect of intellectual functions calling to action processes of thinking, memory, imaging, contriving, devising and judging” (p. 96).

In Guilford’s (1967) Structure of Intellect (SOI) model, the processes mentioned above by Khatena (2000) are also important in creative thinking. However, Guilford (1967) has referred to these processes as mental operations. In the SOI, intelligence is defined as a collection of functions for processing information. These intellectual functions are categorized as informational contents, mental operations, and informational products. Informational contents refer to the kinds of information contained in or used by the mind; mental
operation refers to the basic processes performed on information by the mind; and informational products represent the form of the information (Woodman & Schoenfeldt, 1990). The mental operation category involves five intellectual functions which are cognition, memory, divergent production, convergent production, and evaluation. In the SOI, although all the intellectual functions relate to creativity, it is the operation of divergent production that is directly related to creativity for it is critical for creative behaviour and spurs creative activity. To Guilford, creativity by itself is a multi-dimensional variable that is different from intelligence.

It has been said that Guilford’s factor analytic approach to human intelligence including creativity appeals to many researchers (Huang, 2005; Khatena, 2000; Roweton, 1989; Scope, 1998; Vernon, 1975; Woodman & Schoenfeldt, 1990). In Khatena’s CII model and Guilford’s SOI model, creativity is linked to imaging and divergent production respectively. The divergent production ability of originality is given prominence in Khatena’s CII model apart from the mental processes that include Breaking Away from the Obvious and Commonplace (BAOC), Synthesis-Destructuring-Restructuring (S-D-R), Transposition (TR), and Analogy-Imagery (A-I). These mental processes are used as the creative thinking strategies to enhance the creative thinking abilities of the subjects in this study through the creativity training programme called the Khatena Training Method (KTM), (Khatena, 1978c, 1992, 2000). The KTM together with the creativity measure of Thinking Creatively with Sounds and Words (TCSW), (Khatena & Torrance, 1973, 1981, 1998b; Torrance, Khatena, & Cunnington, 1973, 1990), focus on the originality of thought.

1.5 Summary
In this chapter, definitions, facets, dimensions, theories, and models of creativity were discussed. The fact that the concept of creativity can be looked at from so many diverse categories is a cause for celebration as our comprehension of this complex concept is that much better. Although the many categories mentioned can be somewhat artificial, they are actually interrelated issues that have been debated on for more than half a century. Petrowski (2000) has said that if there is one thing that unites theorists and researchers of creativity, it is the fact that they have contributed unique insights to our understanding of creativity; acknowledged the existence of creative potential in mankind; and emphasized the importance of creative thinking for man’s survival.

Creativity is a multi-faceted concept and since there is a great divergence across theories with regards to explanations of creativity, there is no unified psychological definition or a true scientific theory of creativity. As a result, terms such as imagination, imagery, intuition, ingenuity, originality, innovation, invention, and discovery are often used freely and interchangeably with the term creativity. We are reminded that although there are various definitions of creativity, they share one very important aspect, namely, the capacity to make new and valuable products both tangible and intangible. Khatena and Torrance (1998b) have defined creativity in terms of originality and to them, “Creativity is the power of the imagination to break away from perceptual set so as to restructure new ideas, thoughts, and feelings into novel and associative bonds” (p. 44). This definition is used as the operational definition of the dimension of originality in this study. Originality is given prominence as the creativity training programme, namely, the Khatena Training Method (KTM), (Khatena, 1978c, 1992, 2000) and the creativity measure, namely, Thinking Creatively with Sounds and Words (TCSW), (Khatena & Torrance, 1973, 1981, 1998b;
Torrance, Khatena, & Cunnington, 1973, 1990) encourage originality of thought which is the focus of this study. Also in this study, the creative process is given prominence and Khatena’s (1979) CII model selected to support creativity training is a process model.

CHAPTER TWO

Statement of the Problem

2.0 Introduction

In Malaysia, education is looked upon as a life-long process of acquiring and transferring knowledge, skills, and values and the National Philosophy of Education stresses the importance of the total and balanced development of an individual in the cognitive, affective, and psychomotor domains (Curriculum Development Centre, 1996), (cited in Abdullah, 2003).

In the quest for the all-round holistic development of an individual, the education for creative and critical thinking should not be neglected (Ibrahim, 1988) but utilized in a harmonious way (Ford & Harris, 1992; Gay, 2006; Khatena, 2000; Tan, 2000). To Guilford (1966), creative thinking is divergent thinking that leads a person to generate many novel answers and solutions and critical thinking is convergent thinking that leads a person to decide on a correct answer or solution. Guilford’s distinction between divergent and convergent thinking has influenced people’s understanding of creativity and its development to a great extent (Gay, 2006).

Just like Ibrahim (1988), the former Director General of Education, Wan Mohd. Zahid Mohd. Noordin (Curriculum Development Centre, 1996) had said that creative and critical thinking should be given due attention. This is because Malaysia needs individuals who can think effectively to meet the challenges of
the 21st century and to achieve the country’s vision of 2020. A local researcher (Palaniappan, 2005) too has said that more creative Malaysians are needed to address the challenges of the new millennium. Palaniappan (2005) singles out the importance of creative thinking “as an aspect of thinking which is vital for effective resolution of ever-challenging problems” (p. 3). In this he is supported by other researchers (Cheung, Rudowicz, Yue, & Kwan, 2003; Cole, Sugioka, & Yamagata-Lynch, 1999; Cramond, 2002; Freund & Holling, 2008; Khatena, 2000; Parkhurst, 1999) who have made it clear that preparing a nation’s young people to cope with rapid changes in society, necessitates developing their creativity. This is because creativity can be considered as one of the highest of mental functions (Rhodes, 1961), an important life-sustaining force of civilization (Toynbee 1967) and a catalyst for further human development (Cross, 2001; Kumar, Kemmler, & Holman, 1997; Scope, 1998). Perhaps the strongest statement thus far about the importance of creativity was by Carl Rogers (1962) who stated that, “We are doomed to annihilation unless we improve our creative abilities” (quoted in Walonick, 2006, p. 13).

One way to improve students’ creative thinking abilities is through creativity training with suitable creative thinking strategies and techniques (Khatena, 1992; Norman, 1980; Rose & Lin, 1984). The former Director of the Curriculum Development Centre in Malaysia, Mohd. Khairuddin Mohd. Ashaari (Curriculum Development Centre, 1996) had said that providing students with the tools of thinking could enable them to become innovators and inventors. Thus, the importance of creativity training cannot be denied and the sooner our students are trained in creative thinking skills the better.

2.1 Research Problem
In the light of what has been discovered and highlighted by the Federal School Inspectorate of Malaysia or Jemaah Nazir Sekolah Persekutuan (JNSP), (Abdullah, 2003) and in other JNSP (1992, 1995) reports, teachers may be lacking in knowledge, skills, and training in creativity. Thus, they may not be in a position to teach and train students in a conscious manner so that their creative thinking abilities are enhanced.

The mission of the JNSP of Malaysia is “to ensure the realization of the nation’s educational aims and objectives through quality evaluation to ascertain world class quality education” (Hamzah, 1996, p. 5). In keeping with the above mission, Abdullah (2003) has informed us that according to the Chief Inspector of the JNSP, Nik Faizah Mustapha, teachers lack confidence, knowledge, and the abilities needed to implement the Integrated Secondary School Curriculum (Kurikulum Bersepadu Sekolah Menengah or KBSM). Since one of the objectives of the KBSM, which was implemented in 1988, is to ensure that students acquire critical and creative thinking skills, it could be inferred that they might not be taught and trained with the aim of enhancing their creative thinking abilities as expected. In this study, the words “teaching” and “training” are used synonymously. This is because to Torrance (1971b), thinking is a skill and like any other skill it is teachable and according to the Oxford English Reference Dictionary (2003), to teach is to “enable a person to do something by instruction and training” (p. 1479).

A couple of school reports of the JNSP (1992, 1995) regarding findings about critical and creative thinking skills have given further credence to what the Chief Inspector of Schools had said. In the 1992 report, it was stated that 17 school inspectors from the English language panel used 6,086 students from Form Four classes in 103 secondary schools from all the states in Malaysia as
their aim was to investigate the qualities of an effective teacher from the perspective of a student. Their findings revealed that thinking skills that were considered important by students were not given emphasis by teachers.

In the other report (1995), it was stated that in the teaching and learning process, teachers generally do not question students to challenge their thinking skills and so students are not trained to think critically or creatively. The above mentioned JNSP reports about teachers not doing enough to foster especially creative thinking skills are similar to the findings by some researchers in the United States. It has been said that there are teachers in the United States who do not see the importance in supporting the creativity of their students (Fasko, 2001) and “although teachers generally value creativity, they seem to not want to see it in their classroom” (Runco, 2003, quoted in Beghetto, 2006, p. 449). However, this does not mean that we should be complacent about the importance of fostering the creative thinking abilities of Malaysian students.

The studies carried out by local researchers (Chia, 1997; Joseph, 1998; Palaniappan, 2005; Zarrin, 2003) have given us some reasons to explain the findings of the JNSP reports. Chia (1997) discovered that teacher trainees find thinking skills difficult to teach. Besides, the trainees were concerned that with knowledge growing at a rapid rate and subject syllabuses to complete, they might not have time to teach thinking skills during the teaching and learning process.

In the study carried out by Joseph (1998) on the creative behaviour of English language teachers and classroom methodology in twenty primary schools in Selangor that involved a hundred trained teachers, it was revealed that teachers themselves do not have enough knowledge about creativity. They are not given enough opportunities to acquire creative thinking skills and are not
convinced if the creative thinking abilities of their students can be increased. Teachers generally are of the opinion that thinking skills can be “caught” and thus not necessarily “taught”.

Zarrin’s (2003) study on the creative behaviour of English language teachers in a Malaysian secondary school gave support to Joseph’s study. She disclosed that the teacher respondents in her study need more training in the various aspects of creativity so that they in turn would be able to train their students.

In the study undertaken by Palaniappan (2005) that involved 41 school teachers and 40 school principals from secondary schools throughout Malaysia, it was exposed that the level of creative perception of the subjects was lower when compared to their American counterparts in the subscale of “What Kind Of Person Are You?” from the Khatena Torrance Creative Perception Inventory (Khatena & Torrance, 1976, 1990, 1998a). The finding suggests that the creative personality characteristics of school teachers and principals need to be enhanced.

The studies carried out by the local researchers mentioned above inform us that school teachers and principals generally do not have sound knowledge of concepts, approaches, methods, techniques, and strategies of creativity. Besides, being ill-equipped in creative thinking skills themselves, they naturally lack the confidence to foster and enhance the creative thinking abilities of their students. Hence students are not consciously nurtured and trained in creativity. However, if the creative behaviour, creative knowledge, and skills of school teachers, principals, and especially of students could be further improved by teaching, training, and testing, they could all benefit immensely. We are reminded that creativity is a complex concept that demands high levels of skill (Huang, 2005;
Thus, the sooner serious attention is given to it the better especially since we are aware that creativity plays an important role in the lives of people (Freund & Holling, 2008; Sternberg & Dess, 2001).

Chia (1997) who trained Malaysian teacher trainees in the Creative Problem Solving (CPS) method and tested them with the Torrance Test of Creative Thinking (TTCT) has shown us that creative thinking abilities can be enhanced and it is not difficult to train people to acquire creative thinking skills. Her study was the first empirical study in Malaysia to test a creativity training programme. Before this, teachers were exposed to training programmes under the KBSM, such as the CoRT 1 thinking programme (De Bono, 1970) and Polya’s (1957) methods of problem solving. However, these training programmes have not been empirically tested in the local context to give teachers the assurance that these programmes could indeed enhance the creative thinking abilities of students.

A review of various local sources of records of research on creativity training and testing (Educational Planning and Research Division, Ministry of Education; University of Malaya and other local universities) has shown that a number of Malaysian researchers have investigated, tested or measured the creative level of primary school students (Joseph, 1998; Siti Rafiah, 2007), of secondary school students (Chan, 1986; Palaniappan, 1993, 1994, 1996, 2000; Tan, 1992; Yong, 1986, 1989) as well as undergraduate students (Gan, 1998; Kalliappan, 1998; Palaniappan, 1989; Radiah, 1996). However, so far there has been no documented empirical study on creativity training of students as Chia’s (1997) study was on creativity training of teacher trainees. This suggests that we do not know if training and testing of students in the local context can enhance their creative thinking abilities. Thus this study intends to fill the lacuna.
The aim of this experimental study is to advance research in creativity training and testing of Form Four students in a typical secondary school in Selangor. Creativity has not been neglected by Malaysian educators or researchers. However, there is a lack of empirically tested creativity training programmes that can be used with ease and confidence by teachers to enhance the creative thinking abilities of their students.

Chia (1997) empirically tested the Creative Problem Solving (CPS) method on Malaysian teacher trainees. She found that it is a viable and effective creativity training programme that could be used to enhance the creative thinking abilities of teacher trainees. Her empirically tested CPS programme could be used to enhance the creative thinking abilities of students but the researcher of this study feels that with more empirically tested creativity training programmes, teachers and others who are interested would have a better choice.

The CPS method used by Chia may not be viable for the training of students. This is because the CPS programme can be time consuming and teachers and students do not have the luxury of time. Chia took a month to complete the programme with the teacher trainees. Chia herself had said that initially she wanted to conduct the experiment on the Form Four students of a school (during school hours or after school hours) but she was not given permission by the schools she approached and the reason being, the experiment would involve about ten hours of training over a period of a month and this could disrupt the schools’ schedule where curricula and co-curricula activities were concerned. Thus, there is the need for an empirically tested creativity training programme that is relatively simple and can be completed in a few days. Ferguson (1990), (cited in Walonick, 2006), has brought to our attention that experimental studies conducted by the late E.P. Torrance, who is considered as
the “Father of modern creativity” (Murock, 2005), to determine if creative thinking can be taught, discovered that brief and intensive training can change our thinking. Ansburg and Dominowski (2000) as well as Cunningham and MacGregor (2008) have supported the findings of Torrance.

Another reason for the unsuitability of Chia’s CPS programme that used the Torrance Test of Creative Thinking (TTCT) to measure creativity gains is because a couple of researchers (Millar, 1995; Saeki, Fan, & Van Dusen, 2001) have found that the originality dimension of the TTCT is culture specific. Kim (2004) too has said that “the TTCT scorers also have confirmed that there might be cultural differences in the originality lists” (cited in Kim, 2006a, p. 10). In this study, the Thinking Creatively with Sounds and Words (TCSW) which is an auditory test battery that will be used to measure creativity gains is acknowledged as a culture-free test (Khatena, 1992, 2000).

The uniqueness of this study as differentiated from that of Chia’s study lies in the inclusion of students in creativity training, the different creativity training programme used, the different creativity measure used, and the relatively shorter period of training. The researcher intends to test the efficacy of the Khatena Training Method (KTM), (Khatena, 1978c, 1992, 2000) for Form Four students in a typical school in the state of Selangor. The KTM has been found to be a reliable and valid training programme for students mainly in the United States (Blissett, 1994; Khatena, 1970c, 1971e, 1971b, 1973a; Khatena & Barbour, 1972; Khatena & Dickerson, 1973). The researcher intends to test the efficacy of the KTM with the creativity measure, namely, Thinking Creatively with Sounds and Words (TCSW), (Khatena & Torrance, 1973, 1981, 1998b; Torrance, Khatena & Cunnington, 1973, 1990) which has also been found to be a reliable and valid measure for students especially in the United States
(Khatena & Pazivand, 1983; Khatena, Sharad & Sikka, 1985; Khatena & Torrance, 1976). In the local context, Gan (1998) found that the TCSW for adults is an effective measure. In this study, the researcher intends to investigate if the TCSW for adolescents is an effective measure too. The training and testing sessions are to be completed in seven days.

A number of local studies that measured the creativity level of students and undergraduates in relation to a number of variables such as intelligence level, cognitive level, style of learning, socio-economic status (Yong, 1986); cognitive preferences (Palaniappan, 1989); academic achievement (Palaniappan, 1994); creative perception (Gan, 1998; Kalliappan, 1998); as well as creative level and gender differences (Siti Rafiah, 2007) have revealed that our students have the creative potential. A couple of our local researchers have even discovered that our secondary school students’ creative thinking abilities are comparable (Yong, 1986) or better (Palaniappan, 1996) than students from other countries. Yong’s (1986) study that measured the creative thinking abilities of 397 Form Four students using the Torrance Test of Creative Thinking, found that their creative abilities could be compared to that of students of the same age and educational level in the United States. In the cross-cultural study of creative perceptions undertaken by Palaniappan (1996), it was reported that the 107 Malaysian students who were involved in the study, performed better (the mean total score was higher) than even American, Indian, and Hungarian students on Something About Myself, a sub-measure of the Khatena Torrance Creative Perception Inventory, a self-report measure of creativity.

Taking into consideration the natural inclination of Malaysian secondary school students toward creativity as evidenced by the studies of Yong (1986) and Palaniappan (1996), our priority should be to maintain and even enrich this
natural dimension of creative potential. Perhaps it is time that we think of ways of how we can boost or even catapult significantly the cauldron of creativity that is bubbling in students. One of the ways will be to expose them to training in creativity thinking skills. A number of researchers in the field of creativity (Black, 2006; Chen et al., 2005; Costa, 1984; Khatena, 2000; Lalemi, 1991; Lee, 2005; Nickerson, 1999; Niu & Sternberg, 2002; Sternberg, 2000; Stoycheva, 1996; Torrance, 1987; Williams, 2002) have posited that the strategy most commonly employed to enhance and improve creative performance is training. To Strom and Strom (2002), though creativity training is imperative it does not and need not seek to develop the whole gamut of capabilities that have a bearing on creative achievement. To them, it is enough for creativity training to provide a limited set of experiences that can increase creative thought. Cropley (1997) too has assured us that creative thinking skills can be taught systematically and assessed empirically.

Considering the importance that the United States, South America, Europe, and some Asian and South-East Asian countries have placed on creativity (Strom & Strom, 2002), it is perhaps the right time that in Malaysia serious thought is given to further develop the creative thinking abilities of students through training and testing. Barron’s (1988) advice is timely for he has said that training aimed at increasing creative thinking abilities is required for the nurturing of creativity in schools. The time has come to offer teachers and other interested parties in Malaysia, creativity training programmes that have been empirically tested in the local context and which can have an impact on students’ creative thinking abilities. This is because creativity is a powerful tool in the educational context that teachers and students cannot do without (Bertrand, 2005; Isaksen, 2002).
The research problem in this study focuses attention on the effectiveness of the Khatena training Method (KTM). If the KTM is found to be effective in enhancing the Form Four subjects’ creativity, it could be considered a viable creativity training programme that educators could use with confidence to train students in creative thinking skills. Milgram (1990) has drawn our attention to the importance of identifying and fostering of creative thinking abilities among children as it is an essential optimal educational and social outcome. Other researchers (Gardner & Boix-Mansilla, 1994; Lavonen, Meisalo, & Lattu, 2001) have concurred with Milgram’s view and further added that though creativity is dependent on innate capabilities, it can be nurtured or fostered by factors such as knowledge, experience, and the environment. However, Koren, Klavir, and Gorodetsky (2005) have lamented the fact that an encouraging environment that gives enough experience to students in creative thinking skills is not common in schools. This is because schools generally tend to focus on the pursuit of formal bodies of knowledge.

2.2 Aim of the Study

Based on the discussion above, it can be taken as a fact that by providing students with creative thinking skills through appropriate creative thinking strategies, their creative thinking abilities can be enhanced. Thus, the aim of this experimental study is to investigate the effectiveness of an adapted Khatena Training Method (KTM), (Khatena, 1978c, 1992, 2000) in enhancing the creative thinking abilities of Form Four students in a typical secondary school in the state of Selangor as measured by the Thinking Creatively with Sounds and Words (TCSW) test battery (Khatena & Torrance, 1973, 1981, 1998b; Torrance, Khatena, & Cunnington, 1973, 1990).
This study is designed to determine through statistical variant and covariant analyses, if creativity (verbal originality) can be enhanced. In addition, the study is also designed to assess the effect of creativity training on the high creative, low creative, male, female, science, and arts subjects.

2.3 Objectives of the Study

In keeping with the aim of this study which is to enhance the creative thinking abilities of students through creativity training, the objectives of the study are listed below.

1. The first objective of this study is to determine whether creative thinking abilities can be enhanced in the subjects from the experimental group who will receive the KTM treatment as compared to the subjects in the control group who will not receive the KTM treatment. More specifically, the analysis will attempt to determine if either sample, experimental or control, experience any growth in their creative thinking abilities as measured by the Thinking Creatively with Sounds and Words (TCSW) test battery.

2. The second objective of this study is to determine the effectiveness of the KTM treatment between the experimental and control groups for the high creative, low creative, male, female, science, and arts, subjects as measured by the TCSW test battery.

3. The third objective of this study is to determine the effectiveness of the KTM treatment between the experimental and control groups as a result of delayed posttesting. More specifically, the analysis will attempt to determine if the experimental group can retain the creative thinking
skills learned as measured by the Using Modality and Imagery in Writing (UMIW) checklist.

2.4 Research Questions

In keeping with the aim and objectives of this experimental study, the following research questions were formulated:

1. Are there any significant differences in the gains between the subjects in the experimental and control groups, as measured by the TCSW (Forms 1B of S&I and O&I) posttest scores?

2. Are there any significant differences in the gains between the experimental and control groups, in the TCSW for the a) high creative and b) low creative subjects?

3. Are there any significant differences in the gains between the experimental and control groups, in the TCSW for the a) male and b) female subjects?

4. Are there any significant differences in the gains between the experimental and control groups, in the TCSW for the a) science, and b) arts subjects?

5. Are there any significant differences in the gains between the subjects in the experimental and control groups, as measured by the Using Modality and Imagery in Writing (UMIW), delayed posttest scores?

2.5 Theoretical Framework

The theoretical perspective of creativity and its many correlates have been discussed in Chapter One. However, a number of aspects that are pertinent to this study are examined such as the definition and theory of creativity used,
theory of creativity training subscribed to, and the selected model that supports creativity training.

It has been said that “defining and measuring the construct of creative thinking has proven to be an elusive task” (Ebert, 1994, p. 275). Thus, we should be cautious and heed Ebert’s advice. He has also reminded us that since definitions, theories, and models of creativity are often specific to a particular researcher, it would be appropriate to have a precise definition, a strong theory, and a suitable model especially for research purposes.

2.5.1 Definition and Theory of Creativity

There is a lack of consensus over the definition of creativity as it is a complex construct that spans a cognitive and emotive continuum (Khatena, 1992; Starko, 1995). Rhodes (1961) tried to solve this problem of definition through his explanation of the four facets or four P’s of creativity, namely, Person, Process, Press, and Product (these were discussed in Chapter One, 1.2). The process definition seems appealing to many researchers (Khatena, 2000) and thus the definition of creativity (originality) offered by Khatena and Torrance (1998b) that “creativity is the power of the imagination to break away from perceptual set so as to restructure new ideas, thoughts, and feelings into novel and meaningful associative bonds” (p. 44) is used as the definition of originality in this study. This is because the definition is in synch with Khatena’s (1979) Creative Imagination Imagery (CII) model which supports the creativity training programme, namely, the Khatena Training Method (Khatena, 1978c, 1992, 2000). The definition is also in harmony with the Thinking Creatively with Sounds and Words (TCSW) test battery (Khatena & Torrance, 1973, 1981, 1998b; Torrance et al., 1973, 1990) used in this study. The CII and
TCSW focus on the originality of thought. In the CII model, the creative imagination is actively involved in the creative process to effect transformations and the TCSW “provides conditions of free association for the production of original (statistically infrequent and relevant) responses” (Khatena, 1992, p. 122).

Just as definitions, theories of creativity too are numerous. Gowan (1972) classified creativity theories into five areas and one of them is theories that are cognitive, rational, and semantic in nature. This categorization of theories has been well supported by Guilford (1967), Khatena (2000) and Torrance (1979b) especially the theoretical approach that looks at creativity as a cognitive ability. To them cognitive factors play a crucial role in the creative process. Woodman and Schoenfeldt (1990) too have informed us that “the current research focus seems to have shifted to explorations of cognitive ability-creative behaviour relationships … [for] the notion that creativity can be at least partially explained by some cognitive aspects of the mind seems reasonably well established” (pp. 13-14). They have also said that cognitive factors thought to have important relationships to creativity include divergent production as proposed by Guilford (1967) and imagery as proposed by Khatena (1979). In Khatena’s CII model discussed later which supports the creativity training programme in this study, imagery and divergent production are important concepts of creativity.

2.5.2 Theory of Creativity Training

The focus of this study is creativity training and numerous advocates of creativity training have opined that creativity should not be thought of as inaccessible to formal training (Ambrose, 1996; Black, 2006; Chen et al., 2005;
Ford and Harris (1992) have informed us that “because he viewed creativity as a skill, Torrance argued that it is teachable” (p. 188). Torrance came to the conclusion that it is possible to enhance children’s creative thinking abilities through deliberate training (Torrance & Torrance, 1973) after looking into 142 studies that were designed to test approaches to training children with the view to enhancing their creative thinking abilities (Torrance, 1972a). Thus, to Torrance creativity can be taught like any other skill and when people are trained in a skill, they tend to perform better. Training students for creativity is like training them in the rules of a game so that they can understand them and become adept at applying them when the need arises.

Just like Torrance (1971b), researchers such as Khatena (1992) and De Bono (1993) also view creativity as a skill. Khatena has informed us that creative thinking is “malleable and responsive to intervention or training procedures” (p. 276) and De Bono has said that “training in creative thinking is skill training” (p. 280), but “the skills of creative thinking … have to be learned in their own right” (p. 42). De Bono further added that, “training is an essential piece in the whole process of creativity … without training, creative skills will remain rudimentary” (p. 271). Robinson (2001) concurred with De Bono but has reminded us that though everyone has creative potential, “developing it requires a balance between skill and control and the freedom to experiment and take risks” (p. 45). In Khatena’s CII model discussed below, imagination and
Imagery play prominent roles as they are linked to creativity and we are reminded that the imagination can be trained to produce creative imagery (Khatena, 1979). Bailin (1988) supported Khatena’s view when he said that “imagination is not an element which is separable from skill … they are closely interconnected, with imagination manifested in the execution of skill and skill involved in the development of an imaginative vision” (quoted in Drewe, 1998, p. 270).

Researchers who conducted meta-analytic reviews of studies to investigate the impact of creativity training programmes (Bertrand, 2005; Huang, 2005; Rose & Lin, 1984; Scope, 1998) have brought to our attention that creative thinking is both a skill and an innate ability. Meador, Fishkin, and Hoover (1999) too have looked upon creativity as a skill and in their review “found that skill in specific creativity techniques improved, emphasizing the improvement of process skills” (quoted in Hunsaker, 2005, p. 293).

Hunsaker (2005) and Jalongo (2006) have supported Torrance’s (1971b) theory of creativity. To Hunsaker, “approaching creativity as a life skill can be invaluable as a result” (p. 292) and to Jalongo, children need to be coached in creativity and “apprenticed into understanding the repertoire of skills necessary to attain excellence … and practice those skills alongside helpful, observant professionals and peers” (p. 7). Stanko (2000) too has strongly asserted that teachers should teach the skills of creative thinking to students. Though our creative skills have helped us to adapt to change, it is strange that schools and colleges do not equip students with creative thinking skills (Scope, 1998).

2.5.3 Creative Imagination Imagery Model
The model chosen for creativity training in this study is the Creative Imagination Imagery (CII) model by Khatena (1979, 1992, 2000). It provides support for the creativity training programme, namely, the Khatena Training Method (KTM), (Khatena, 1978c, 1992, 2000) that is to be used to train the subjects in this study. In the CII model (Figure 2.1), important terms used by Khatena such as creative imagination, imagery, emotive, and mental energy fields, the right and left hemispheres of the brain, and intellectual abilities are explained and discussed.

*Figure 2.1: Creative Imagination Imagery (CII) model (Khatena, 1979)*
Creative imagination is “the chemistry of mental processing in which interactive intellectual and emotive forces participate to stimulate, energize, and propagate the creative act” (Khatena, 1984, cited in Khatena, 2000, p. 95). To Khatena (1992), creative imagination is brain activity and imagery is mind activity too for images give coherence to the multifarious information that comes through our senses. He has reminded us that, “the language of discovery or imagery is the language of intuitive imagination [and] as a human function it can be fostered and trained, just as other facets of the creative imagination” (Khatena, 1992, p. 384). Besides, “research appears to confirm that imagery training can improve creative productivity” (Daniels-McGhee & Davis, 1994, p. 171).

In Figure 2.1, it can be seen that when intellectual abilities are energized by the dynamic and interactive energy field of mental and emotive forces, the creative process is set in motion by imagination. The interaction and interplay between the mental elements and emotions or feelings is the very essence of imagination, for it gives rise to mental imagery (Cross, 2001; Khatena, 1992). Other researchers (Averill, 2005; Ferguson, 1990; Lesner & Hillman, 1983; Selby et al., 2005; Starko, 1995; Torrance, 1972a; Treffinger, 1980) also subscribe to a similar view for they support the blend of cognition and emotion in the creative act. To them creativity has over the years become associated with many aspects of creative behaviour and mental functioning and that the mind and emotions play a dynamic role in this association. However, Councill (1988) singled out the importance of emotions and put it in a nutshell when she said, “perhaps Edward de Bono (1976) is correct when he declares that emotions are more important than anything else in the art of thinking” (p. 125). This perhaps is because the “openness to emotion in cognition and fantasy broadens the
associative process, perhaps by increasing ease of access to emotion-laden memories” (Russ & Schafer, 2006, p. 347).

The interaction of the intellect and emotions means that both the left brain and the right brain are also involved in an interactive and complementary manner in mental processes and share the potential for many functions (Khatena, 1979). To Jaben (1986), though creativity consists of cognitive skills, it involves more than only thinking skills for it calls for a more effective use of both the left and right hemispheres of the brain (Okabayashi & Torrance, 1984). Gowan (1978) has referred to this left and right brain engagement as a symbiotic operation. However, it is imperative to subdue the left hemisphere functions by relaxing, imaginative, and fun activities so that right hemisphere imagery can occur (Khatena, 2000). The left brain needs to be kept in abeyance, for the occurrence of imagery is the province of the right brain (Gowan, 1978). Khatena’s and Gowan’s views about brain activity and imagery are supported by Lowery (1982) because “recent right and left brain hemisphere research revealed that the right brain produced the necessary imagery for creative thinking, and this imagery is part of the incubation, intuitive process of creativity” (p. 134). Wheeler-Brownlee (1985) too has a similar view for right brain imagery is the vehicle through which incubation produces creativity. So right brain activity as it relates to creative imagination has to do with imagery and imagery is the language of discovery and the key to mankind’s creativity (Khatena, 1979). Furthermore, the right brain specializes in the handling of mental operations like metaphor, analogy, and imagination imagery apart from divergent production suggested by Guilford (1967) in his Structure of Intellect model (Khatena, 1979). There is indeed a special relationship between imagery and what Guilford (1959a) calls divergent production (Suler & Rizziello, 1987).
Khatena’s (1979) CII model is a synthesis of the thoughts of Guilford (1967), Vargiu (1977), and Wallas (1926) on creativity and problem solving processes. Khatena has said that,

_Synthesizing Guilford’s model of intellectual abilities, and Wallas’s and Vargiu’s thoughts on creativity and the problem-solving processes, we can construct a model that illustrates that abilities energized by magnetic fields of mental and emotive forces are central to the workings of creative imagination (Khatena, 1992: 333)._ 

Creative imagination is considered as the highest aspect of intellectual functions (Khatena, 2000) and in the creative process, the imagination is stimulated to produce images when there is interaction of mental and emotive energy (Khatena, 1992; Vargiu, 1977). This energy gives focus and direction to solve problems (Wallas, 1926) and to think divergently in order to produce novel insights (Guilford, 1967). “Nourishment of divergent thinking, a function of creative imagination, will strengthen it and facilitate it so that it grows as near as possible to full potential” (Khatena, 1992, p. 341).

The thoughts of Guilford, Vargiu, and Wallas have a bearing on Khatena’s (1979) CII model and as such it would be pertinent to discuss further their thoughts on creativity. Figure 2.2 (on the next page) depicts the thoughts of Wallas (1926), Guilford (1967), and Vargiu (1977) that have greatly influenced Khatena’s CII model. The CII model captures the complexity of creativity in a nutshell.
Earlier on in Khatena’s (1979) Creative Imagination Imagery (CII) model (Figure 2.1) it was shown that Guilford’s Structure Of Intellect (SOI) model (depicted in the form of a cube) is given prominence. This is because Khatena (1992) and others like Peake (2005) believe that the SOI is a comprehensive and systematic theoretical model of the complex concept of human intelligence and that intellectual capacity includes the ability to be...
creative (Khatena, 2000; Runco, 1993; Torrance, 1974). The intellectual abilities as proposed by Guilford in the SOI and the energy field as depicted in the CII model (Figure 2.1), work together in diverse ways to the extent that they stimulate the creative process to produce incubation, creative imagery, and illumination of original thought.

In Guilford’s SOI as depicted in Khatena’s (1979) CII model (Figure 2.1), and his thoughts enumerated in Figure 2.2, intellectual ability is viewed as a multi-dimensional factor and creativity acknowledged as a widely distributed intellectual ability. Guilford has organized intellectual abilities along three dimensions, namely, contents, operations, and products. Each of the abilities is distinguished from the rest by its unique interactive combination of mental operations, contents, and products. Guilford (1977) has also equated creativity with the mental operation of divergent production in his SOI as “right hemisphere functions of the brain are concerned with divergent production and involve imagery through which imagination produces creativity” (quoted in Gowan, 1978, p. 24). Other researchers (Han & Marvin, 2002; Parkhurst, 1999; Woodman & Schoenfeldt, 1990) too have concurred with Guilford’s contention as they feel that the mental operation that is particularly significant for creative thinking is divergent production or divergent thinking. To Han and Marvin, “the terms creativity and divergent thinking may even be used rather interchangeably” (2002, p. 99) for “divergent thinking is one major cognitive process important in creativity” (Russ & Schafer, 2006, p. 347).

Khatena has informed us that the attention given to divergent thinking abilities in the SOI model has lit the fuse for knowledge and research in the area of creativity to flourish “besides setting in motion viable efforts for the discovery of measurable creativity” (Khatena, 1982b, p. 22). Khatena (1992) has
further stated that divergent thinking, a function of creative imagination which in turn is a human function, needs to be fostered if we want individuals to actualize their potential. The best way to develop intellectual abilities generally and divergent thinking abilities specifically is to ensure that individuals are given the opportunity to strengthen the abilities and this is best done through training (Antonietti, 2000; Garaigordobil, 2006; Ma, 2006). Generally, numerous other researchers (Ambrose, 2006; Baer, 1996; Gay, 2006; Isaksen et al., 1994; Joy, 2008; Komarik & Brutenicova, 2003; Molle, Marshall, Wolf, Horst, & Born, 1999; Sternberg, 2006; Vosburg, 1998; Wheatley & Kellner-Rogers, 1999) have expressed similar sentiments in support of the role that divergence plays in predicting creative accomplishment.

In this study, creativity training is via the Khatena Training Method (KTM), (Khatena, 1978c, 1992, 2000) and creativity testing is through the Thinking Creatively through Sounds and Words (TCSW), (Khatena & Torrance, 1973, 1981, 1998b; Torrance et al., 1973, 1990). The KTM and TCSW focus on the divergent thinking ability of originality. According to Khatena (1992), the rationale for this is that the KTM strategies of Breaking Away from the Obvious and Commonplace (BAOC), Synthesis-Destructuring-Restructuring (S-D-R), Transposition (TR), and Analogy-Imagery (A-I), (these strategies are explained later in this Chapter, 2.6) stimulate the creative imagination to engage in constructive fantasy and produce original imagery. Similarly, the TCSW test battery is a test of originality for “the listener receives information with instructions to be imaginative and produce original verbal images” (Khatena, 1992, p. 328). In the TCSW, originality of response is determined by statistical infrequency (Khatena & Torrance, 1998b). In Guilford’s (1967) SOI model too, originality is the ability to produce clever ideas and solutions that are
statistically rare. To Khatena (1992, 2000), Guilford (1967), and Torrance (1979b), originality is the ability to generate unique and novel solutions and to Runco et al. (2005), creativity and originality are closely related.

In Khatena’s (1979) CII model (Figure 2.1), apart from having taken into consideration the thoughts on creativity as proposed by Guilford in his SOI model, Khatena has also used the thoughts of Vargiu (1977) and Wallas (1926) on creativity as enumerated in Figure 2.2. To Vargiu, imagination functions as a result of the interaction of the elements of mental and emotive forces that create energy fields much like a thin layer of iron filings in the presence of a magnet. The creative process is first stimulated and the imagination is activated. Then the creative process goes through the stage of incubation. Before long, the energy field that is intensified brings forth sudden and unexpected illuminative ideas in our consciousness. Vargiu’s thoughts on creativity are similar to the steps in the creative problem solving process put forward by Wallas, namely, preparation (information gathering), incubation (unconscious workings of the mind), illumination (emergent solutions) and verification (acceptance). However, Vargiu added “frustration” as a step following preparation and he changed verification to “elaboration”. To Wallas, below the level of consciousness, the mind and body function in unison and engage in the creative imagination process of forming and transforming information into concrete and meaningful expression. This is the state of relaxed tension or incubation that can result in unexpected illumination of ideas to be verified by the logical mind processes. To Khatena (1992) the problem-solving steps or stages involved in creativity as suggested by Vargiu and Wallas, “form the basic principles of creative problem-solving models” (p. 366).
We are informed that specific process tools and strategies can be used to increase creative thinking skills (Torrance, 1986) and the Khatena Training Method (KTM) strategies of BAOC, S-D-R, TR, and A-I are specific tools that allow for mentally and emotionally challenging right brain activities to be experienced by the subjects in this study. During the KTM treatment, the subjects will be prepared for the imaginative activities, told to relax and have fun. This is because “relaxation coupled with focusing techniques common to methods of meditation help to quiet the mind and to center its energy on a problem or area of interest” (Rockenstein, 1988, p. 82). The KTM strategies involve structured activities that can give students direction and focus, and training that is structured but allow students to enjoy the learning process is ideal (Whiting, 1985).

To Khatena (1992, 2000), activities that are designed for training can stretch one’s imagination to produce original images and when the imagination is involved, one’s emotions are automatically involved. Studies have found that emotionally involved children were more creative than their normal counterparts (Ferguson, 1990). Imagery plays an important role in the creative process and the deliberate evocation of mental images can increase creativity (Gonzales & Campos, 1997; Khatena, 1978b). In a study carried out by Khatena (1975d), significant correlation was found between creative perception and auditory, visual, and tactile imagery vividness. Similarly, in the study by Gonzales and Campos (1997), it was found that imagery correlated significantly with many aspects of creative thinking.

In the study by Khatena (1975d), one of the KTM activities involved sounds and music as it could arouse images which have personal meaning for the listener. Summer (1985) too has informed us that music can stir the emotions
to produce vivid images. This is because “music shares the structures of the emotional world since both are based on tension and resolution as a fundamental relationship” (p. 88). In this study, the KTM strategies and the TCSW test battery will give the subjects opportunity for the emergence of vivid imagery. This is because one of the KTM activities involves sounds and music and the TCSW testing battery is based on sounds and onomatopoeic words.

Activities that challenge the mental and emotional faculties not only allow for vivid imagery (Cross, 2001) but also give rise to incubation and illumination of ideas as suggested by Vargiu and Wallas. To them and also to Ovlet (2008), incubation is the stage of the creative process during which a person is not actively thinking about the problem. Khatena (1982a) defined incubation as “… that stage in creative thinking and problem solving when mental events, earlier set in motion by deliberate and intensive preparation, are energized to become autonomous for the occurrence of fruitful insights that lead to good solutions to problems” (quoted in Rockenstein, 1988, p. 81). The time interval for the process of incubation may vary from a few moments to even months away from the problem and is terminated when the solution or illuminative idea occurs (Khatena, 1992, 2000; Khatena & Torrance, 1998b; Penney, Godsell, Scott, & Balsom, 2004). During the KTM treatment when the subjects find themselves in situations when they cannot produce new ideas, they will be told to relax by closing their eyes for a few moments before resuming. Suspending conscious efforts or diverting focus from the problem can provide a new start toward a solution, often yielding unique ideas when work is resumed (Kiakwood, 1984). This is because periods of lull in intentional effort might expose the problem solver to some environmental cue that could activate memory associations (Penney et al., 2004) or permit subconscious interaction
and transformation of the data involving the problem to produce novel associations (Arieti, 1976; Parnes, 1975; Rockenstein, 1988) that could result in original imagery. To Shaw and DeMers (1986), original imagery is related to the qualitative aspect of creativity.

Khatena’s (1979) CII model (Figures 2.1 & 2.2) supports the Khatena Training Method (KTM), (Khatena, 1978c, 1992, 2000) in this study. In 1978, Mansfield, Busse, and Krepelka reviewed a number of creativity training programmes and to them where effectiveness of creativity training programmes was concerned, the KTM and the Osborn-Parnes Program were most convincing as they have “in common breadth of training without being linked to a fixed set of materials” (quoted in Khatena, 1992, p. 354). We are also informed us that the generic roots of creativity training programmes can be identified especially through Guilford’s Structure of Intellect (Khatena, 1992) as depicted in Khatena’s CII model (Figure 2.1). In the local context, the Osborn-Parnes Program was used by Chia (1997) to test its effectiveness on teacher trainees. In this study, the researcher intends to test the efficacy of the KTM on Form Four students from a typical school in the state of Selangor.

2.6 Conceptual Framework

The fundamental research question guiding this study is, “Is there a significant difference in the gains in creativity between the experimental and control groups?” It is hypothesized that the creative thinking abilities of the Form Four subjects can be enhanced through the Khatena Training Method (KTM) treatment. Thus, the conceptual framework for this study is causal in nature and takes into consideration the model, factors, and instruments that are integrated into a comprehensive paradigm (Figure 2.3). The creativity model
chosen for this study is Khata’s (1979) Creative Imagination Imagery (CII) model. The factors or control variables to be studied are creative ability level (high creatives & low creatives), gender category (males & females), and academic stream (science & arts). The instruments to be used are Something About Myself (SAM), Thinking Creatively with Sounds and Words (TCSW), and Using Modality and Imagery in Writing (UMIW).

![Conceptual Framework of the Study](image)

**Figure 2.3**: Conceptual Framework of the Study

2.6.1 Model

Creativity training is the independent or predictor variable in this study. The theoretical process model chosen to support creativity training, through the Khata Training Method (KTM) strategies of Breaking Away from the Obvious and Commonplace (BAOC), Synthesis-Destructuring-Restructuring (S-
D-R), Transposition (TR) and Analogy-Imagery (A-I), is Khatena’s (1979) Creativity Imagination Imagery (CII) model which was discussed earlier.

According to Khatena (1978c, 1992, 2000), the creative imagination organizes the intellective and emotive forces in diverse and interactive ways to process informational content as images and it is “these processes that include divergent thinking, breaking away from the obvious and commonplace, transposition, synthesis-destructuring-restructuring, and analogy and metaphor” (quoted in Khatena, 1992, p. 340). Analogies, metaphors, and imagery are higher order thinking skills that involve complex transformational mental processes and cognitive factors (Treffinger, 1980).

The KTM is not a ready-made or packaged creativity training programme. The creativity approaches and strategies for the KTM were extracted from Khatena’s (1978c, 1992, 2000) three books. The KTM programme planned by the researcher was approved by Prof. Emeritus Joe Khatena, from Florida, United States. The KTM provides instructions and practice in the creative training strategies mentioned above. Khatena believes that training through the KTM strategies, which involve higher order divergent thinking mental processes that focus on originality of thought, creative thinking abilities can be maximized. The KTM strategies are directly or indirectly similar in essence to many of the 13 criterion-referenced measures that Torrance added to his popular creativity measure known as the Torrance Tests of Creative Thinking (Torrance, 1998). The criterion-referenced measures are “emotional expressiveness, story telling articulateness, movement of action, expressiveness of titles, synthesis of incomplete figures, synthesis of lines or circles, unusual visualization, internal visualization, extending or breaking boundaries, humour, richness of imagery, colourfulness of imagery, and fantasy” (quoted in Kim,
2006a, p. 5). Thus, Khatena and Torrance seem to be on the same wave-length where creative strategies and strengths are concerned.

In this study, the KTM strategies of BAOC, S-D-R, TR and A-I will be used to stimulate, facilitate, and encourage creative imagination imagery that are unique, novel and original. According to Smith (1998), in the absence of a single best creativity technique, a set of well-designed repertoire of devices is likely to be effective in especially divergent thinking tasks. Smith’s reminder gives indirect support for Khatena’s creativity training strategies mentioned above. Khatena has used the KTM strategies and the Thinking Creatively with Sounds and Words (TCSW) test battery in a number of research studies and obtained impressive and significant results. (please refer to Chapter Three, for the above mentioned studies).

Creativity represents a synthesis of figural, symbolic, and semantic skills (Dacey & Lennon, 1998) and the creativity strategies of BAOC, S-D-R, TR, and A-I that are based on figural, symbolic, and semantic activities will give ample opportunities for the subjects in this study to stretch their imagination, think divergently, and produce original ideas. The importance of the faculty of imagination has been stressed by researchers (Cross, 2001; Khatena, 2000; Smith, 1998; Starko, 1995; Vargiu, 1977) for it is virtually synonymous with creativity (Smith, 1998). It is an integral part of our intellect (Cross, 2001) and the province of the right brain. It can be described as activity of creative energy fields that are mental and emotive (Starko, 1995) and as a result of the interaction of the energy fields, feeling-charged images are formed in the mind (Khatena, 2000; Vargiu, 1977). People’s abilities to use their imagination in diverse ways have been demonstrated by research findings (Finke et al., 1992).
Khatena’s creative thinking strategies of BAOC, S-D-R, TR, and A-I are not mutually exclusive. They are really interrelated strategies. If individuals want to enhance their creative thinking abilities, they need to be trained to consciously get away from the mundane way of thinking and deliberately think in unusual ways. If individuals are not satisfied with the existing situation or order that has long been synthesized and adhered to, they need to take action even if it means destroying the existing or safe situation. This can be done by the use of mental processes such as destructuring and restructuring or recombining that can transform the old order into a new order, transpose a new order upon the old order or transfer an existing structure from one mode to another. Mental processes can be aided by the use of facilitative strategies such as analogies and metaphors. Their function is to find likeness in dissimilar things and thereby make imagery more vivid and complex. Highly imaginative individuals make use of more complex images (Khatena, 1992). (The KTM strategies are discussed below and the KTM activities for creativity training are explained in Appendix A).

2.6.1.1 Breaking Away from the Obvious and Commonplace (BAOC)

Torrance (1971c) has lent support to Khatena’s CII model where creative thinking strategies of Breaking Away from the Obvious and Commonplace (BAOC) and Synthesis-Destructuring-Restructuring (S-D-R) are concerned. Torrance is identified mainly with the BAOC or habit-breaking strategy and to a lesser extent with the S-D-R strategy. For the development of his divergent thinking tests, Torrance (1971c) used the scientific problem solving method to provide the rationale which included:

such principles as resistance to early closure, structuring and integrating, control of tension long enough to make
the mental leap necessary to break away from the obvious and commonplace, the tendency toward disruption of structure in order to create the new, and finding purpose for something that has no definite purpose and to elaborate it in such a way that the purpose is achieved (quoted in Khatena, 1982b: 22).

Smith (1998) echoed a similar view because to him the BAOC strategies “are based on the premise that the mind must break out of normal response patterns to think creatively” (p. 121). This means that information from the environment around us is screened by the mental schema of our past experiences before they become etched in our minds with time. These experiences become responsible for our habitual patterns of thought that can inhibit or affect our creative imagination adversely. The BAOC is indeed a special thinking process that can be used in a conscious manner to help us dissociate ourselves from the habitual mental set that we may have become accustomed to and thereby develop a unique concept (Weisberg, 1993). For us to be creative we have to make a conscious and deliberate effort to free ourselves from inhibitory experiences and a mindset that has become ingrained in a habitual pattern of thought (Levine, 1988; Amabile, 1989). In this way we will soon acquire the habit of thinking in fresh, unusual, and unique ways. We need to constantly strive to transcend our usual way of thinking and behaving. No one has a lock on creativity and that should remind us to think about unlocking our own. Freeing our rigid mindset should be the first step to making us more creative. In other words, the crux of the concept of creative thinking is overcoming habitual thinking and trying to see things differently.

During the Khatena Training Method (KTM) treatment, the subjects will be reminded that by consciously, deliberately, and constantly applying the strategy of BAOC, they would in no time be able to think in non-habitual ways and this could throw open the door to unique, clever, and extraordinary ways of
thinking and doing. For example, if subjects are given paper clips and asked for what the clips can be used, they would obviously say that they are meant for securing a few sheets of paper so that they do not get misplaced or lost easily. But if the subjects are encouraged and even challenged to think of other unique ways that paper clips can be put to use, they may come up with ideas such as, use as a “skipping rope”, give as a “present” and use to demonstrate “colours” (the BAOC activities are explained in detail in Appendix A).

2.6.1.2 Synthesis-Destructuring-Restructuring (S-D-R)

The creative process in Land’s (1973) Transformation Theory lends support to Khatena’s (1979) CII model where creative thinking strategies of BAOC, S-D-R, TR, and A-I are concerned, especially that of the S-D-R strategy. The key concept in Land’s theory is growth and it brings into focus different but connected stages of growth: accretive, replicate, mutualistic, transformational. Each stage is a transition to a higher and more complex level of growth. At the accretive stage, creative thinking helps in the enlargement of a concept or idea and the replicative stage involves modifications that could result in better ideas. At the mutualistic stage, creativity is equated with higher level associations, analogies, and metaphors and at the transformation stage, “creativity relates to invention or the recombination of the old concept at a higher level of relationship to the environment involving destructuring and reintegration” (quoted in Khatena, 1992, p. 200). The S-D-R process is also observable in the natural environment (Land, 1973) as nature itself can be observed to thrive in the evolutionary process by alleviating to higher levels, forms, and growth. Just as things in nature are constantly in a state of flux, mental activity too is perpetually in the process of synthesizing, destructuring,
and restructuring. Torrance (1979b), Bandura (1997) and Smith (1998) have lent support to the S-D-R strategy. Smith has referred to it as a task-focused strategy where “rearrangement alters the structure of a situation by rearranging its parts” (p. 122), whereas to Torrance “when two or more somewhat unrelated elements must be synthesized into a single response, the mental leap that occurs is likely to result in something original” (quoted in Councill, 1988, p. 128). Bandura too has informed us that creativity or innovativeness involves the processes of restructuring and synthesizing (cited in Beghetto, 2006).

The S-D-R strategy is a three-dimensional thinking strategy that plays a big part in the creative process (Piirto, 2004). In fact, the creative process revolves around the S-D-R strategy. Information gathered from memory storage is firstly organized and synthesized into some kind of order to produce something tangible or intangible that is new and novel. In other words, we bring forth new ideas or create new products by bringing together all the knowledge, information and things needed or required into a synergistic endeavour. Thus, when we combine or bring together two or more concepts, new properties can result (Hampton, 1997). Then a time may come when a change of form is desirable and inevitable. We then deliberately cast off old ideas and discard old products in favour of new ones. The very act of moving away an object or concept from its usual associative context and seeing it in a new light is an important part of the creative process (Lytton, 1971). In this way the old order is replaced or transformed with a new order. It is a process of disintegration preceeding the new synthesis through destructuring and restructuring such as rearrangement, recombination, addition, deletion, reduction, enlargement, reversals, and elaboration (Kosslyn, 1985), in order to create, innovate or invent something more interesting, tantalizing, and satisfying. To Long and Hiebert
(1985) too “creativity derives from the ability to retrieve, combine and synthesize these experiences in novel ways” (quoted in Jampole, Mathews, & Konopak, 1994, p. 1).

The S-D-R concept is in keeping with the Freudian, Associationists, and Gestaltists way of thinking (Lubeck & Biddle, 1988). The Freudian argument that creativity is an effort to reduce tension, the Associationists’ view that creative insights are built up by meaningful associations and the Gestaltists’ holistic view of the whole structure before rearranging or restructuring its parts (Wertheimer, 1959) are all important concepts in the creative process.

The creative act is indeed an act of manipulation and it involves destruction, but not destruction for destruction’s sake but destruction for the sake of a greater construction and glory. To Pierson (1983), creative manipulation is the act of reshaping or remodelling the “what could be” to create a totally new idea to solve a problem. Thus, the S-D-R is a never-ending process, as human beings by their very nature are always hungry for new challenges and discoveries. The processes of S-D-R are seen in many accounts of the lives and works of those who are considered to be very creatively inclined (Kosslyn, 1985; Wallace & Gruber, 1989).

Creative manipulation can be linked to the faculty of imagination for the birth of a new order brings about change or transformation and this is the result of creative imagination activity (Khatena, 1992). To create we need to change the old into the new for we do not create out of nothing. Thus, creativity is taking the old and building it into something new, through processes such as mixing, moving, moulding, and manipulating. For creativity to happen, we must make it happen by stretching our imagination. We can take the data and fiddle,
fidget and fool around with them until we realize that something new and novel has sprung out of it, as a result of our creative imagination activity.

During the KTM treatment, the S-D-R process can be taken advantage of by deliberately stimulating the creative imagination of the subjects through suitable activities such as encouraging them to create something, then destroying it, only to recreate something new and different. When creative imagination is stimulated, information in the form of images that had been lying dormant in our memory files is first synthesized with incoming new information in unique ways that manifests in a certain acceptable order. But when the new order is no longer novel or relevant and a newer order is sought, then the destructuring or breaking-up, and restructuring or building-up process is inevitable to bring about the desirable transformation which is usually of greater quality. This is the result of creative imagination activity. Children are often seen putting things together to create something. Then when curiosity gets the better of them, they take their creations apart only to come up with newer ones. This is a never-ending process and this is how children learn and grow to become more flexible and better thinkers. Creativity is essentially an act of play (Baggerly, 1999; Greely, 1993, cited in Walonick, 2006; Howard, Taylor, & Sutton, 2002) for play stimulates creativity. Exercises in the S-D-R process can make use of different types of content such as verbal, semantic, figural, and behavioural (the S-D-R activities are explained in detail in Appendix A).

2.6.1.3 Transposition (TR)

To Hornby (1995), to transpose is to cause two or more things to move and adapt. It also involves changing the usual, relative or respective order. Similarly, to Khatena (1992), transposition (TR) is a sense-transposing strategy.
and when challenged to respond in original ways, the build-up of creative energies directs “the transformation of ideas from one sense modality to another. What is ordinarily a visual perception can be metamorphosed into an auditory perception …” (Khatena & Torrance, 1998b, p. 47). Thus, the TR strategy is a thinking strategy that can help us switch from one sense modality to another as from visual to auditory, thereby strengthening our imaginative and creative powers.

The ability to shift from one mode to another or to combine modalities such as visual, auditory, olfactory, gustatory, kinesthetic, symbolic, semantic, and behavioural can be consciously and purposefully directed for a richer effect and result (Wheeler-Brownlee, 1985). So the TR strategy can help in the “transference of an existing structural or functional relationship of a phenomenon from one mode of expression to another” (Khatena, 1992, p. 344). Like Wheeler-Brownlee and Khatena, McKellar (1995) too believes that the peculiar transposition of familiar and unfamiliar objects is a function of the creative imagination. This is to say that our imagination becomes more vivid when more sensory codes are used for “as the number of sensory codes increases, recall of past memories and imagination of future prospects is enhanced, thus allowing for greater choice in making decisions and solving problems” (Lankton, 1980, quoted in Tracy, Roesner, & Kovac, 1988, p. 146). In the investigation of sense modalities, Tracy, Tracy, and Ramsdell (1985) found that when a non-visual modality such as hearing or feeling was added to the visual modality, recall was improved as compared with the visual modality alone. Thus, they bring to our attention that multiple sensory modes can enhance recall and this in turn can greatly aid in creative thinking.
The strategy of transposition can take the form of figural or verbal stimulus. For example, when a figural stimulus (object-visual) in the form of two pencils are given, one being larger than the other, the transposition made in terms of linguistics can be the letter “I” in the upper case and the letter “i” in the lower case or in terms of taste as a long ice-cream cone and a short one. When a verbal stimulus (auditory) is given such as “thunderstorm,” the transposition in terms of visual can be leaves on the branches of a tree swaying in the wind and in terms of taste, popcorns exploding in the mouth (the TR activities are explained in detail in Appendix A).

The Thinking Creatively with Sounds and Words (TCSW) test battery, (Khatena & Torrance, 1973, 1981, 1998b; Torrance et al., 1973, 1990) used in this study is mainly based on the strategy of transposition as “the logic of the tests hinges upon the operation of the creative imagination to affect a breakaway from the perceptual set of audio or audio-verbal stimuli to bring about the production of original responses” (Khatena & Torrance, 1998b, p. 1).

2.6.1.4 Analogy-Imagery (A-I)

Schaefer (1975) gave indirect support to Khatena’s creative thinking strategy of A-I when he said that “recognition of the importance of metaphorical thinking fits in with an associative theory of creativity” (p. 141). He further added that according to Koestler’s (1964) “biociative act”, “the moment of creative insight or inspiration occurs when one sees that an element hidden in one frame of reference belongs also to another frame of reference, its double membership thus revealing a relationship that can solve a problem or illuminate a point” (p. 141). Smith (1998) has also referred to the A-I strategy as a relationship-seeking strategy.
Metaphors or analogies are partial resemblance between two or more ideas, processes or objects and “what distinguishes creative from ordinary thinking is richness of metaphoric thinking …” (Brown, 2008, p. 374). While to Holyoak and Thagard (1995), analogy plays an important role in creative thinking, Daniels-McGhee and Davis (1994) believe that “mental imagery and creativity are intimately related” (p. 151). Thus, there seems to be a close connection between analogy and imagery. Davis (1992) and Khatena (2000) too have attested to this connection. According to Davis, analogical thinking can be used as a deliberate creativity technique with the purpose of combining reality with fantasy so as to produce idea combinations that can be original. Khatena concurred with Davis and further added that the use of Analogy-Imagery (A-I) is a thinking strategy that is considered one of the most outstanding and power-packed mechanisms of thought that can play a dynamic role in the creative process.

The elegant figures of speech such as the simile and the metaphor that are commonly used for the purposes of comparison are components of the larger term of analogy. A simile is a figure of speech in which two dissimilar things are compared explicitly using a specific word of likening such as “like” or “as”. For example, “His heart is like a stone”. But when we leave out the word of comparison and make an implicit suggestion or imply a likeness as, “He is stone-hearted”, we are making use of a metaphor. Similes and metaphors can provide vivid images of people, events and things. To Kogan (1983) when we use a metaphor, we call attention to a similarity between two seemingly dissimilar things and this to him suggests a process similar to divergent thinking.
Analogies in the form of metaphors, which are implied comparisons between two things, can help to make the strange familiar or the familiar strange as they provide a link between the known and the unknown. To Moore, McCann, & McCann (1985), when a problem-solving or decision-making cycle comes to a dead end because we cannot think of worthwhile conclusions, then looking for analogical or metaphorical relationships can bring about the needed breakthrough. The search for analogies can be started by comparing the problem faced with other similar problems. The synectics group (Gordon, 1961) has described analogies in terms of creative problem solving that can make the strange familiar and the familiar strange.

The synectics group has also categorized analogies as personal analogy, direct analogy, symbolic analogy, and fantasy analogy. All the above types of analogies make use of imagery and are also known as metaphorical mechanisms especially for making the familiar strange. For example, to describe oneself as wicked, one can say, “I am as wicked as a devil”. This is a personal analogy and it involves identifying oneself with the elements of a problem or imagining oneself to be the object with which one is working. To Lytton (1971) it also involves imagining one’s feelings and emotions if one were, say, a shoe-box or tool-box for which various uses is sought. In direct analogy, the pronoun “I” from the first example is removed and replaced with “He” or “Paul” as in, “Paul is as wicked as a devil”. Khatena (2000) has reminded us that “like personal analogy, direct analogy finds a relationship between two unlike phenomena, but without self-involvement” (p. 112).

In direct analogy, fact, knowledge or technology from one domain is used in another. Alexander Bell’s perception of the human ear led to the
invention of the telephone and the human eye helped in the invention of the camera. These are examples of direct analogy.

If a symbolic analogy is used, the earlier sentence can be modified to, “Paul is the devil of the family”. In symbolic analogy, objective and impersonal images are used to describe the problem at hand. To Lytton (1971), symbolic analogy consists of restating in verbal-symbolic form the meaning of pertinent and crucial words. For example, “target” can be re-interpreted as “focused desire”.

Fantasy analogy involves wish fulfilment of the ideal though it may be a fantastic or a far-fetched solution to a problem. The object or subject of comparison is imaginary as in, “Paul is the Biblical Satan himself”. When a person uses a fantasy strategy, he thinks of states in which there are no reality constraints (Dominowski, 1995).

Strong mental images are used when analogies are created. Thinking by analogy and imagery can be facilitated by various incubation techniques that sever the dominance of the left-cerebral hemisphere and allow right-cerebral hemisphere activity. Analogical or metaphorical thinking fuels the creative process. Being able to see analogies is the very essence of the creative act (Koestler, 1975) and the use of analogy is crucial to creative thinking, both in the sciences and in the arts (Boden, 1990). Since creating analogies is a powerful mechanism of thought, research from the 1980’s focused attention on analogy as being crucial to the creative process (Khatena, 2000). (The A-I activities are explained in detail in Appendix A).

2.6.2 Factors
The objectives of this study are three-pronged. Firstly, to investigate if the subjects in the experimental and control groups experience any gain in their creativity as measured by the Thinking Creatively with Sounds and Words (TCSW) posttest scores. Secondly, to ascertain if the subjects in the experimental and control groups, identified as high creatives, low creatives, males, females, science and arts, experience any gain in their creativity as measured by the Thinking Creatively with Sounds and Words (TCSW) posttest scores. Thirdly, to investigate if the subjects in the experimental and control groups experience any gain in their creativity as measured by the Using Modality and Imagery in Writing (UMIW) delayed posttest scores.

In this study the independent or predictor variable is creativity training and the control variables or factors are creative ability level (high creative & low creative), gender category (male & female), and academic stream (science & arts). Since according to Torrance (1971b) creativity is a skill that can be trained, the creative performance of the experimental subjects as a whole; the creative performance of the high creative, low creative, male, female, science and arts, experimental subjects should improve as a result of creativity training. However, this may not be so and this is because studies that looked into the performance of high and low creatives, male and female subjects as well as science and arts subjects have not produced consistent results. The disparity in the findings of the studies concerned provides the rationale for investigating the performance of high and low creatives, males and females as well as science and arts subjects in this study that focuses on creativity training (the related studies are discussed in Chapter Three, 3.6).

2.6.3 Instruments
There are many measuring instruments whose psychometric and practical considerations have been taken into account (Khatena, 1982b) and among them are two of the instruments to be utilized in this study that are published tests. They are firstly, Something About Myself (SAM) a sub-measure in the Khatena Torrance Creative Perception Inventory (KTCPI), (Khatena & Torrance, 1976, 1990, 1998a). Secondly, Thinking Creatively with Sounds and Words (TCSW) test battery which is made up of two sub-measures: Sounds and Images (S&I) and Onomatopoeia and Images (O&I), (Khatena & Torrance, 1973, 1981, 1998b; Torrance et al., 1973, 1990). The third instrument to be used in this study is the Using Modality and Imagery in Writing (UMIW) which is a checklist. The UMIW was modelled on some studies (Khatena, 1976c, 1979, 1983; Khatena & Bellarosa, 1979; Khatena & Parks, 1987) and pilot tested by the researcher.

The SAM inventory will be used to differentiate the subjects in the study into high creatives and low creatives. The TCSW test battery, a dependent variable, will be used as pretest (before the experiment) and posttest (a day after the experiment) to measure originality gains. The TCSW is an auditory divergent thinking test of verbal originality. Cramond (1994) has informed us that many researchers have used divergent thinking tests as outcome measures for evaluating creativity training programmes. The UMIW checklist, a dependent variable, will be used as pretest (before the experiment) and delayed posttest (two weeks after the experiment), to determine if the creativity strategies learned through the KTM can be retained by the subjects after a period of two weeks as assessed by their written compositions (the validity and reliability of the instruments of SAM & TCSW according to their instructional manuals are discussed in Chapter Three, 3.5 and the criterion-related validity of
SAM, TCSW, and UMIW, as well as the test-retest and interscorer reliabilities of UMIW in the local context are discussed in Chapter Four, 4.4).

2.7 Justification for the Dimension of Originality

In this study, the Khatena Training Method (KTM) by Khatena (1978c, 1992, 2000), appraised as one of the creativity training programmes that is most convincing in terms of empirical evidence (Mansfield et al., 1978) and one of the fifteen types of popular creativity training programmes classified by Ma (2006) in his meta-analytic study, focuses on the originality of thought. Also in this study, the Thinking Creatively with Sounds and Words (TCSW) test battery (Khatena & Torrance, 1973, 1981, 1998b; Torrance et al., 1973, 1990) which is acknowledged as one of the six popularly used measures of creativity, “seems to have the most potential … to stimulate originality under free associative conditions” (Cooper, 1991, p. 200). Creativity tests are generally concerned with originality or novelty (Rothenberg & Sobel, 1980).

The KTM and the TSCW place emphasis on the originality of thought which is the objective of this study. They are both in synch with Khatena’s (1979) Creativity Imagination Imagery (CII) model that supports this study. Creativity and imagination are so strongly related (Moran, Sawyers, Fu, & Milgram, 1988), that to Mellou (1996), “the main criterion common to both creativity and imagination, has been considered by investigators to be newness or originality” (p. 134). Originality is often the most frequently mentioned attribute of the cognitive component, even by teachers (Lee & Seo, 2006; Spiel & von Korff, 1998).

There are many dimensions of creativity (Daniels-McGhee & Davis, 1994; Kearsley, 2005; Murdock & Keller-Mathers, 2002), but originality as a
factor of creative mental functioning has interested numerous thinkers and researchers (Aljughaiman & Mowrer-Reynolds, 2005; Bailin, 1994; Davidovitch & Milgram, 2006; Papworth & James, 2003; Runco et al., 2005; Saeki et al., 2001; Sternberg & Lubart; 1999; Torrance, 1995). This is because the less statistically frequent an idea, the more novel it is and the more novel an idea, the more likely it is to be creative. Originality was found to be a significant predictor of quality of creative achievement (Torrance, 2002, cited in Kim, 2006a). This is because more original ideas are interpreted as reflecting more productivity (Kerr & Gagliardi, 2005).

In Rose and Lin’s (1984) meta-analytic study (cited in Scott et al., 2004b), 46 creativity training programmes were evaluated. The aim was to determine the effects of creativity training in connection with divergent thinking test scores. It was discovered that there was a large effect for the dimension of originality. In a recent study by Garaigordobil (2006), the “results of the analyses of variance suggest a positive effect of the intervention, as the experimental participants significantly increased their verbal creativity (originality) …” (p. 329). The studies mentioned give us the assurance that even after a span of 20 years, the dimension of originality, acknowledged as the ability to produce novel, unique, and appropriate responses and solutions in response to a task, is still considered as an indication of the demonstration of creativity (Parkhurst, 1999; Shaw & DeMers, 1986). Thus, it is not surprising when the dimension of originality is often referred to as the central element, key factor or primary determinant in creative behaviour (Dollinger, 2003; Khatena, 2000; Mayer, 1999; Torrance & Goff, 1989).

Some researchers have even gone to the extent of saying with conviction that creativity and originality are synonymous (Altsech, 1995; McLaughlin,
1993; Runco & Vega, 1990; Sternberg, 2006), for “without originality, there is no creativity” (Runco et al., 2005, p. 138). The implication here is that without the other dimensions of creativity such as fluency, flexibility, and elaboration, there can still be creativity. The International Encyclopaedia of the Social and Behavioural Sciences (2001) gives credence to all that has been said about originality by the researchers mentioned above for “originality is after all, the most widely accepted dimension of creativity. Creative things are always original” (pp. 2893-2894).

Over the years, the fall from grace of the dimensions of fluency, flexibility, and elaboration has given further credence to the indisputable importance of the dimension of originality as a measure of creativity. According to Cramond, Matthews-Morgan, Bandalos, & Zuo (2005), Torrance (1966, 1974) himself who had designed the Torrance Test of Creative Thinking (TTCT), which is acknowledged as the most popularly used creativity measure, became dissatisfied with the existing scoring criteria that focused on the dimensions of creativity namely, fluency, flexibility, elaboration, and originality. Thus, for the verbal tests, Torrance (1974) simplified the scoring to include only fluency, flexibility, and originality. This was because of the problem of getting inter-rater reliability for untrained scorers on the dimension of elaboration. Also in a couple of studies, elaboration was not given due attention. In the study by Besemer and O’Quin (1986), it was found that the elaboration and synthesis items did not always yield a separate dimension but often loaded either on the novelty (originality) or resolution (logic) dimensions. Studies by Hargreaves and Bolton (1972) and Wallach (1970), (cited in Shaw & DeMers, 1986), utilized only the scores for fluency, flexibility and originality because to them “elaboration is not an important indicator of creativity as used
in the Torrance battery” (p. 66). In a recent meta-analytic study (Ma, 2006) that synthesized the effect of creativity training, it was revealed “that the originality of divergent thinking had the largest effect size, whereas elaboration had the smallest effect size” (p. 443). Besides, with regards to the connection between the dimension of elaboration and logic, it has been said that “similarities may be seen between Guilford’s step of elaboration and Wallas’ fourth step of verification” (Councill, 1988, p. 129). This is to say that the tedious process of elaborating, developing or refining ideas is more for the purpose of confirmation and fulfillment and is only useful after the inspiration or illumination has occurred. The illumination aspect suggested by Wallas (1926) meets the criterion of novelty or originality in the creative process (Ebert, 1994). In this study, the KTM treatment and the TCSW test battery encourage the illumination of ideas.

After Torrance had eliminated the dimension of elaboration from the verbal tests, he turned his attention to the figural tests. Due to the high correlation between flexibility and fluency scores, Torrance and Ball (1984) designed the streamlined scoring system that removed flexibility from the scoring. Hebert, Cramond, Neumeister, Miller, and Silvian (2002), (cited in Kim, 2006a) have confirmed the removal of the measure of flexibility from the Torrance Tests of Creative Thinking, due to its high correlation with fluency. Also in the study by Johns and Morse (1997), it was said that “the nonsignificant results of ratio score measures suggest that fluency measures confounded the traditional flexibility measures” (p. 163). Flexibility was also a problem in the study undertaken by Runco and Okuda (1988). Their purpose was to test the relation between originality and flexibility. Though “they expected originality and flexibility to be particularly strongly related … the
results indicated that flexibility and originality were unrelated” (cited in Runco et al., 2005, p.139).

There have been problems too with the dimension of fluency which serves as a quantitative measure of creativity while originality serves as a qualitative measure of creativity (Haley, 1984; Shaw & DeMers, 1986). However, originality is more important than fluency (Runco & Charles, 1993), (cited in Plucker, Runco, & Lim, 2006). Due to the significant correlation between fluency and originality (Abernathy Tannehill, 1998, cited in Kim, 2006b; Kim & Cramond, 2004), in statistical analysis, fluency and originality are often treated as independent measures although it has been determined that originality is a function of fluency (Moran et al., 1988; Torrance & Safter, 1999). Besides, researchers have found that while gains in originality are normal for those who receive creativity training, gains in fluency are often slight or even nonexistent (Ferguson, 1982). This perhaps depends on the aim of the study. The aim of this study is creativity training that focuses on the originality of thought.

The segregation or elimination of some of the dimensions of creativity by researchers as mentioned above tells us that generally, the dimensions can be viewed as independent constructs as far as creativity training programmes are concerned. Besides, Johns and Morse (1997) have informed us that “divergent thinking theory and research view fluency, flexibility, and originality as differential products of divergent thinking” (p. 158). Furthermore, Oral (2006) has reminded us that “scores on these dimensions represent different domains of creative or divergent thinking ability” (p. 67).

If there is still any misgiving from the view of validity, regarding the use of originality as the sole dimension of creativity in this study, Torrance (1974)
has assured us that it is not possible to specify the number and range of test tasks that are suitable and adequate for the assessment of creative potential. Besides, Feldhusen and Clinkenbeard (1986) have suggested that “one solution to the validity problem may be to use a ‘high-quality’ response score for divergent thinking tests, rather than the fluency, flexibility, originality and elaboration scores” (p. 177). They cited a study by Harrington, Block, and Block (1983), in which instead of fluency, flexibility, originality, and elaboration scores, “they used a composite ‘high quality’ response score taking into account both imagination and a realization of the constraints of the task; in other words, an original but still usable response” (p. 154). Other researchers (Chase, 1985; Treffinger, 1985; Kim & Cramond, 2004) have also brought to our attention that since the correlation coefficients among fluency, flexibility, and originality were usually high, the use of a single score would be advisable instead of resorting to three subscores. Thus, in this study, the creativity score is the originality score of the Thinking Creatively with Sounds and Words (TCSW) test battery.

The TCSW is an auditory test battery that comprises two sub-measures of Sounds and Images (S&I) and Onomatopoeia and images (O&I). “Both measures call for free association to produce original verbal images that are scored for originality … ” (Khatena, 2000, p. 49). The TCSW focuses only on verbal originality. This perhaps is because “verbal and figural creativity were not always highly correlated” (Dawson, D’Andrea, Affinito, & Westby, 1999), (cited in Lee & Seo, 2006, p. 238) especially in a number of quantitative meta-analytic studies (Bertrand, 2005; Huang, 2005; Miga, Burger, Hetland, & Winner, 2000, cited in Ma, 2006; Rose & Lin, 1984) that looked into the effectiveness of creativity training programmes. In the study by Rose and Lin (1984), it was found that creativity training resulted in positive effects on
creativity scores. However, the overall figural components of creativity did not show as much improvement as the verbal components of creativity (cited in Huang, 2005). Similarly, in the review undertaken by Bertrand (2005), it was reported that creative ability can be enhanced through training but there was more improvement in the verbal components as opposed to the figural components. The above studies suggest that the strength of creativity training programmes appears to lie in the verbal components of creativity. Thus, in this experimental study though the students will be trained in both the verbal and figural components, the focus of testing will be on the verbal components as the TCSW test battery is an auditory-verbal measure of originality.

Apart from the TCSW, which will be used as pretest and posttest, the creative inventory of Something About Myself (SAM) will be used to differentiate the high and low creative subjects in this study. The Using Modality and Imagery in Writing (UMIW) checklist will be used as pretest and delayed posttest to assess the use of sense modality and imagery in the written component. This is to determine if transfer of learning can take place after a period of two weeks. The SAM inventory and the UMIW checklist are in synch with the TCSW test battery. SAM focuses on the verbal component and the UMIW which checks for original use of sense modality and imagery focuses on the verbal component as well.

The testing (TCSW), rating (SAM), and checking (UMIW) measures chosen for this study should be adequate to assess creative behaviour for Johnson and Fishkin (1999) as well as Kim (2006a) have recommended a minimum of two measures to evaluate creativity potential.

2.8 Original Contribution of this Study
The aim of this study is to ascertain if the creativity of the Form Four subjects in the experimental group can be positively enhanced through the creativity training programme, named the Khatena Training Method (KTM).

To the knowledge of the researcher, in studies that used the Khatena Training Method (KTM) to enhance the creative thinking abilities of the subjects involved, the subjects were mainly pretested and posttested or only posttested via the Thinking creatively with Sounds and Words (TCSW) test battery, after the KTM treatment. However, so far there has been no effort made in the United States or elsewhere to determine if the creativity strategies learnt through the KTM can be retained by the subjects after a period of two weeks as assessed by their written compositions. Thus, though the researcher’s aim is to investigate if the KTM is a viable creativity training programme that could be used to enhance the creative thinking abilities of Form Four students in a typical secondary school in the state of Selangor, one of the objectives of this study is to determine if the KTM could help promote retention and transfer of the creative effects to other areas of intellectual functioning such as in writing (via composition writing).

One of the reasons for the selection of the writing component to be tested through the UMIW checklist (pretest & delayed posttest) is because Torrance (1962) observed that training in the skills of creative thinking usually transferred to creative writing. Khatena (2000) too believes that if students are taught and motivated to make use of analogies in their writing activities in school, “their writing can then be checked for factual information to be enriched by analogies. In this way, writing can become full and vital because what was once black and white is now in color” (p. 127). Another reason is that “the use of language is perhaps the most common creative act that all humans possess and exhibit …
[and] writing is one of our more creative abilities …” (Gay, 2006, pp. 4-5). The quotation indirectly sums up the importance of fostering creative thinking skills in the language classroom especially through the written component. Kaufman, Baer, Cole, and Sexton (2008) agreed with Gay’s view when they said that, “Reform efforts in school standards are showing a renewed interest in Literature and creative writing” (p. 172).

Creative writing enriches a language and open-ended assignments encourage students to take risks and tolerate ambiguities besides stimulating imagination, enhancing curiosity, and increasing awareness of the world (Bigler, 1980). Other researchers (Amabile, 1996; Niu & Sternberg, 2002; Russo, 2004) too have informed us that apart from using conventional divergent-thinking tests, heuristic tasks or performance-based assessments such as writing short essays can correspond more closely to those of real-life creativity. Such product-oriented tasks can be regarded as valid and adequate in an experiment that involves the measurement of creativity (Joy, 2005; Khatena, 1989; Mansfield et al., 1978; Sternberg & Lubart, 1995). To Joy (2008), both a divergent production approach and expert judgement proved to be closely related” (p. 274).

In this study, the subjects in the experimental and control groups will be involved in two pretests, a posttest, and a delayed posttest. Initially, subjects in the experimental and control groups will be pretested (via the TCSW test battery, Forms 1A of S&I and O&I, and the UMIW checklist) before the commencement of creativity training. Creativity training, via the Khatena Training Method (KTM) treatment will be given only to the subjects in the experimental group. Then a day after the completion of creativity training (2 days, 4 hours each day), all the subjects in the experimental and control groups
will be posttested (via the TCSW test battery, Forms 1B of S&I and O&I). After a period of 2 weeks, all the subjects in the experimental and control groups will be involved in the UMIW delayed posttest. The delayed posttest will determine if there is a positive educational transfer effect as a result of the KTM treatment. For the UMIW pretest and the UMIW delayed posttest, the subjects will be asked to write an open-ended composition on the same topic (… it was only a dream). The subjects will be given the option to write their compositions in English or Bahasa Malaysia, the National language. Their composition will be assessed with the UMIW checklist for the use of modality and imagery.

The assessment of the writing component will be based on two of the creative thinking strategies used in the Khatena Training Method (KTM), namely, transposition (use of sense modalities) and analogy-imagery (use of creative imagery) which are inter-linked. To Shaw and DeMers (1986) “the link between originality and imagery processes should be tested in other ways, including the use of real-life situations, rather than paper-and-pencil tests” (p. 73). The assessment checklist (please refer to Appendix D) designed by the researcher is named as Using Modality and Imagery in Writing (UMIW). The UMIW assesses a real-life classroom situation where students are routinely asked to write descriptive accounts or stories during their language lessons. Campos and Gonzalez (1993) have encouraged researchers to study the relationship between imagery and creativity as well as to use new and different tests and designs to measure imagery and creativity objectively.

The UMIW, an objective measure of assessing creativity, takes into consideration the sense modality types and creative analogy types that were used in a number of experimental studies (Khatena, 1972e, 1973e, 1976a, 1976c, 1978a; 1979; Khatena & Bellarosa, 1979; Khatena & Parks, 1987;
Sajjadi-Bafghi & Khatena, 1985). For the sense modality types, the researchers resorted to the Betts Scale (Sheehan, 1967) where images were analyzed singly or in combination of the seven sense modality categories: visual, auditory, kinesthetic, olfactory, gustatory, cutaneous, organic. Campos and Gonzalez (1994) too have informed us that the Betts Scale involves seven sensory modalities. For the creative analogy types, the researchers used Gordon’s (1961) categorization of direct, personal, fantasy, and symbolic, analogies.

In this study, the use of sense modality and creative analogy types by the subjects will be analyzed from their written compositions unlike the studies mentioned above where responses that were analyzed for originality were from the Thinking Creatively with Sounds and Words test battery which can be used as a testing measure or training strategy. In this study, the subjects’ written compositions will be judged for verbal originality which will be the combined UMIW score obtained for the use of different sense modalities and different creative analogies (the UMIW checklist and assessment of composition writing is discussed further in Chapter Four, 4.33).

According to Jampole et al. (1994), there is a strong connection between mental imagery and sensory modality. This is because “students make mental images of previously stored knowledge and/or current sensory information in response to a learning event” (p. 1). It is in this way that learning becomes a process of retrieving, associating, combining, synthesizing, and restructuring ideas in a novel or original way (Khatena, 1977; Long & Hiebert, 1985). To Khatena (2000), anyone who has not only learned to think in analogies but uses such strategies consciously has an excellent chance of being creative and innovative (studies on sense modality and creative imagery are discussed in Chapter Three, 3.4.7).
2.9 Scope and Assumptions of the Study

This study is based on the randomized groups, pretest-posttest design (Ary, Jacobs, & Razavieh, 1972). Initially all the Form Four classes in the science and arts academic streams, in a typical grade A, urban secondary school, in the district of Petaling from the state of Selangor, will be involved.

Firstly, the subjects’ creative potential will be assessed by Something About Myself (SAM), (please refer to Appendix B for details on SAM) a sub-measure from the Khatena Torrance Creative Perception Inventory (KTCPI), (Khatena & Torrance, 1976, 1990, 1998a). SAM will be conducted in a day. The selection of the subjects for the experiment will be based on the extreme scores of SAM, according to whether they are in the category of high creatives (75th percentile) or low creatives (25th percentile). Then the selected subjects, who have been identified as high creatives and low creatives, from the science stream and from the arts stream will be assigned randomly (stratified random sampling) to the experimental group or to the control group. The experimental and control groups will have more or less equal numbers of male and female students. Thus, the purpose of SAM is to differentiate the science and arts students into high creatives and low creatives before assigning them randomly in equal numbers of males and females to the experimental and control groups.

Secondly, creativity training will be carried out using the Khatena Training Method (KTM), (please refer to Appendix A for details on the KTM). The KTM will utilize the creativity training strategies suggested by Khatena (1978c, 1992, 2000) in his books. They are Breaking Away from the Obvious and Commonplace (BAOC), Synthesis-Destructuring-Restructuring (S-D-R), Transposition (TR), and Analogy-Imagery (A-I). The training will be conducted
in English and Bahasa Malaysia will be used if and when necessary especially for giving instructions. The training will be conducted in two days (four hours each day, that is, two hours before recess and two hours after recess). The primary concern of this study is to determine if the Khatena Training Method (KTM) is effective in enhancing the creativity of the subjects in the experimental group. Besides, it is also an initial evaluation of the KTM in the local context.

Thirdly, creativity (gains in verbal originality) will be measured by the Thinking Creatively with Sounds and Words (TCSW) test battery (Khatena & Torrance, 1973, 1981, 1998b; Torrance et al., 1973, 1990) comprising two sub-tests, namely, Sounds and Images (S&I), Forms 1A and 1B; and Onomatopoeia and Images (O&I), Forms 1A and 1B (please refer to Appendix C for details on the TCSW). These are auditory tests of verbal originality that will be used as pretest (Forms 1A) and posttest (Forms 1B).

Fourthly, a checklist designed by the researcher and named as Using Modality and Imagery in Writing (UMIW) will be used as pretest and delayed posttest (after two weeks) to determine if any educational transfer effect had taken place (please refer to Appendix D for details on the UMIW).

Apart from the above mentioned instruments of SAM, TCSW (S&I & O&I) and UMIW, the subjects will not be assessed by any other divergent thinking tests, personality inventories, self-ratings, or ratings by others.

This study is based on a number of assumptions. Firstly, the concept of creativity is universal and often referred to as divergent thinking (Guilford, 1984). Secondly, an abstract construct such as creativity can be measured by divergent thinking tests (Guilford, 1967; Khatena, 1992; Niu & Sternberg, 2002; Torrance, 1998) and the subjects’ responses to the items in the creativity tests
will reflect their creativity (Khatena, 2000). Thirdly, the creativity instruments used to assess creative thinking abilities will measure these capacities as validity and reliability of the instruments have been determined (Khatena & Torrance, 1998b).

2.10 Operational Definitions

The operational definitions listed below define concepts and constructs in terms of the operations or processes that are used to explain or measure them in this study.

1. Creativity

Creativity in this study is defined as the ability to perform divergent thinking tasks required on tests of verbal originality as measured by the Thinking Creatively with Sounds and Words (TSCW), comprising sub-measures of Sounds and Images (S&I) and Onomatopoeia and Images (O&I), (Khatena & Torrance, 1998b).

2. Divergent Production

Divergent production refers to the specific thinking ability of originality as proposed by Guilford (1967) in his Structure of Intellect model that can be demonstrated verbally (semantically) or non-verbally (figurally).

3. Originality

Originality is the ability to produce extraordinary, remote or clever ideas. It is the ability to think in a unique and transformational manner and to generate dramatic ideas using words or figures in response to a task involving creative imagination. Khatena and Torrance (1998b) have defined originality as “the power of the imagination to break away from
perceptual set so as to restructure or structure anew ideas, thoughts, and feelings into novel and meaningful associative bonds” (p. 44).

4. Creative Imagination

Creative imagination is the chemistry of mental processing in which interactive, intellectual (cognitive), and emotive (affective) forces participate to stimulate, energize, and propagate the creative act (Khatena, 1984).

5. Creative Imagery

Creative imagery is the image or mental picture organised in some kind of pattern that makes some sense of the world for the image-maker (Khatena, 2000).

6. Creative Thinking Ability

Creative thinking ability is an innate ability that some people naturally possess in greater abundance than others (Rose & Lin, 1984).

7. Creative Thinking Skill

Creative thinking skill is a specific thinking strategy that can be developed through multifarious teaching methods (Rose & Lin, 1984).

8. Creativity Training

Creativity training refers to the adapted Khatena Training Method (KTM) treatment (approved by Professor Emeritus Dr Joe Khatena) using creativity strategies (Khatena, 1978c, 1992, 2000) namely: Breaking Away from the Obvious and Commonplace (BAOC); Synthesis - Destructuring - Restructuring (S-D-R); Transposition (TR);
Analogy and Imagery (A-I).

9. Creativity Testing

Creativity testing refers to the Thinking Creatively with Sounds and Words (TCSW) test battery (Khatena & Torrance, 1973, 1981, 1998b; Torrance et al., 1973, 1990) which is a measure of originality. The TCSW for children and adolescents comprises the following submeasures:

Sounds and Images (S&I – Forms 1A & 1B);
Onomatopoeia and Images (O&I – Forms 1A & 1B).

10. Delayed Posttest

Delayed posttest refers to the Using Modality and Imagery in Writing (UMIW) checklist used to assess the subjects’ written compositions, two weeks after the end of the KTM treatment. The UMIW was modelled on Khatena’s scoring procedures (Khatena, 1976c, 1983) and pilot tested.

2.11 Justification for the Study

A review of the studies done on creativity in Malaysia has shown that creativity research is still in its infancy. Of the limited research carried out by researchers in the University of Malaya in fulfilment of the requirements for their higher degrees (Chan, 1986; Chia, 1997; Gan, 1998; Govindasamy, 2004; Joseph, 1998; Kalaniappan, 1998; Palaniappan, 1989, 1994; Radiah, 1996; Siti Rafiah, 2007; Tan, 1992; Yong, 1986; Zarrin, 2003), only Chia’s study (1997) focused on creativity training involving teacher trainees.

Research studies and reviews on creativity in countries such as in the United States of America (Childs, 2003; Cropley, 1997; Joy, 2005, 2008; Mumford, Baughman, & Sager, 2003; Nickerson, 1999; Puccio, 1994; Scott et
Studies carried out by researchers (Blissett, 1994; Khatena, 1970c, 1971b, 1971h, 1972e, 1973a, 1973c, 1975c; Khatena & Barbour, 1972; Khatena & Dickerson, 1973; Khatena & Parnes, 1974; Sikka, 1991) using the Khatena Training Method generally provided evidence that creativity can be deliberately increased. In Malaysia, Chia’s (1997) research on the effectiveness of the Creative Problem Solving (CPS) program was carried out on teacher trainees. She has shown us that the CPS program is a viable creativity training programme for adults. However, there has been no attempt to test the effectiveness of a creativity training programme on school students in Malaysia.

As the world progresses at a tremendous speed, there is greater urgency to understand more about creativity and its impact on educational pursuits. Besides, in view of the dearth of creativity training programmes in Malaysia and the positive results of creativity training in the field of education especially in other countries like the United States, there is a compelling need for this study. This study is timely as it will add to the limited literature on creativity studies done in Malaysia so far. It will also provide credible information on the effectiveness of creativity training of students. To date, there is no data in the area of creativity training and testing of Malaysian students. Thus, this study can provide pertinent information on the feasibility and viability of creativity training of students. Teaching and training methods are in need of scientific
investigation so that our ways of doing things will be based upon empirical evidence.

This present study which focuses on creativity training is different from Chia’s study in certain respects. Firstly, unlike her experimental study that focused on critical and creative thinking, this study focuses only on creative thinking. Secondly, unlike Chia’s study that focused on female teacher trainees, this study focuses on male and female Form Four students from the science and arts streams. Thirdly, unlike the earlier study that investigated the effectiveness of an adapted Osborn-Parnes, Creative Problem Solving (CPS) method, using the Torrance Test of Creative Thinking (TTCT) which is a verbal-figural test battery, this study intends testing the efficacy of the adapted Khatena Training Method (KTM), utilizing the Thinking Creatively with Sounds and Words (TCSW) which is an auditory-verbal test battery. Finally, unlike Chia’s study that took ten days and over a month to complete, this study will take 7 days (one day of screening, two days of training and four days of testing) and over four weeks to complete.

The results of Chia’s study showed that the CPS programme was effective in enhancing the creativity of the teacher trainees. It is important to enhance the creativity of teachers especially teacher trainees so that they will be able to teach their students in a creative manner right from the beginning of their teaching career and thereby indirectly foster the creativity of their students. However, it would definitely be better and wiser to foster creative thinking skills directly among students. Thus, this study aims to test the effectiveness of the KTM in enhancing the creative thinking abilities of Form Four students in a typical school in the state of Selangor.
Gan (1998), who examined the nature of creativity and creative perception among female undergraduates, used Thinking Creatively with Sounds and Words (TCSW), a creativity instrument comprising two measures, namely, Sound and Images (S&I) and Onomatopoeia and Images (O&I). The TCSW is an instrument that measures verbal originality through auditory-verbal stimuli. This present study also utilizes the TCSW and its measures of S&I and O&I but it uses both Forms 1A and 1B (suitable for children and adolescents), tests both females and males and is used in the school context, unlike the study by Gan that used only Form 2A (suitable for adults) and tested only female undergraduates. Gan found that Form 2A is a suitable creativity measure for adults. Thus, it would be interesting to see if Forms 1A and 1B are suitable creativity measures for adolescents. Gan’s study discovered that the research sample has significantly lower verbal originality scores than the norms of American students of similar educational background. She suggested training in creative thinking to increase verbal originality. So, it would be interesting to see if the verbal originality scores of the research sample in this study could be increased as a result of creativity training.

Chan (1986), Palaniappan (1989), and Yong (1986) who can be considered the pioneers in creativity research in the Malaysian educational context made a clarion call for more research on creativity. Their call was heeded and more creativity research was carried out from the 1990’s to ascertain the relationship between creativity and relevant variables. Though from 1990 and into the new millennium, research in the field of creativity was more diverse in terms of subjects and topics, there has been no research done to investigate the effectiveness of a creativity training programme that could enhance the creativity of Malaysian students so far.
Prominent researchers (Fleith, 2002; Harnad, 2006; Khatena, 2000; Meeker, 1980; Milgram, 1990; Runco, 2006; Sternberg, 2006; Torrance, 2000) in the field of creativity have reminded us that there is no logical reason that creative skills and abilities cannot be fostered in students through training. Researchers (Bertrand, 2005; Huang, 2005; Ma, 2006; Meador et al., 1999; Rose & Lin, 1984; Scope, 1998; Scott et al., 2004a, 2004b) who carried out meta-analytic studies on the effectiveness of creativity training have shown us that creativity can be improved by utilizing suitable training programmes. This is because “all the approaches share a common premise that training, practice, and encouragement in using creative thinking skills can increase the degree of creativity manifested by individuals” (Rose & Lin, 1984, p. 11). Creativity can be fostered because everyone is blessed with creative potential and creative abilities are continuously distributed in normal people (Gute et al., 2008; Huang, 2005).

2.12 Significance of the Study

This experimental study is expected to provide data on the creative thinking abilities of the subjects before and after the Khatena Training Method (KTM) treatment as measured by the Thinking Creatively with Sounds and Words (TCSW) test battery. The study will reveal if the empirically tested KTM is an adequate creativity training programme that can be used with confidence to enhance the creative thinking abilities of Form Four students. In the secondary school curriculum there is provision for creative thinking skills to be developed among students but in practice, inadequate attention has been paid to it (JNSP, 1992, 1995; Zarrin, 2003). The following are some benefits to be derived from empirically tested creativity training programmes such as the KTM.
Firstly, students will not be deprived of the opportunity of having their creative potential enhanced systematically through training and testing. This can help them to be balanced individuals where knowledge and creativity are concerned. Generally, schools in Malaysia tend to emphasize the attainment of knowledge (Joseph, 1998; Zarrin, 2003). However, De Bono (1993) is of the opinion that students who leave school with knowledge of various learning subjects will soon find such knowledge inadequate because knowledge gained can soon become obsolete (Strom & Strom, 2002). But thinking skills especially creative thinking skills will stand them in good stead in the future for their own good and for the good of the country. According to the Progressive Policy Institute (2002) in the United States, more than any other quality, creativity has left an indelible mark on cultures worldwide as it is the very heart of a knowledge based age. Thus, we should focus on teaching students thinking skills especially creative thinking skills, rather than just dishing out knowledge. Thinking skills can aid them immensely to gain new knowledge on their own in the future. In an informational age, information can be acquired in a split-second but thinking skills need time to nurture. It has been said that creativity involves the passage of time for outstanding creative thought is the product of years of learning and preparation (Mau, 1997; Weisberg, 1993, cited in Jalongo, 2006).

Secondly, school teachers and principals can be provided with instructional tools to train and to test the creativity thinking skills of their students especially outside school hours allocated for academic subjects. In this way students will be well-grounded in creative thinking skills by the time they leave school. Training and testing can also be for the purposes of determining creative potential, screening creative talent, and identifying gifted children (Kim, 2006a). Providing school teachers and principals with creativity training
programmes like the Khatena Training Method (KTM) can also help them to better understand creativity techniques and strategies that they can perhaps experiment with in their daily classroom teaching. Aljughaiman and Mowrer-Reynolds (2005) and local researchers (Chia, 1997; Joseph, 1998; Zarrin, 2003) have said that teachers generally feel ill-prepared to foster creativity as they do not know much about creativity.

Thirdly, educators and administrators will be able to recommend creativity training programmes to interested parties, besides using the information gathered from the implementation of such programmes to further improve the school curricula where the aspect of creativity is concerned. Besides, findings from this study could enlighten educational authorities especially policy makers of the need to look at creativity training programmes in the right perspective. This can necessitate changes in the secondary school curriculum in keeping with our country’s National Philosophy of Education which aims to develop the full potential of each and every individual. It can also bring about changes in our teacher training institutions as there will be the need to further train teachers so that they can be in a position to understand more about creativity, learn more about how to teach creatively, and be confident of training students in creativity with the aim of fostering and enhancing their creative thinking talents and abilities.

Fourthly, creativity training programmes are a good way of providing students who possess high ability with an enriched environment (Dacey, 1989b). In this way we will be encouraging not only intellectual growth but also creative growth. Dacey has also informed us that creativity training programmes are useful for the identification of students low in creative ability and who do not know how to stretch their creative imagination. Thus, remedial classes can be
organized to help those who are deficient in imagination to strengthen their imaginative faculties which are essential for divergent thinking and problem solving.

Fifthly, to ensure that a creativity training programme is effective, testing of the subjects involved is paramount. Creativity assessment can then be used to advice and help students to make the right decisions in choosing educational areas to pursue and career paths to take that may require creativity thinking skills. Such information can help particularly school counsellors. Apart from assisting students in their educational and career goals, they can also use the information gained to better understand students who are underachievers, uncooperative, disruptive or who have other personal problems. This is because according to Torrance (1981), a creative child who is curious, artistic, and independent may not be well-rounded, may have few friends, and dislike the routine and rigid authoritarian classrooms. Davis and Rimm (1985, 1994) and Oliphant (1986) too believe that students who refuse to complete their homework or cooperate with their teachers and classmates may be more creatively inclined. Thus, the creativity potential of such students may not be developed by teachers who think they are just out to cause trouble (Kim, 2006a). In this regard, information about creativity and creativeness can greatly help school counsellors diagnose problems.

Sixthly, training and testing students for creativity can interest psychologists who are interested in developmental patterns of creativity (Dacey, 1989a). They may want to know what the normal growth and decline periods are like for different kinds of students. They may also be interested to know if there are peak periods that are conducive for creativity to be fostered. For instance, according to Torrance (1962), youths who are 16 to 18 years in age need outlets
for their emotional energy and it may perhaps be the best age for helping them to make full use of their imagination. Dacey (1989a) and Pickard (1990) too believe that adolescence may be a good time for creativity to be fostered. Thus, through creativity training and testing, an overall scenario of the development patterns of creativity in students can be attained. Besides, by measuring creative abilities or evaluating personality based dispositions for creative thinking, the data collected can be used for psychological and educational research with the intention of comparing or choosing creative children to participate in programmes for the gifted and talented (Davis, 1986). Gifted children can be defined as those who are high in creativity apart from being high in motivation (Renzulli, Reis, & Smith, 1981) and at least above average in intelligence (Silvia, 2008).

Seventhly, this study can lead to new problems and questions and thereby pave the way for further investigations in the diverse area of creativity. The results of new investigations can then be of further interest especially to those involved in education. Though the field of creativity is vast and complex, there are many areas that are researchable and testable as instruments are available.

Finally, it is felt that this experimental study seeking empirical evidence will not only bridge the gap but fill the void in the field of creativity training and testing of Malaysian secondary school students. Creativity is teachable and testable (Cunningham & MacGregor, 2008; Jalil, 2007; Runco, 1993; Sternberg, 2006) but a nation’s growth can be stunted if its people do not think in creative ways (Khatena, 2000; Williams, 2002).

2.13 Summary
In the Malaysian school system, creative thinking is encouraged. However, JNSP (1992, 1995) reports and local studies (Joseph, 1998, Zarrin, 2003) revealed that not enough emphasis had been given to the importance of fostering creativity among Malaysian students. Thus, measures need to be taken to put in place the right teaching and learning environment in order to enhance students’ creative thinking skills. One way to achieve this is through creativity training and testing which has not been carried out in Malaysia using established creativity training and testing methods. Researchers have generally been in agreement that the strategy best employed to improve creative performance is training (Black, 2006; Chen et al., 2005; Khatena, 2000; Niu & Sternberg, 2003) and we have been reminded that creative thinking is becoming a common purpose throughout the world (Strom & Strom, 2002).

This study intends to advance research in creativity training and testing of students, considering the lack of empirically tested creativity training programmes that can be used by educators to enhance the creative thinking abilities of their students. The creativity process model chosen for this study was the Creative Imagination Imagery (CII) model (Khatena, 1979), which is a synthesis of the thoughts on creativity by some prominent researchers, namely, Wallas (1926), Guilford (1967), and Vargiu (1977).

The CII model supports the Khatena Training Method (KTM), (Khatena, 1976c, 1992, 2000) to be used in this study which is a training programme that focuses on the creativity dimension of originality. The KTM has been acknowledged as one of the few effective creativity training programmes in the review by Mansfield, Busse, and Krepelka (1978) and in the meta-analytic study by Ma (2006). For this study, the KTM is based on four creative thinking strategies, namely, Breaking Away from the Obvious and commonplace
(BAOC), Synthesis-Destructuring-Restructuring S-D-R), Transposition (TR), and Analogy-Imagery (A-I).

The Thinking Creatively with Sounds and Words (TCSW) test battery is the main dependent variable. The TCSW and its sub-measures of Sounds and Images (S&I) and Onomatopoeia and Images (O&I), focus on the creativity dimension of verbal originality.

The aim of this experimental study is to investigate the effectiveness of the KTM in enhancing the creative thinking abilities of Form Four students in a typical secondary school in the state of Selangor.

CHAPTER THREE

Literature Review

3.0 Introduction

The United States of America has led the way in research on creativity from as early as the beginning of the twentieth century. Then from the 1950’s, the crusade for creativity was stepped up (Scope, 1998) as psychologists, sociologists, and educators among others began to research many aspects of creativity with greater vigour. Aspects such as creativity training, creativity testing, and issues linking creativity with variables like intelligence, academic achievement, gender, and socio-economic status were given greater attention. In Malaysia, in the educational context, research on creativity and its correlates started only in the 1980’s. The first three studies undertaken were by Chan (1986), Palaniappan (1989), and Yong (1986). Now after nearly 20 years, only a
handful of researchers have pursued research studies in this important and dynamic area of creativity.

This chapter gives an overview of education and creativity; training and creativity; training procedures and creativity; measurement and creativity; imagery, imagination, and creativity; and finally control variables and creativity. The above mentioned aspects are directly or indirectly connected to this study and as such they are pertinent and given due attention. The focus of this study is creativity training and testing in the educational context. The study intends to test the effectiveness of the Khatena Training Method in enhancing the creative thinking abilities of Form Four students in a typical secondary school.

3.1 Education and Creativity

The aim of education is to promote the overall or total development of all individuals so that they acquire appropriate knowledge, useful skills, and suitable kinds of attitudes for their own well-being and for the good of society. To Otto (1966), the main purpose of an educational institution is to provide a framework for the actualization of human potential.

Education is the unfolding of human potentialities and central to this is the concept of “thinking” which is a complex and multifaceted human activity (Khatena, 2000). Thus, refining and sharpening the process of thought should be given priority in formal education and should be a basic aim of teaching and learning in all disciplines. However, effective thinking has to be both creative and critical if we want to develop students to be independent thinkers during their school years so that thinking skills will benefit them long after formal schooling (Cramond, 2002).
Creative and critical thinking are both important but it is essential to teach children how to use creative thinking skills so that they can be prepared to cope better with the complexities and challenges of an uncertain future (Torrance, 1972a). Educating children in ways that foster creative development is in keeping with Fontana’s (1997) view of “education for being” (Jalongo, 2006). It means offering children, “the right to express their own feelings … to have their inner world of dreams and fantasies and imaginings taken seriously and to make their own engagement in life” (cited in Craft, 2000, p. 13). While we are assured that “… education can enhance creativity and giftedness because creative thinking … can be taught and learnt” (Li, 1996; cited in Jalongo, 2006 p. 5), we are also reminded that it is incumbent upon an educational system to provide children the opportunity for creative thought and expression as they have the right to have their creative potential and abilities affirmed and nurtured (Isenberg and Jalongo, 2001). To Torrance (1972a), creativity of the adult which can gain public acclaim and extend frontiers of knowledge is usually rooted in the early transformational activity of the young.

The views expressed by some of the prominent researchers in the field of creativity mentioned above especially Torrance, nudge our conscience and prod us to give serious attention to the deliberate development of creative behaviour and to enhance the creative thinking abilities of our students. Creative thinking skills can be taught as part and parcel of the academic curricula. They can also be taught in isolation or artificial situations through deliberate creativity training programmes (Scope, 1998). Thinking skills taught in isolation during the elementary years appear to have transferred to content-specific subject matter in the secondary years (Moon et al., 1994). Thus, in whatever situation or context,
creativity can be enhanced through training and practice (Wheatley, Anthony, & Maddox, 1991; Huang, 2005).

3.1.1 Teaching and Creativity

According to Schacter, Thum, and Zifkin (2006), researchers like Dacey and Lennon (1998) and Nickerson (1984) have over the years documented that developing the creativity of students has not been a priority with American teachers. This is because firstly, teachers are too achievement and examination-oriented and tend to over-emphasize the importance of “facts and memory”. Hence they give very little or no opportunities for their students to use their imagination in divergent ways (Berk, 1991, cited in Gay, 2006; Rea, 2001; Stanko, 2000). Secondly, teachers prefer to “raise problems that have one predetermined solution and students are rewarded for speed and accuracy with which they converge on the solution” (Renzulli & Callahan, 1975, p. 39). Such teachers deprive students of expressing their creativity by not providing enough opportunities to allow their students’ minds to range far and wide in search of possible solutions to a given problem. Thirdly, some teachers even go to the extent of deliberately suppressing the imaginative activities of children and stifling their creativity (Grigorenko & Sternberg, 1997; Parkhurst, 1999).

The behaviour of teachers in not promoting or even suppressing their students’ creativity could be because they have not been given sufficient training in creativity (Narramore, 1992). This view was supported by the investigations carried out by a number of researchers (Aljughaiman & Mowrer-Reynolds, 2005; Feldhusen & Treffinger, 1976; Fleith, 2000; Khatena, 1978c; Lee & Seo, 2006; Reid & McGuire, 1995; Tan, 2000). They revealed that
teachers had shown a general lack of understanding of the concept and nature of creativity and the characteristics of creative students.

The ignorance of teachers about creativity was also demonstrated in some elaborate studies. In the study conducted by Fryer and Collings (1991) that involved a thousand teachers in the United States, it was revealed that only about half the number of teachers regarded divergent thinking, which is the very essence of imagination, as an element in creative thought. Similarly, in the study by Lee and Seo (2006), 95.2% of the Korean teachers involved showed their lack of understanding of creativity. Other studies that were conducted (Freund & Holling, 2008; Fryer & Collings, 1991; Schack, 1993, cited in Walonick, 2006; Stoycheva, 1996; Welkener, 2000) have also revealed that teachers generally attest to the importance of fostering student creativity but they are not confident in doing so as they are not qualified to recognize and enhance creative behaviours.

A longitudinal study conducted by Torrance (1995) revealed that generally American school students were becoming less curious and less creative. So he undertook an elaborate study in 2000 to see if teachers from the United States and other countries were responsible for students’ lack of creativity. His study involved 1,000 teachers from the United States, India, Germany, Greece, and the Philippines. He gave the teachers the “ideal student checklist” comprising 62 characteristics that discriminate between persons of high and low creative ability. He found low correlations between the behaviours teachers wanted students to demonstrate and behaviours usually demonstrated by creative persons. The study exposed that the teachers preferred behaviours such as memorization and obedience from their students compared to
behaviours such as asking questions and taking risks that are generally associated with creative persons.

A couple of recent studies (Lee & Seo, 2006; Schacter et al., 2006) supported the findings of Torrance. It was discovered that the majority of teachers did not resort to teaching strategies that foster students’ creativity. Considering that the benefits of creative training are well established (Antonietti, 2000; Csikszentmihalyi, 1996; Fritz, 2002; Komarik & Brutenicova, 2003; Mumford & Simonton, 1997; Torrance, 1995), the above findings are rather disturbing. If this trend continues, students’ creative thinking abilities may be diminished instead of being enhanced.

In Malaysia, studies by Joseph (1998) and Zarrin (2003) that involved trained primary and secondary school teachers respectively, revealed similar results as the studies mentioned above. Zarrin’s (2003) study was on “the creative behaviour of English language teachers in a Malaysian secondary school” while Joseph’s (1998) study was on “the creative behaviour of English language teachers and classroom methodology” which was carried out in 20 primary schools in the state of Selangor. Thus, there is the need to increase teachers’ knowledge and skills in creative thinking so that they will be able to provide the psychological climate needed to foster the imagination and creativeness of the students under their charge. Besides, a more creative style of teaching and training that can capitalize on students’ interests and talents is urgently needed to meet the challenges of this global era. Researchers like Chan and Chan (1999) as well as Diakidoy and Kanari (1999) have strongly asserted that “any effort to facilitate creativity in education must take into account the role of teachers, because teachers are believed to play an important role in helping to develop the creative potential of students” (cited in Lee & Seo, 2006,
Thus teachers can and must prevent the marginalization of student creativity in classrooms (Fasko, 2001, cited in Beghetto, 2006).

3.1.2 Learning and creativity

“In educational terms, the question of creativity has become central to the very idea of learning …” (Osborne, 2005, p. 1) and “creativity as the expression of flexibility, diversity, and imaginative ways of thought is a central objective in educating the youngsters” (Carnegie Report, 1986, cited in Koren et al., 2005, p. 194). However, to Clapham and Schuster (1992), a number of researchers in the United States have expressed their concern over the lack of emphasis on creativity in the educational system. De Bono (1993) too has expressed similar sentiments when he said that though the governments of Singapore, Malaysia, Australia, and Canada are “beginning to do a little bit about the direct teaching of thinking as a skill, education does very little indeed about teaching creative thinking” (p. 2).

Meaningful learning is viewed as essentially creative (Caine & Caine, 1991, cited in Clemons, 2006) and to function creatively, children need learning environments that are suitable and supportive (Gute et al., 2008; Rea, 2001). Children who are actively engaged in learner-centred environments have scored higher in measures of creativity (Hyson, Hirsh-Pasek, & Rescorla, 1990; Rushton & Larkin, 2001). This is because “… all students have creative potential that can be identified and nurtured” (Selby et al., 2005, p. 300) in conducive environments. Other researchers (Black, 2006; Niu & Sternberg, 2002; Treffinger, Young, Selby, & Shephardson, 2002; Williams, 2002) share a similar view and they believe that creative productivity can be increased through training.
In view of what has been said about learning and creativity, schools and teachers need to create the kind of environment that can foster the deliberate development of creative abilities so that creativity can permeate all aspects of a child’s learning. Generally, the teachers’ main tasks are to pose meaningful and challenging problems, to ensure their students acquire knowledge necessary to solve those problems, and to encourage them to use their creative and imaginative powers. The students, on the other hand, have the responsibility for involving themselves actively, working together in a spirit of cooperation, and challenging their thinking faculties. Though teachers and students share responsibility for learning as both are agents of education, “the focus of creative teaching needs to be as much, if not more on the learner than it is on the teacher” (Jalongo, 2006, p.8).

Creative learning through training in creative thinking skills is important because it can help learners to be more effective problem solvers and decision makers and this may lead to important consequences in their lives (Treffinger, 1980). With creativity training, the greater will be their knowledge of creativity and the more they can manipulate, synthesize, and apply that knowledge by combining and rearranging facts into new thoughts, ideas, and solutions. To Guilford (1977), problem-solving and creative thinking are linked to creative learning (cited in Isaken & Parnes, 1985). Other researchers have a similar view (Slavkin, 2004; Starko, 1995; Torrance, 1970). To Torrance, learning creatively through creative and problem solving activities, requires such abilities as divergent production and evaluation. Starko believes in giving students opportunities to be creative by allowing them to find and solve problems as well as communicate ideas in novel ways. Slavkin too believes that students can benefit from creativity exercises that challenge their thinking faculties. Thus, it
can be said that educational research especially in the field of teaching and learning has made us aware of the fact that generally, people have a strong preference to learn in creative ways mainly through problem solving activities which are interesting, challenging, and motivating. We are reminded that to enhance creative abilities, tried and tested forms of teaching and training are needed (Robinson, 2001) and that “creative skill training…should be part of education at all levels, from primary schools to universities” (De Bono, 1993, p. 276).

3.2 Training and Creativity

Creativity training is the crux of this study and the independent variable of interest as the study intends to test the effectiveness of the adapted Khatena Training Method (KTM) in enhancing the creativity of Form Four students in a typical school in Selangor. In this study, the experimental group will be given the KTM treatment (they will be trained in creativity) and the control group will not be given the KTM treatment (they will be engaged in normal lessons). Thus, a discussion of creativity training or creativity development including creativity studies giving credence to the fact that creativity can be trained is pertinent.

3.2.1 The Importance of Creativity Development

Creativity is a capacity that can express itself in all areas of life for it is a specific way of thinking and behaving. Training for creativity can prepare us for a richer and more rewarding life. We are informed that there is a vast body of information on the nature of creativity, explaining how creativity can contribute to eminence and progress (Khatena, 1992).
Creative thinking is both an innate ability and a skill (Rose & Lin, 1984). The innate abilities can be stimulated and nourished (Guilford, 1967; Khatena, 2000) and the skills can be developed through creativity training (Khatena, 2000; Torrance, 1971a). Though there is disagreement among creativity theorists as to whether creative thinking can be taught, Garaigordobil (2006) has brought to our attention that many researchers (Antonietti, 2000; Fleith, Renzulli, & Westberg, 2002; Komarik & Brunetinova, 2003; Kurtzberg & Reale, 1999; Parker, 1998; Saxon, Treffinger, Young, & Wittig, 2003) who carried out recent research in deliberate methods for facilitating creative behaviour came to the conclusion that creative ability as measured by divergent thinking tests could be increased through training.

According to Nickerson (1999), though a number of different strategies have been used to encourage creativity over the years, the strategy most commonly resorted to in attempts to improve creative performance is training. Harnad (2006) agreed with him as he also believes that the best strategy one can utilize in order to optimize the likelihood of creativity is to maximize preparation and preparation is best done through training. Thus, creativity training programmes can help students actualize their creative potential and thereby close the gap that may exist between their creative potential and their creative productivity.

Creativity training programmes are generally successful because they provide the participants with metacognitive experiences, besides knowledge and strategies (Flavell, 1979, 1981). Metacognition is a person’s ability to think, monitor, and regulate his or her own thinking and. creative thinking can be looked at as a self-regulatory metacognitive process (Kitchener, 1983). Pesut (1990) has offered us a model of creativity self-regulatory metacognitive
process for he strongly believes that it is possible to “consciously invoke the use of creativity technologies in order to guide thinking and behaviour in an effort to generate creative associations that are useful to the development of a desired outcome” (p. 107). Bruch (1988) too has got us excited because to her a model of metacreativity that involves complex internal processes and encompasses cognitive, affective, and physical components can be a possibility. However, what is clear to us is that with creativity training, one’s knowledge concerning one’s own cognitive processes can be increased and the bottom line is that it is possible to teach and train people to think creatively and at the same time help them to monitor and regulate their thinking and behaviour especially during creative problem solving activities.

The length of creativity training programmes, whether they are of short duration (an hour, a day or a week) or carried on for a length of time (a month, a semester or more) does not seem to diminish the fact that creativity thinking skills can be taught successfully (Osburn & Mumford, 2006). Clapham and Schuster’s (1992) study on 56 volunteer engineering students that used a pretest-intervention-posttest design showed that divergent thinking skills could be increased after only a one-hour training session and after a one-week interval between training and posttesting. Blissett’s (1994) research was on creativity training and interpersonal problem-solving training. The administration of pretest measures, training techniques, and posttest measures, were all carried out in one day over a five-hour period with a lunch break of one-half hour. Her hypothesis that there would be a main effect for creativity training based on the Khatena Training Method (Khatena, 1970c) and a main effect for interpersonal problem-solving training (based on the Problem-Solving Therapy Model by Nezu, Nezu, & Perri, 1989) was supported. Kurtzberg and Reale’s (1999) study
used two heterogeneously grouped science classrooms of eighth graders in the same school. One group was trained in the problem-identification phase of the Future Problem Solving process while the other group was not. The experiment was carried out in a week and the result showed a significant difference \((p < .001)\) favouring the group that received the treatment. Other researchers (Ansburg & Dominowski, 2000; Cunningham & MacGregor, 2008) who conducted brief creativity training programmes also produced positive results.

In Malaysia, Chia’s (1997) study that used the Creative Problem Solving (CPS) program to train teacher trainees over a period of a month (total of ten hours) obtained impressive results. The creativity of the subjects in the experimental group was enhanced compared to the subjects in the comparison group. The results showed that the CPS program was effective in increasing the creativity of the teacher trainees via fluency and originality. According to some researchers (Chen et al., 2005; Cheung et al, 2006; Clapham, 1997; Greer & Levine, 1991; O’Hara & Sternberg, 2001; Thornbury, 1991), students who received creativity training in an experimental setting for one or two semesters, demonstrated higher creativity. According to Chia (1997), the CPS programmes that were carried out by Parnes and Meadow (1959) over a period of eight months and by Reese, Parnes, Treffinger, & Kaltsounis (1976) over a period of two years obtained significant results. The longitudinal analysis of students’ creativity scripts also produced positive results (Zampetakis et al., 2008). In this study, creativity testing and training will take seven days to complete. It is thought that a creativity training and testing programme that is relatively of short duration will appeal to educators especially teachers.

3.2.2 Brief History of Creativity Development
Creativity development has gone through various stages: hope and hunch stage, research-replication-report stage, widespread application stage (Parnes, 1967).

The hope and hunch stage started in the 1950’s especially after Guilford highlighted the importance of creativity in his inaugural presidential address in 1950. Researchers at first were interested in identifying creative individuals. The Institute for Personality Assessment and Research at the University of California initiated research on the nature of highly creative individuals (Barron, 1963). Then towards the latter half of the 1950’s, researchers shifted their concern to the conscious development of creative behaviour especially after it was realized that creative ability could be developed by deliberate programmes (Osborn, 1957).

The research-replication-report stage of the 1960’s saw a beehive of activity where creativity development was concerned. Osborn’s (1963) earlier writings on creativity, his book entitled “Applied Imagination”, and his Creative Education Foundation which helped to promote and develop creative ability, were to a great extent responsible for the sudden surge in creativity research. Creativity training procedures like brainstorming (Osborn, 1963) and synectics (Gordon, 1971) were popularly used. It was during this time that Guilford’s (1967) Structure of the Intellect model, especially the mental operation of divergent thinking, gave researchers the basis to train and test for creativity. Test materials for educational programmes began to be developed. The works of researchers from the University of Minnesota (Torrance, 1962, 1963, 1965), the University of Buffalo (Parnes, 1967) and the University of Georgia (Khatena, 1968, 1969b, 1969a) were widely acknowledged at this time and had given us evidence to prove that creative behaviour could be enhanced through
instructions, programmes and measures. Besides, the Journal of Creative Behavior which was inaugurated in 1967 by the Creative Education Foundation gave further credence to the importance of creativity development. It was also during this time that there was a sharp increase in the trend towards preparing teachers for a more creative type of teaching that could enable students to discover their own creative abilities and to strengthen those abilities while mastering subject matter.

The widespread application stage of creativity development which began with great interest and eagerness in the latter part of the 1960’s proceeded with greater force in the 1970’s and beyond. Large-scale application of creative problem-solving programmes such as those suggested earlier by Gordon (1971) and Parnes (1967) were still undertaken. Assessment and measurement of creativity development were also undertaken in a big way by researchers especially in American schools and institutions.

3.2.3 Short Global Scenario of Creativity Development

According to Strom and Strom (2002), creative thinking is fast becoming a common purpose throughout the world such as in the United States, South America, Europe, Asia, and South-East Asia. There is a host of literature to support creativity training and testing of school, college, and university students mainly in the United States. Creative thinking skills have been taught in American schools for decades not only through subject matter content and context but also as a subject by itself (Isaken & Parnes, 1985). Parkhurst (1999) has brought to our attention that when the Education Commission of the States instructed a committee made up of prominent people in various organizations to
investigate and identify those skills that would be paramount for the future, creativity and synthesis were two of the nine skills listed. Two other skills listed, namely, problem-solving and decision-making strategies also involve creative thinking. This implies that creative thinking skills are needed for future growth.

South America too is concerned about the development of creativity. According to Fleith (1999, 2002), most of the Brazilian studies from the 1970’s to the 1990’s focused on ways of fostering creative thinking abilities in the classroom. Studies that were conducted in Brazil from 1985 to 1995 to investigate the effects of creativity training programmes on teachers and students suggested a positive impact of the programmes on creative thinking abilities.

In Europe, recommendations for transformation of schools have been expressed by concerned people especially in the business sector (Senge, Cambron-McCabe, Lucas, Smith, Dutton, & Kleiner, 2000). According to Sternberg (2006), France, Germany, Italy, Poland, and Spain have carried out research on various aspects of creativity. France and Germany have placed emphasis on the facets of creativity, namely, the person, the process, the product, and the press or environment. The twentieth century was a turning point for Italy as it focussed on three important issues where research is concerned: to gain better understanding of the creative processes, to promote creativity in schools, and to measure creative abilities. In Poland creativity skills has been looked upon as attainable as everyone has creative potential. Spain too believes that creative thinking can be enhanced and so the teaching of creativity has remained an important area of research since the 1960’s. From the above discussion, it is evident that people in the United States, South America and
Europe are aware of the far-reaching effects of creativity and have realised that teaching and training for creativity is vital for survival in a fast changing world.

Some Asian and South-East Asian countries like India, Japan, China, Hong Kong, South Korea, Singapore, Indonesia, and Malaysia have also shown their nationwide commitment to nurturing creativity as it is considered seriously in educational pursuits. Creativity has been an area of interest in India especially in educational pursuits (Sternberg, 2006). Though Indian myths continue to influence thinking about creativity, creation is viewed as a natural desire of human beings. Thus, Indian researchers like Gupta (1981) and Katiyar and Jarial (1983), continue to strive so as to better understand creativity through research studies with the aim of facilitating it in human beings.

Mori (1996) reported that the Japanese Ministry of Education is constantly thinking of ways to design and assess school curricula so as to promote creativity. Likewise, Chan (2000) too reported that the National Commission on Educational Reform in Tokyo had come to the conclusion that its tertiary educational institutions were not placing enough importance on nurturing the creativity that the nation needs to make headway in the new century (cited in Strom & Strom, 2002). This shows the importance the Japanese are placing on creativity. The Chinese too are following the Japanese example, as “the Education Ministry for the Republic of China wants reforms that enable colleges to educate students more broadly and reward creativity instead of rote memory” (Kuo, 2000, cited in Strom & Strom, 2002, p. 183).

Local universities in Hong Kong have experimented with creativity training courses and undergraduates have realized that training in generic skills like creative thinking could be of benefit (Roskams & Fisher, 2006). This is
because developing and strengthening creative thinking is of economic importance (Lilley, 2001).

According to Choe (cited in Sternberg, 2006), creativity research in South Korea has included a wide spectrum such as creativity and educational methods, programmes to develop creativity, and the role of teachers in nurturing creativity. It seems that Hong Kong and South Korea are giving due attention to the importance of creativity.

The Indonesian educational system has placed importance on thinking skills. However, Hasan (1991) has said that more could be done to enhance creativity thinking skills. He came to this conclusion while he was lecturing masters’ students during his sabbatical leave. He noticed that though the students were mature in their thinking, they lacked creativity thinking skills.

Regarding the importance of creativity in Singapore, it has been said that, “Creativity education has been an inspiration of Singaporean educators and leaders … Singaporean leaders adhere to fostering creative, innovative, and entrepreneurial spirits among the young” (Tan, 2001, p. 133). Tan has also informed us that creativity education started in the sixties, gained impetus in the eighties and became popular nationwide in the nineties. This was especially so when the Singapore Prime Minister (Goh, 1997) expressed in no uncertain terms that the nation should prepare the young for the greater socio-economic challenges of the next millennium and that academic achievement alone might not be adequate for future success.

Creativity research and development in Malaysia is relatively young compared to the United States of America. To the knowledge of the researcher, creativity research in Malaysia has been mainly undertaken by the University of Malaya. Chan (1986), Palaniappan (1989), and Yong (1986) were the pioneers
in creativity research. Then from the 1990’s a number of studies on creativity and creativity variables were carried out by researchers (Chia, 1997; Gan, 1998; Govindasamy, 2004; Joseph, 1998; Kalaniappan, 1998; Palaniappan, 1994, 1996, 2000, 2005; Radiah, 1996; Siti Rafiah, 2007; Tan, 1992; Zarrin, 2003).

Regarding the testing of the effectiveness of creativity training programmes in the Malaysian context, so far only one researcher (Chia, 1997) undertook this task. She tested the effectiveness of the Creative Problem Solving programme on teacher trainees and obtained positive results.

3.2.4 Programmes and Studies of Creativity Development

Scientific studies on the development of creativity in the educational context started in the latter half of the 1950’s with great vigour. This was because it was realized that it is possible to teach creative thinking through systematic introduction of instructional materials and procedures. If the 1950’s saw a modest start of creativity studies, the 1960’s and 1970’s saw a meticulous boom in the design and implementation of creativity development programmes especially in classrooms across America. This was because actual incremental training programmes were already available for children (Anderson, 1965; Covington & Crutchfield, 1965; Davis & Houtman, 1968; Feldhusen, Bahlke, & Treffinger, 1969; Myers & Torrance, 1964, 1965a, 1965b, 1966a, 1966b; Olton, 1966) and for adolescents and adults (Khatena, 1968, 1969b, 1970c; Osborn & Parnes, 1963, 1975; Parnes, 1966). From the 1980’s and beyond, numerous empirical studies with diverse training methods and materials were undertaken especially in the United States to assess the effectiveness of deliberate creativity development programmes. Most of the studies showed positive results as assessed by meta-analytic reviews by researchers (Bertrand, 2005; Huang, 2005;
Kim, 2008a; Ma, 2006; Meador et al., 1999; Rose & Lin, 1984; Scope, 1998; Scott et al., 2004a, 2004b) interested in creativity.

Mansfield et al. (1978) had assessed the effectiveness of five of the most popular extended programmes, namely, the Productive Thinking Program (PTP), the Purdue Creative Thinking Program (PCTP), the Myers-Torrance Ideabooks (MTI), the Creative Problem Solving (CPS) Program, and the Khatena Training Method (KTM). According to this review, the latter two programmes, namely, the CPS and KTM had the most convincing empirical evidence. Although there are differences in the approaches in the above mentioned programmes, what they have in common is “the development of divergent thinking, creative problem-solving abilities and creative ways of dealing with information” (Khatena, 2000, pp. 80-81).

The CPS and KTM creativity training programmes are more suitable for adolescents and adults compared to the PTP, PCTP, and MTI which are suitable for children from the fourth to the eighth grades. In Malaysia, the CPS program was used by Chia (1997) to train teacher trainees but the researcher intends using the Khatena Training Method in this study to train Form Four adolescent students (US, tenth grade). Creativity training programmes assessed by Mansfield et al. (1978) will be discussed briefly with special emphasis on the KTM as it is of concern in this study. Also other useful creativity training programmes, long-term studies, and meta-analytic reviews of creativity programmes will be discussed.

3.2.4.1 Productive Thinking Program

The Productive Thinking Program (PTP) consists of 16 programmed instructional booklets designed to develop general creative problem solving
abilities especially in fifth and sixth-grade students. The first evidence of the programme’s effectiveness was presented by its developers (Covington & Crutchfield, 1965). A total of 195 students were involved for an hour a day for three weeks and 13 out of the 16 booklets were used. After training, the experimental and control groups were given an 8-hour post-test battery. For each of the measures used, the instructed group far outperformed the control group by a 3-to-1 ratio. A second study using all 16 booklets, again indicated marked superiority in the instructed group with effects stronger at the fifth-grade than the sixth-grade level. In a study by Olton and Crutchfield (1969), a class of 25 fifth-graders were given intensive training in productive thinking while no such training was given to another class of fifth-graders matched for IQ, age, and achievement. The results demonstrated the effectiveness of the programme.

3.2.4.2 Purdue Creative Thinking Program

Creativity studies to assess the effectiveness of creativity training in elementary schools that were undertaken on a large scale started with the Purdue Creative Thinking Program (PCTP). Initial work in developing the PCTP was carried out in cooperation with the radio station at Purdue University for it was felt that when students are limited to an auditory stimulus, they will use their imagination to a greater extent. Later the programme became available to teachers as a series of audio tapes with an instructional manual. We are informed that the “audio-taped lessons are used to describe strategies for idea generation or divergent thinking with these strategies being illustrated through description of their use by historic figures” (Scott et al., 2004b, p. 151). The PCTP has specific creative thinking goals related to divergent thinking. The first research study involved 265 school children in cities and rural areas in Indiana.
The Torrance Tests of Creative Thinking and the Metropolitan Achievement Tests were used as criterion measures. The results showed that the PCTP was effective in increasing children’s creative thinking abilities. On verbal and non-verbal tests of originality, children who received the creativity instruction scored higher than children who did not get the instruction. The PCTP has been the object of research with several different populations. In the study involving 66 fourth-grade students from two Atlanta public schools (Robinson, 1969), half of the students were instructed with the PCTP for 14 weeks. The test results indicated that students in the group receiving the training had highly significant gains on all creativity scores on the Minnesota Tests of Creative Thinking. According to Moon et al. (1994), the long-term effects of an elementary enrichment program for gifted youths that was investigated was a program based on the Purdue Three-Stage Model. The findings suggested that the model was an effective framework for elementary enrichment programmes.

3.2.4.3 Myers-Torrance Ideabooks

The first Myers-Torrance Ideabook (MTI), namely, “Invitation to thinking and doing” (Myers & Torrance, 1964) is a creativity training programme for children designed for grades four to six. Now there are altogether five Ideabooks for grades one through eight. The aim is to strengthen simple and complex thinking abilities and to foster attitudes conducive to imagination. Built into each book is a warm-up period to ensure a conducive atmosphere to encourage spontaneous ideas. The Ideabook, “Can you imagine?” (Myers & Torrance, 1965a), for grades one and two, uses questioning to develop imagination. The Ideabook, “For those who wonder” (Myers & Torrance, 1966a), suitable for grades three and four, presents challenging ideas. In the
Ideabook, “Invitation to speaking and writing creatively” (Myers & Torrance, 1965b), for grades six to eight, the creative language arts activities and exercises designed are to encourage self-expression. The Ideabook, “Plots, puzzles and ploys” (Myers & Torrance, 1966b) that uses adventure exercises is for grades seven and eight. Studies on “Invitations to thinking and doing” by Casey (1965) as well as Torrance and Myers (1970) obtained impressive results as experimentals performed better than controls.

3.2.4.4 Creative Problem Solving Program

The Creative Problem Solving (CPS) program devised by Osborn (1963) and later improved by Parnes (1975, 1992) is a popular creativity development programme that has been used mainly with adults. Isaksen and DeSchryver (2000) reviewed more than 700 reports of the effectiveness and impact of the CPS and they found it to be one of the strongest models for enhancing creativity. It is a method to help people solve problems through enhanced creativity. It provides a framework for the problem solver who is guided through six sequential stages: problem finding, data finding, problem definition, idea generation, solution finding, acceptance finding. At each stage the problem solver is required to use both his divergent and convergent thinking skills (Starko, 1995; Trefingger, 1995). Thus, CPS involves both creative and critical thinking. During the CPS, creative or divergent thinking techniques that are usually used are brainstorming, synectics, and scamper.

The most extensive investigation of the effectiveness of the CPS approach was the Creative Studies Project (CSP) which began in Buffalo in 1969. It was a two-year research study which investigated the effects of a four-semester sequence of creative studies courses for undergraduate students.
Results of the study were highly positive. Experimental students showed significant differences over controls especially in the ability to handle real-life problems in situational tests. They reported large gains as a result of the enhancement of their productive thinking skills and rated the project as helpful in their other college courses. Researchers (Biles, 1976; Kabanoff & Bottger, 1991; Kurtzberg & Reale, 1999; Reese et al., 1976; Shean, 1977) who had used the CPS programme with adults and those who had used it with youths (Baer, 1988; Golovin, 1993; McDonald-Schwartz, 1991; Puccio, 1994; Schack, 1993) have generally found the CPS to be a viable creativity training programme.

In Malaysia, Chia (1997) undertook a study that involved 94 female teacher-trainees. Comparisons were made between subjects in the experimental group who were trained in CPS to solve problems and subjects in the control group who were trained in some non-creative activities. The Torrance Tests of Creative Thinking were used as pretest and posttest. Her study revealed that training in CPS was effective in enhancing the creativity of the teacher-trainees in the experimental group, via fluency and originality scores.

3.2.4.5 Khatena Training Method

Interest in the fostering of creativity especially in the educational context has been considerable and this has resulted in many studies that looked into the effectiveness of creativity training programmes (Khatena, 1976b). One such programme is the Khatena Training Method (KTM) which is of interest in this study. In Ma’s (2006) meta-analytic study, the different types of creativity training programmes were grouped into 15 categories and one of the categories
was the KTM that emphasizes creative thinking strategies like breaking away from the obvious and commonplace, transposition, analogy, restructuring, and synthesis. In Ma’s (2006) study, the KTM obtained an effect size of 0.82 which could be considered as large (Cohen, 1977).

The KTM is a viable creativity enhancing method that can provide individuals with the opportunity to improve and develop their creative thinking abilities. Thus, this study intends to test the efficacy of the KTM in enhancing the creativity of Form Four students in a typical school. The KTM is not a ready-made or packaged creativity training programme. The approaches and strategies for the KTM were extracted from Khatena’s (1978c, 1992, 2000) books. The KTM designed for this study by the researcher was approved by Professor Emeritus Dr J. Khatena from Florida, USA.

The Khatena Training Method (KTM), first used by Khatena (1969b), focused on the stimulation and facilitation of creative imagination imagery with special emphasis on originality. The KTM which has been improved on over the years by Khatena (2000) uses creative thinking strategies such as Breaking Away from the Obvious and Commonplace (BAOC), Synthesis-Destructuring-Restructuring (S-D-R), Transposition (TR), and Analogy-Imagery (A-I). Mansfield et al. (1978) and Ma (2006) have confirmed that the KTM provides instruction and practice in creative thinking strategies such as the BAOC, S-D-R, TR, and A-I. These strategies with special emphasis on verbal and figural activities or tasks are intended to increase original thought (the creative thinking strategies of BAOC, S-D-R, TR, and A-I have been discussed in detail in Chapter Two, 2.6.1). Khatena and other researchers have used the KTM in a number of studies especially with the Thinking Creatively with Sounds and Words (TCSW) test battery and had obtained impressive results. Although the
KTM has been in existence for a long time and used mainly in the United States, it has never been used in the Malaysian educational context to test its effectiveness. If the KTM is successful in enhancing the creative thinking abilities of the subjects in this study, it will not only provide us with new knowledge about creativity training but also give us the assurance that there are empirically tested creativity training programmes that can be used with confidence when needed.

Two initial sets of studies that were carried out on creativity training using the Khatena Training Method (KTM), generally provided evidence that verbal originality could be deliberately increased. In the first set of studies (Khatena, 1970c, 1971b, 1971h, 1973a), the first experiment (1970c) that was carried out involved 100 college students who were randomly assigned to four treatment groups. The two experimental groups received the training variable. However, the first group received the pretest and posttest while the second group was only posttested. In the two control groups, one received the pretest and posttest while the other received only the posttest. The experimental groups received two 60 minute sessions (120 min.) of instruction and practice in five creative thinking strategies, namely, Breaking away from the obvious and common-place, Transposition, Analogy, Restructuring, and Synthesis. When the subjects’ creative abilities were measured by scores on the sub-measures of the TCSW test battery which were the dependent measures, no main effect for training was found for either of the dependent measure. This was perhaps due to the brevity of the training period. However, the results showed that training does lead to improvement in giving original responses. The short duration of the training period was addressed by Khatena in his second experiment.
In the second experiment (1971b) the same training strategies were used but the training period was increased to 240 minutes over four days. A total of 105 college students served as subjects and were randomly assigned to four treatment groups (n = 29, 24, 28, 24). This time when the experimental groups’ (either tested and taught or taught only) creative abilities were measured by the TCSW test battery, it showed that there was a significant increase in originality for both the sub-measures of the TCSW, namely, Sounds and Images (S&I) and Onomatopoeia and Images (O&I). The results supported the use of the training strategies and increased training time.

In the third experiment undertaken by Khatena (1971h), disadvantaged preschoolers were the subjects of the study. The creativity training strategies used were, Breaking away from the obvious and commonplace, Transposition, and Analogy. The training period lasted for 360 minutes. The results showed an increase in originality scores and confirmed the need to increase the length of the training.

In the fourth experiment which was carried out by Khatena (1973a), his intention was to evaluate if training was influenced by a subject’s level of creativity as measured by Khatena’s creativity inventory named Something About Myself (SAM). The subjects were divided into high and low creativity groups and randomly assigned to the experimental or control group. The subjects in the experimental group were given creativity training for 240 minutes over four days. Creativity training was based on the five creative thinking strategies, namely, Breaking away from the obvious and commonplace, Restructuring, Synthesis, Transposition, and Analogy. After creativity training, the subjects were administered the O&I test (Form 2). The results showed that though both groups of subjects who were higher and lower in creative ability
gained from creativity training, they did not differ significantly after training to think creatively.

As discussed above, the first set of studies conducted by Khatena involved college students and children in four separate experiments. Three of the experimental studies produced significant results and the studies utilized either 240 minutes or 360 minutes for creativity training. In this study, adolescents will be used as subjects. Besides, 480 minutes over a two-day period will be allocated for creativity training. Thus, it will be interesting to find out if the KTM is an effective creativity training program for adolescents just as it was for adults and children. It will also be interesting to find out if the increased time allocation for creativity training can bring about better significant results.

The second set of studies by Khatena (1972c, 1973c, 1975c) explored the area of imaginative analogies and the production of original (simple and complex) images in two descriptive studies and one experimental study. Analogy is one of the creative training strategies in the KTM and is of concern in this study. Training in analogies can help one to be more creative and generate better original images. The first descriptive study (1972c) involved 141 high original adult students selected from a number of American states. Their verbal responses were analyzed in terms of direct, personal, symbolic, and fantasy analogies as well as in terms of simple or complex images. The results revealed that the subjects preferred to use direct analogies (98%) and simple (89%) rather than complex images.

The second descriptive study (1973c) involved 248 high original children between the ages of 8 and 19 years selected from a number of American states. Their responses were categorized as direct, personal, symbolic, and fantasy analogies as well as simple or complex images. The results showed
that most of the analogies produced were direct analogies (93.6%) and most of the analogies were of the simple image structure (81.2%). The other types of analogies (personal, fantasy, and symbolic) produced were negligible.

The third study (1975c) that was experimental in nature involved high and low creative subjects and training on producing analogies was intensified. The two-groups randomized subjects, posttest only design was used. The 100 subjects were divided equally into two treatment groups. The subjects in the experimental groups were given training for 200 minutes (four 50-minute sessions) over a period of ten days. After the training, the subjects were given the O&I as a posttest. The results showed that both the high and low creative subjects in the treatment groups produced more original images than the high and low creatives of the control groups. It was also discovered that all subjects in the treatment and control groups preferred to use direct analogies and simple images compared to the other analogy-image types. However, the high and low creatives in the treatment groups produced more complex images when compared to the images produced by the high and low creatives in the control groups. The high creative subjects of both groups produced more complex images than the low creative subjects of both groups. A few fantasy analogies were produced by both groups with the treatment groups fairing better than the controls. The success of the experiment tells us that creativity training can help subjects to produce complex images.

Further studies using the KTM were carried out by Khatena and his associates (Khatena & Barbour, 1972; Khatena & Dickerson, 1973; Khatena & Parnes, 1974) and the results have generally been favourable. In the study by Khatena and Barbour (1972), the aim was to train music majors in college to think creatively with sounds and words. A total of 72 college adults were
randomly assigned to four treatment groups of equal numbers. However, experimental mortality reduced the size of the groups to 10, 16, 12, and 18. The two experimental groups were either tested and taught or taught only. The two control groups were either tested but not taught or tested only. The creativity training programme was made up of three of Khatena’s training strategies such as Breaking away from the obvious and common-place, Transposition, and Analogy. The training programme also included Osborn’s (1963) idea-spurring questions. The training lasted for 400 minutes (50 minutes over 8 days). A 2 x 2 analysis of variance factorial design was used to determine the significance of the training. The measure used for testing was the TCSW with its sub-measures of S&I and O&I. The results supported the use of creative thinking strategies in the context of group brainstorming to increase the production of original verbal images.

In the study undertaken by Khatena and Dickerson (1973), 56 boys and girls of ages between 11 and 12 were randomly assigned to the experimental and control groups. Those in the experimental group were trained in the KTM strategies of Breaking away from the obvious and commonplace, Restructuring, and Synthesis, for 360 minutes (9 days x 40 minutes). The Torrance Tests of Creative Thinking was used as the dependent variable. A 2 x 2 factorial analysis of variance of the data revealed significant main effects of training on verbal fluency, flexibility, and originality. However, significant interaction of training by sex was only for originality scores. The study confirmed the effectiveness of the KTM as a viable creativity training programme.

In the study carried out by Khatena and Parnes (1974), the purpose was to investigate if college students would benefit from creativity training. A total of 88 subjects formed the volunteer experimental group and 50 subjects formed
the non-volunteer control group. Subjects in the experimental group attended a two-semester course in creative studies development. After training, both the experimental and control groups were administered the O&I test (Form 2 A). The results revealed that volunteers in the experimental group obtained higher mean originality scores and lower variance when compared to non-volunteer controls. The study proved that the course in creative studies development could increase original image production.

In the study carried out by Masten and Hairston (1989) involving 110 undergraduates, the purpose was to assess the effect of spaced training and delayed post-testing on originality. This was because all previous studies but one, gave training on consecutive days and immediately after training, post-testing was carried out. In the study of Masten and Hairston (1989), training of 4 hours (2 weekly sessions) was expected to be sufficient to observe significant mean differences between the experimental and control groups. The training was based on Khatena’s (1979, 1984) creative thinking strategies of Breaking away from the obvious and commonplace, Synthesis, Analogy, Restructuring, and Incubation. Subjects in the experimental group were asked to take the delayed posttest a week after the second training session. The results showed no significant main effects on the TCSW. The researchers speculated that the subjects who may have learned from the training, returned to their former level of originality because of too much time between sessions. Thus, the advice by Masten and Hairston (1989) was that “attempts to produce significant effects of training to use the creative imagination should be massed, not spaced or of longer duration” (p. 66). Following the advice given by Masten and Hairston, in this study, training will be for 2 days and for 8 hours (4 hours a day) and posttesting will follow the next day. However, this study has also included a
delayed posttest (to be conducted after two weeks of training). This is to ascertain if there is any educational transfer effect as a result of creativity training.

In 1991, Sikka undertook a study to investigate the effect of creativity training on the creative thinking of 101 African-American minority students. The students were from the fourth, fifth and sixth grade of a school. A total of three creativity stimulation techniques (Khatena’s training strategies) were used for training. The Solomon four-group research design was used to study the effects of pretest administration and creativity training methods. The dependent variables were the Torrance Tests of Creative Thinking and Thinking Creatively with Sounds and Words. The results of the study revealed that the main effects of pretest condition and creative training technique did not have a significant effect on any of the combination of the measures of creative thinking. Besides, the interaction between pretest condition and creative training technique was also not statistically significant. The nonsignificant differences were attributed to small sample size, short duration of training period, motivation of students and appropriateness of training material. Unlike Sikka’s (1991) study, in this study, more subjects will be involved, four creativity training strategies will be used and the dependent variable measured will be only originality which will be measured by the TCSW test battery and its sub-measures of S&I and O&I. With more subjects and more creativity strategies used as well as more time allocated for training, the results in this study are expected to be better.

In 1994, Blissett undertook an initial evaluation study of creativity training and interpersonal problem-solving training. The voluntary participants in her study were 74 undergraduates and their ages ranged from 17 years to 55 years. The creativity training program was based on the Khatena Training
Program and focused on five creativity strategies such as Brainstorming, Breaking away from the obvious and commonplace, Synthesis, Restructuring, and Incubation. The interpersonal problem-solving training was based on the Problem-Solving Therapy Model. The four groups of subjects were randomly assigned to the different training programmes. The first three groups received social problem-solving training only; creativity training only; or social problem-solving training and creativity training. The fourth group served as the control group. The administration of the pretest measures, training techniques and posttest measures all occurred on the same day. Each training program lasted five hours, not taking into account a one half-hour lunch break through the program. The results revealed that subjects who received creativity training alone had greater fluency, flexibility, originality and average creativity scores. Interpersonal problem-solving training did not have a significant effect on the creativity indices, showing that problem-solving and creativity are different constructs. No interaction was found attributable to the combined creativity and problem-solving training group. The results suggested that both creativity and interpersonal problem-solving skills could be improved in a short period of time. This is to say that short-term training programmes of even one day can provide benefits to skills improvement just as long-term training programmes.

3.2.4.6 Other Creativity Training Programmes for Children

Treffinger and Gowan (1972) collected a list of hundreds of active creativity development programmes and materials. To them the three popular programmes were the Instrumental Enrichment (IE), CoRT Thinking Program and Odyssey. However, these programmes are not suitable for this study as they are elaborate in nature and time-consuming.
The IE has 15 sets of paper and pencil exercises for low functioning adolescents aimed at narrowing the gap between the manifest performance and potential performance of students. Feuerstein (1980) reported of a study comparing adolescent special education students who received IE training over a two-year period with equivalent students who received conventional instruction. The IE group outperformed the other students on cognitive tests involving spatial and mathematical reasoning. With a follow-up test given two years later, the IE group still scored higher than the control group on tests of non-verbal intelligence. This suggests the positive transfer effects of creativity training.

The CoRT Thinking Program (designed by Edward de Bono and his Cognitive Research Trust) suitable for school children and adults, consists of six sections of ten lessons each. Each lesson teaches a specific skill used in representing or analyzing a practical problem. According to de Bono (1985), this programme has been widely and successfully used “for the direct teaching of thinking skill as a curriculum subject in schools” (p. 6). He has also informed us that students in more than 5,000 classrooms in ten countries have gained from this programme. However, there have been no well-designed evaluation studies to provide scientifically accepted evidence of the effectiveness of the CoRT Thinking Program.

Odyssey is another popular thinking skills programme for school children based on specific skills for solving problems creatively through a process of dialogue and discovery. The programme consists of 99, 45-minute lessons organized in six books. It was reported (Chance, 1986) that several hundred students were given training for a year using 56 lessons. At the same time an equal number of students received traditional instruction. All the subjects were given problem solving tests at the beginning and at the end of the
year. The trained students performed twice as well as the control students in solving problems.

3.2.4.7 Long-term Creativity Studies

Among the many longitudinal studies that Torrance undertook to investigate the predictive capabilities of the Torrance Tests of Creative Thinking (TTCT), was the follow-up study of 391 elementary students from Minneapolis and Minnesota who were first pre-tested in 1958 (Khatena, 2000). The follow-up study was carried out in 1980 after 22 years and Torrance used the students’ (215 of the original sample) real-life creative achievements as criteria and discovered that there were significant correlations with their test scores. His study showed that it was possible to predict positively, adult creativity from their performance when they were children during their primary school years. Torrance followed up the same students again in 1998, 40 years after the initial testing. A total of 99 of the 170 respondents who were located returned the checklists and questionnaires sent to them and the results showed that the predictive validity of the TTCT, both verbal and figural, was relatively strong (Cramond, et al., 2005).

Apart from the predictive longitudinal validity studies undertaken by Torrance there have also been 7-year and 12-year predictive validity studies carried out involving the TTCT. These have also shown significant correlations with creative achievement (Kim, 2006b). This confirms the high correlation between creativity scores obtained in elementary school and quality of creative production years later. This also gives a boost to creativity testing and creativity training.
The study by Lunken (1991) was to assess the long-term effects on 62 undergraduates in Creative Studies on their personal and professional lives. These undergraduates completed their programmes between 1975 and 1990. The results, from the questionnaires used to collect information, suggested that the students used the knowledge they acquired in a variety of ways and integrated the information into their lives. In 1992, a year-long research study by Sanfilippo investigated if problem solving skills could be increased with the Creative Problem Solving (CPS) programme. The findings showed that the CPS was an effective model for teaching problem solving skills. A study by Firestein and Lunken undertaken in 1993 looked at the long-term impact of a 30-hour course in Creative Studies as part of the Master of Science Degree, upon the lives of the participants. The qualitative and quantitative findings from the questionnaires distributed, indicated that the programme had long-term impact on the graduates’ continued education, professional and personal accomplishments, and ability to cope with challenges of real life.

3.2.4.8 Meta-analytic Reviews of Creativity Programmes

Torrance (1972a) produced a comprehensive summary of 142 experimental studies in elementary and secondary schools that were designed to test approaches to nurturing creative behaviour in children (cited in Ma, 2006). Torrance said that the highest percentage of success (over 90%) came to those who used the Osborn-Parnes (Osborn, 1963; Parnes, 1967) Creative Problem Solving (CPS) program and its modifications. Torrance also categorized programmes teaching children into nine categories and said that the programmes on the whole were at least 50% successful.
One of the bibliographic searches by Parnes (1972) detected over 40 studies evaluating programmes for training students to improve their creative thinking abilities. These evaluative investigations ranged from the retarded level to the gifted level and from the first grade through college and adult education. The investigations showed that about 90% of the total creativity levels were significantly increased by deliberate educational programmes. From the review studies of Torrance and Parnes, it can be inferred that creativity training does have a positive effect on the creativity of children, adolescents, and adults and that it is possible to teach them to think creatively.

Mansfield et al. (1978) reviewed the research on extended creativity development programmes such as the Productive Training Program, the Purdue Creativity Training Program, the Creative Problem Solving Program, the Meyer-Torrance Workbooks and the Khatena Training Method. According to Ma (2006), Mansfield et al. concluded that most evaluation studies support the view that creativity can be trained.

Rose and Lin (1984) who conducted a meta-analytic study to investigate the impact of creativity training programmes across a wide range of studies came to the conclusion that training does affect creativity positively. They carried out a quantitative and meta-analytic review of 46 studies that evaluated the effects of creativity training in connection with divergent thinking test scores. According to Scott et al. (2004b), the study by Rose and Lin “found that creativity training contributed to performance on divergent thinking tests producing reasonably large effects, especially in terms of originality” (p. 153).

In 1984, Cohn carried out a research synthesis of existing creativity training studies since evaluations of creativity training methods had resulted in inconsistent findings. A total of 106 published studies and dissertations, which
yielded 177 independent samples of subjects, were used. The findings suggested
that creativity as measured by the number of responses (fluency) or the number
of statistically infrequent responses (originality) can be increased. However, the
results also revealed that creativity training may not be as effective in enhancing
creative performance on tasks that were not similar to those employed during
the training. In this study, creativity training and creativity testing are in synch
as both emphasize the creative thinking dimension of originality.

Feldhusen and Clinkenbeard (1986) reviewed the effectiveness of 87
studies on teaching creativity and problem-solving (cited in Moon et al., 1994).
These included the Productive Training Program, the Purdue Creativity Training
Program, the Creative Problem Solving Program, Imag/craft Series and
Ideabooks. They concluded that it is possible through programmed instruction
“to increase children’s creative-thinking and problem-solving abilities using
well-established instructional materials” (p. 46). In 1988, Richardson reviewed
the historical background on Osborn-Parnes Creative Problem Solving program.
He concluded that the programme is a life skill all children need.

Scope (1998) carried out a meta-analysis on 30 studies to determine the
effect of creativity training and the result proved to be positively insightful
(cited in Ma, 2006). Scope reported that the studies reviewed, focused more on
cognitive processes that underlie creative performance rather than exploring
individual personality characteristics as was done in the past. This study also
focuses attention on cognitive processes. Khatena’s (1979) Creative Imagination
Imagery model that supports this study is a process model.

Separate creativity review studies were also carried out in 1999 by Pyryt
as well as Meador et al. (1999), cited in Hunsaker (2005). Pyryt’s meta-analysis
of 25 studies to determine the extent to which training in divergent thinking
tasks would be effective, found a correlation between the number of creativity training lessons and the performance of the subjects on divergent thinking tasks. The review by Meador et al. (1999) focussed on creativity training programmes that included Synectics, Odyssey of the Mind, and Future Problem Solving. They found that the targeted programmes showed effectiveness on a number of measures that included divergent thinking tests.

In 2000, Miga et al. (cited in Ma, 2006), looked into eight studies and their meta-analysis showed a modest correlation. Scott et al. (2004b) used content analysis to appraise 156 training programmes with respect to cognitive processes, traininging techniques, media, and types of practice exercises. They also used cluster analysis to determine the major types of training and meta-analytic data to assess the effectiveness of each type of training. As a result they identified 11 common types of training and out of these, idea production and cognitive training proved particularly effective. Scott et al. (2004a) also undertook another meta-analysis on 70 prior studies that involved 4,210 participants. It was discovered that properly designed creativity training programmes enhanced creative thinking abilities especially in the dimension of originality where it produced the biggest effect size just as in the study of Rose and Lin (1984). In this study, the Khatena Training Method and the Thinking Creatively with Sounds and Words testing battery focus on the creative dimension of verbal originality.

In 2005, Bertrand (2005) conducted a meta-analytic study. He evaluated only 47 out of the 112 creativity training studies as they met design and reporting requirements. The results of the study suggested that it was possible to enhance especially verbal creative thinking abilities through creativity training.
A notable finding was that the frequency or the duration of training did not influence creativity gains.

In the recent meta-analysis undertaken by Ma (2006), studies with no control groups were not included because the effect size would be different when compared to studies with control groups in the creativity training experiment. The types of creativity training programmes in the meta-analysis were classified into 15 categories and one of the categories was the “Khatena Training Method … This program consists of breaking away from the obvious and commonplace, transposition, analogy, restructuring, and synthesis” (Ma, 2006, p. 439). The results of the meta-analysis revealed that the grand mean effect size (0.77) of creativity training was larger than that obtained by the study of Rose and Lin (1984) which was 0.47 and closer to that obtained by the study of Scott et al. (2004b) which was 0.78. However, it was smaller than that of Scope’s (1998) which was 0.90. The results of the above mentioned meta-analytic studies are noteworthy because they give the assurance that creative thinking abilities can be enhanced successfully.

3.3 Training Procedures and Creativity

A discussion of creativity training procedures is pertinent here especially that of brainstorming and synectics. Training is the experimental variable in this study and the Khatena Training Method (KTM) that is to be used to train the subjects in the experimental group is based on Khatena’s (1978c, 1992, 2000) creativity thinking strategies of Breaking Away from the Obvious and Commonplace (BAOC), Synthesis-Destructuring-Restructuring (S-D-R), Transposition (TR), and Analogy-Imagery (A-I). These creative thinking strategies designed in the form of activities (please refer to Appendix A) will be
implemented mainly through creativity training procedures of brainstorming and synectics.

Research on creativity gives credence to the view that creativity training programmes can enhance creativity thinking abilities and skills through specific training procedures to release the latent creative power within individuals. Training procedures such as approaches, methods, strategies, and techniques, generally promote idea generation or divergent thinking (Mumford & Gustafson, 1988, cited in Smith, 1998). Over the years, educators and psychologists have developed many training procedures to facilitate creativity as they believe that creativity training, practice and even encouragement can increase an individual’s level of creativity.

The variety of creativity training procedures in existence has made it possible to improve creative behaviour and mental functioning with great success (Feldhusen, Treffinger, & Bahlke, 1970; Khatena, 1992, 2000). However, there is no single training approach, method, strategy, or technique that can claim to be better than others in helping a person break away from thinking habits that do not enhance his or her creative potential (Smith, 1998).

3.3.1 Categorization of Creativity Training Procedures

Torrance and Hall (1980) and Davis (1983) categorized creativity training procedures for easy reference and their categorizations were somewhat similar. To Torrance and Hall, creativity training procedures can be divided into two categories, namely, the rational and the supra-rational. However, the common goal is to increase the occurrence of divergent thinking. The rational
procedures such as brainstorming and synectics (use of analogies and metaphors) which are mainly logical and linear in nature rely on the discriminating capacity of the intellect. The intellect is engaged in an expansive search process for new relationships. On the other hand, the supra-rational procedures such as visualization, meditation, dreaming, and hypnosis focus mainly on non-linear idea generation and aim at utilizing the more subtle aspects of mental functioning. They have their primary origins in the attempts of mysticism and psychology to expend or alter states of consciousness.

Davis divided creativity training procedures into personal, standard, and miscellaneous strategies. Personal strategies are used by creative individuals and the majority of such strategies involve metaphorical thinking which utilizes metaphors and analogies accompanied by vivid mental imagery. To Koestler (1964) analogies form the essence of the creative act (cited in Grossman & Wiseman, 1993). The idea is to find likeness in dissimilar things, that is, to make a forced relationship, an association or connection between two previously unrelated ideas or things. For instance, by borrowing or transferring ideas, the result is often a new product or novel idea. It is clear that creativity always involves a transformation of what we know and it can take several forms. The second category is standard strategies which can be taught and learned too, such as brainstorming, synectics, attribute listing, morphological synthesis and idea checklists. These strategies are intended to supplement and not replace one’s imaginative and intuitive idea generation. The third category is miscellaneous strategies and they include the use of paradoxes, relaxation, and meditation.

To Ambrose (1996) brainstorming (Osborn, 1957), Synectics (Gordon, 1961), and creative problem solving (Isaksen & Treffinger, 1985) are some of the many creativity strategies and techniques that are popular and teachable.
LeBoeuf (1986) too believes in the importance of the above mentioned strategies and techniques. However, other strategies and techniques for generating and capturing new ideas such as questioning, attribute listing, morphological synthesis, and checklists are also important to LeBoeuf. To Cropley (1992), the common elements identified in the many training techniques usually used in creativity training programmes are making analogies, making associations, redefining questions or problems, and looking at information in novel ways. Other researchers (Bull, Montgomery, & Balloche, 1995; Khatena, 2000; Smith, 1998) are in agreement with Cropley as they too are of the opinion that brainstorming, imagery, metaphors, and analogies are techniques that are commonly used in creativity training.

In this study, for creativity training through the Khatena Training Method, the creativity training procedures that will be employed to enable the subjects to think in diverse ways and produce original responses will be mainly brainstorming that focuses on the generation of ideas, and synectics that focuses on making use of analogies and associations that enable one to look at information in new ways. Ma’s (2006) meta-analytic study analyzed the effectiveness of single components and packages in creativity training programmes after classifying them into 15 categories. Two of the categories were brainstorming and synectics. Both brainstorming and synectics also give opportunities for the incubation of ideas and for the use of creative imagination imagery. Hunsaker (2005) has assured us that training in creative thinking strategies can improve students’ creative abilities in the specific strategies in which they are trained. Brainstorming and synectics are divergent production procedures and to Guilford (1984) the mental operation of divergent production in his “Structure of Intellect” is a key process in creative thinking. In Khatena’s
Chia’s (1997) experimental study that trained teacher trainees in creative thinking was the first study in Malaysia. She used the Creative Problem Solving program to enhance the creative thinking abilities of her subjects. The creativity training procedures that were used to enable her subjects to think divergently are more or less similar to the procedures to be used in this study. She used visualization, checklists, and brainstorming. Visualization included imagery to facilitate creative imagination and improve divergent thinking. The checklist in the form of questions including ‘SCAMPER’ (Eberle, 1977), a list of verbs (Substitute, Combine, Alter, Modify, Put to another use, Eliminate and Reverse) that suggest possible modifications leading to problem solutions was to guide the problem solver in obtaining as much information as possible. The checklist in the form of ideas was to enable the problem solver to obtain further original ideas. Brainstorming was to stretch the subjects’ imagination and stimulate many unique ideas.

3.3.2 Brainstorming

Brainstorming is an effective creativity thinking tool or idea generation technique. To Osborn (1957), it is the most valuable and well-researched approach for the generation of ideas and specific pieces of information. Daniels-McGhee and Davis (1994) are in agreement with him and further add that brainstorming allows one to search for unique ideas and to combine these ideas until a large pool of possibilities are available. The power of associating ideas provides a two-way flow of thought, for someone who puts forward an idea kindles his own imagination as well as the imagination of others.
Some of the rules for both nominal and interacting group brainstorming sessions are that there should be deferment of judgement, censure of criticism as well as encouragement of quantity, quality, combination, and improvement of ideas (Schwartz, 1991). Brainstorming is a good technique for generating many options based on the divergent thinking guidelines or rules mentioned above (Isaksen et al., 1994). The general principle underlying many idea generation methods is in the creation of sources of variety in the participants’ environment as it is believed that the greater the variety in the sources of ideas, the greater the potential for the variety of ideas generated. Hence brainstorming can be looked upon as a method to increase fluency and flexibility in thinking and thereby contribute to divergent production (Weisberg, 1993).

Siau (1995) believes in directed rather than undirected brainstorming. In directed brainstorming, participants can use attention getting tools such as the “plus-minus-interesting” tool as proposed by de Bono (1975, 1982) to assist them in generating ideas. Participants can first direct their attention towards the plus points, then brainstorm the minus and interesting aspects. Levine (1988) has informed us that many researchers are in agreement that for the production of creative ideas, it is imperative that we move away from habitual ways of thinking and that we can do this through brainstorming.

3.3.3 Synectics

According to Khatena (1982b), the theory of synectics “assumes that individuals increase creative efficiency by understanding psychological processes involved in the irrational and emotional. This understanding may increase the potential to problem solve” (p. 64).
Synectics can also be considered as a form of brainstorming though it is more elaborate and sophisticated. It encourages the spontaneous and free flow of ideas but uses a different technique to gain fresh and new perspectives. Synectics is a useful metaphor and analogy based technique to make novel connections (Isaksen et al., 1994) that can be used to encourage divergent thinking (Starko, 1995).

Synectics makes use of two basic mechanisms, namely, making the strange familiar and making the familiar strange. Both use analogies which are central to creative thinking. The first mechanism involves taking a new problem, analyzing, generalizing, and transforming it into something familiar. Hence making the strange familiar involves familiarizing oneself with the new problem at hand, analyzing it meticulously from all angles, and transferring it into something understandable and familiar by using metaphor and analogy. The second mechanism involves what is known and familiar, and viewing it from different angles, perspectives, and fresh points of view so as to gain new insights. Thus, making the familiar strange involves looking and examining at what is ordinary, common, and familiar with new perspectives, new points of view, and using analogies so that deliberate changes can be made to produce something new and novel.

In synectics, personal, direct, symbolic, and fantasy analogies can be employed freely to generate diverse ideas. With personal analogy, the individual achieves new views and ideas on a problem by becoming part of the problem. A personal analogy is basically role-playing. It is an attempt to gain empathy. In direct analogy, there is no self involvement but the individual is asked to think of ways that related problems have been solved by using especially metaphors from nature. As regards the importance of metaphors, LeBoeuf (1986) has said
that to Aristotle, being the master of the metaphor is one of the greatest things. In symbolic analogy, objective and impersonal images like signs and symbols are used to describe the problem or phenomenon and in fantasy analogy, the problem-solver thinks of ideal solutions that may seem far-fetched. But then the weird fantasy of one’s imagination may light-up realistic ideas in another. In making analogies, several well-known figures of speech based on agreement, similarity or resemblance may be used such as simile, metaphor, personification, and allusion. Slabbert (1994) has brought to our attention that synectics is the best method for generating original ideas and encouraging flexibility of thought.

### 3.3.4 Studies on Brainstorming and Synectics

The following are some studies that focused mainly on divergent thinking procedures of brainstorming and synectics. Dirkes’s (1974) study investigated the effect of divergent thinking training on creative thinking scores. Using a brainstorming climate, 52 secondary geometry students generated different uses, combinations, and arrangements as possibilities for problem solutions. Test results showed that the students who participated in the divergent thinking exercises scored higher on verbal tasks of Torrance Tests of Creative Thinking.

Firestien (1979), wanted to investigate the effects of brainstorming or short-term incubation on divergent production in problem solving. Students who were involved in the brainstorming session while incubating were compared to subjects who incubated alone without participating in the brainstorming session. Effects of the treatments were assessed by the subjects’ responses on a written problem solving inventory. Analysis of variance indicated that those subjects trained in divergent production through brainstorming performed better on tests
that measured divergent production compared to the subjects in the control group.

In 1983, Burns undertook a comparative study of three creative problem solving methodologies. Undergraduate students working in groups were studied using brainstorming, brainstorming plus personal analogy, and brainstorming plus forced relationship to see which technique produced the greater number of ideas and which treatment stimulated fluency, flexibility, and originality of ideas. The results showed that brainstorming alone was most effective for producing flexibility, originality, and total creativity within individuals.

A study to investigate the effect of direct (convergent) teaching techniques and indirect (divergent) teaching techniques on the academic performance and responses of 115 fourth-graders was carried out by Farrar in 1984. Two experimental groups received training with a divergent thinking and brainstorming approach to teaching mathematics. Two control groups received traditional or convergent thinking approach to mathematics. A third control group received no training. Results showed that students trained in divergent thinking initiated responses more but it was not clearly demonstrated that divergent thinking training affects performance. This was perhaps due to the “fourth-grade slump” that Torrance talked about. Torrance studied 100 children from 1959 to 1964 (cited in Khatena, 2000) and he found that on the average, slumps in creative thinking abilities occurred at the fourth-grade level.

A study by Ekvall and Parnes (1989) investigated the effects of training in a variety of creativity techniques on problem solving effectiveness of adults when real-life criteria were applied. The five groups of participants involved were trained in brainstorming, brainstorming with analogical thinking, morphological analysis, creative group leadership (discussion format), and
leaderless group discussion. During the three days of training, each group worked on solutions to five different real technical problems, using each of the techniques. Solutions were given a total score, combining ratings on usefulness, originality, and elegance. The results indicated that brainstorming with analogy produced higher total solution scores for all five problems. Statistical significance ($p < .05$) was found when brainstorming principles were combined with synectics principles and gave better results than brainstorming alone.

Baer (1994), wanted to examine the creative performance of second graders in several domains after they received divergent thinking training. The control group was trained in mathematical word problems and the experimental group was trained in individual, and group word problems, with emphasis on brainstorming. Results indicated that the divergent thinking group had significantly higher creativity scores.

Baer (1996) also conducted a study to test how divergent-thinking training can be targeted. For four weeks, seventh-grade students were given divergent thinking exercises twice a week. The exercises consisted of training and practice in sounds, metaphors, and images. The aim of the training was to test how the divergent exercises would affect performance on creative poetry and story writing. The results showed that the creativity scores of the trained group were higher than those of the control group.

McGregor’s (2001) study involving 97 college students looked into the effects of various creativity training procedures including brainstorming, creative problem solving, and creative drama on creative thinking abilities. It was found that the greatest effects on creative thinking abilities were for the brainstorming group.
The study by McIntyre, Hite, and Rickard (2003) used students who were enrolled in a Master’s Degree programme. The students were provided with 45-minute training sessions, one each in brainstorming, heuristic ideation (using a cognitive model to generate new ideas), and forced relationship (associating two different concepts to generate unique ideas). Scores on the figural component of the Torrance Tests of Creative Thinking (TTCT) were recorded before and after training. The study revealed significant differences for the Abstractness and Elaboration subtests of the TTCT.

3.4 Imagery, Imagination, and Creativity

A discussion of the concepts of imagery, imagination, and creativity is relevant and necessary. These concepts form the foundation for the training procedures (discussed above) especially brainstorming and synectics which are considered important in the implementation of the Khatena Training Method (KTM) in this study. The concepts are also important as they are linked to the testing measures selected for this study. The Thinking Creatively with Sounds and Words (TCSW) and its sub-measures of Sounds and Images (S&I) and Onomatopoeia and Images (O&I) are measures that focus on original verbal images. The Using Modality and Imagery in Writing (UMIW) checklist designed by the researcher also focuses on original verbal modality and imagery types. To produce original images that are vivid and appropriate, one has to stretch one’s creative imagination.

3.4.1 Imagery

The enormous amount of information of the world that comes to us through our sensory modalities (visual, auditory, olfactory, gustatory,
kinesthetic, cutaneous, organic) and which adds to our experiences, is organized, integrated, connected, and stored through images or mental pictures for mental processing by the intellect and creative imagination. Forisha (1978a) believes that an image is a representation of a sensory impression. She views images as non-verbal representations of thought resulting from our imaginative experiences that can be conscious or unconscious.

To Forisha (1978b) and Daniels-McGhee and Davis (1994), it cannot be denied that mental imagery is an implicit part of the creative process. Piirto (2004) who is in agreement with them has said that imagery can be viewed as an attribute of the faculty of imagination and part of the creative process. The role played by imagery in the creative process was confirmed through studies undertaken by Gonzales and Campos (1997), (cited in Kim, 2006a). They revealed that imagery is significantly correlated with creative thinking.

As early as 1926, Wallas put forward his thoughts on creativity. To him, imagery can be viewed as a bridge between incubation and illumination which are important steps in the creative process. However, to Khatena (1992), imagery is not only a bridge but a gateway to creativity and “the key to humankind's creativity” (p. 335), “as it is a vital human capacity which represents a precursor and the essence of the creative process” (Wheatley et al., 1991, p. 57). Thus, imagery can be considered important for our growth and progress. In fact, it is vital for our very existence and can be viewed as an iconic, dynamic, flexible and transformable representation of our experiences that we cannot do without.

Ahsen (1984) as well as Bagley and Hess (1984) posited three levels of imagery or biassociation, namely, superficial (unclear picture), covert (clear, detailed image that could include emotional content), and interactive (powerful
images with authentic meaning and strong emotional content). According to Khatena (1992), a number of researchers like Hilgard (1981), Mckellar (1972) and Richardson (1969) have categorized imagery as after-imagery, eidetic-imagery, memory-imagery, and imagination-imagery and he supports their view.

After-imagery depends to a great extent on the stimulation of the sensory modalities especially the visual modality. This type of imagery is of the fleeting kind such as seeing an aeroplane flying at close quarters and experiencing its vibrations. Eidetic-imagery is usually a visual representation that lasts longer than after-imagery. An example would be the image of a hijacking scene witnessed in an aeroplane. Memory-imagery is the retrieval of stored images of the past, present, and future anticipated happenings. This type of imagery can be vivid and controlled but often it is volatile, not well defined and is of short duration. Examples of memory-imagery would be recalling an aeroplane accident, witnessing an aeroplane on fire or anticipating a pleasant flight to a pleasurable destination. Imagination-imagery can be viewed as the product of fantasy or dreams but can be vivid and novel. Richardson (1969) further classified imagination-imagery into hypnogogic imagery, perceptual isolation imagery, hallucinogens drug imagery, photic stimulation imagery, pulse current imagery, non-drug induced hallucination imagery, and creative imagination imagery. However, it is creative imagination imagery (discussed later) that involves constructive fantasy and brings about transformation that is of concern in this study. To Long and Hiebert (1985) “research appears to confirm that imagery training can improve creative productivity” (p. 9), especially training in vivid imagery which is “the richness of detail imagined by the individual or the amount of information imagined in a mental scenario” (Wheatley et al., 1991, p. 58).
3.4.2 Imagination

According to Drewe (1998), great thinkers have conceived of the imagination as a faculty of the mind that is closely associated with the faculties of perception (imagining and image-making) and conception (where ideas are united). In order to trigger and produce imagery especially of the vivid kind suitable for creative use, one’s imagination needs to be stimulated not only with dynamic thinking but also with strong feeling. According to Ashen (1984), Khatena (1984, 2000) and Vargiu (1977) a creative act which results in a new idea, insight or product is the result of the imagination being stimulated and energized by intellectual and emotional forces.

Creativity and imagination are so inter-linked and intimately related (Daniels-McGhee & Davis, 1994) that the terms creativity and imagination are often used without distinction from each other. However, some people distinguish between creativity and imagination. To Wheeler-Brownlee (1985), creativity resides in the outer world and should be looked at from a social context while imagination should be looked at as an enigmatic element, emanating from within the inner world of an individual. Furthermore, to Wheeler-Brownlee, “imagination is a distinct element with a significant and unique role in the process of creativity” (p. 255). There is general agreement that the results of imagination are manifested when an individual performs creatively. The climax of imagination in the service of creativity has been given a variety of labels such as insight, inspiration, and illumination. There is no denying that imagination plays a useful and significant role in the process of creativity. Without the vehicle of imagination, there can be no imagery or creation (Khatena, 1992).
Khatena (2000) has categorized imagination into primary imagination and secondary imagination. Primary imagination which is also referred to as cosmic imagination or deified imagination is due to some spiritual or divine force that is credited for unusual creative experiences and acts. Khatena’s primary imagery is similar to Gordon’s (1972) autonomous imagery which can be of high creative value. On the other hand, secondary imagination or human imagination is due to the involvement of mental processes that “use synthesis, destructuring and restructuring to effect transformations; operations of the creative imagination that anticipate more recent thoughts associated with creative problem-solving” (Khatena, 2000, p. 95). To Khatena (1992) intuitive imagination can provide the channel or link between divine energy and human energy.

3.4.3 Creative Imagination Imagery

Imagination is the ability of the mind to produce, develop, and use images (Isaksen et al., 1994) and just like imagery imagination is also part of the creative process (Piirto, 2004). Our creative imagination and the images they produce are responsible for some of the great things we feel, say, and do. Khatena (1984) attempts to define creative imagination as the chemistry of mental processing in which intellectual and emotive forces operate interactively. These forces stimulate, energize, and propagate the act of creation.

Approaches to stimulate and facilitate the use of creative imagination with the aim of producing creative imagery have been described by Johnson (1978) and Khatena (1979, 1984, 2000) in terms creative strategies of Breaking Away from the Obvious and Commonplace (BAOC), Synthesis-Destructuring-Restructuring (S-D-R), Transposition (TR), and Analogy-Imagery (A-I). These
involve divergent thinking, incubation, autonomous imagery, and multi-sense modality. Suler and Rizziello (1987) have brought to our attention that there is a special relationship between imagination imagery and what Guilford called “divergent thinking”. We are further informed that the thinking strategies of BAOC, S-D-R, TR, and A-I, can be taught to students with the aim of stimulating the creative imagination to produce original imagery and thereby enhancing their creative thinking abilities (Khatena, 1992). In this study, Khatena’s creative thinking strategies of BAOC, S-D-R, TR, and A-I will be the focus of creativity training through the Khatena Training Method (KTM).

The 1960’s and the 1970’s saw very little research investigations being carried out to study creative imagination imagery, albeit creative imagery’s value in education was acknowledged by researchers (Bugelski, 1970; Forisha, 1978a, 1978b; Gowan, 1978; Johnson, 1979; Paivio, 1971; Vargiu, 1977). However, from the 1980’s, 1990’s and beyond, more research studies were carried out (Cross, 2001; Gonzales & Campos, 1997; Khatena, 1987; LeBoutiller & Marks, 2003; Martindale, 2001; Masten & Hairston, 1989; McKeller, 1995; Perez-Fabello & Campos, 2007; Richardson, 1995; Shaw & DeMers, 1986) to make people understand the importance and significance of creative imagination and the relationship between creative imagination and its imagery-analogy correlates.

Instruments have been devised to measure creative imagination imagery with the aim of facilitating and enhancing learning in the classroom situation. The Thinking Creatively with Sounds and Words (TCSW) test battery, by Khatena and Torrance (1973, 1981, 1998b) and Torrance et al. (1973, 1990) is a popular testing device that has been used to study imagery and the creative imagination. The TCSW consists of two sub-measures, namely, Sounds and
Images and Onomatopoeia and images and their “logic hinges of the operation of creative imagination to effect a break away from the perceptual set of audio or audio-visual-verbal stimuli to produce original images” (Khatena, 1992, p. 510).

The TCSW that will be used to measure the subjects’ creativity before and after the training are tests of originality. Of the four dimensions of creative thinking, originality has been hailed as being even more important than fluency, flexibility, and elaboration (Dollinger, 2003; Feldhusen & Clinkenbeard, 1986; Kim & Cramond, 2004; Runco et al., 2005; Plucker, Runco, & Lim, 2006; Treffinger, 1985).

The KTM (creativity training programme) and TCSW (creativity testing measure) chosen for this research study will stimulate the creative imagination of the subjects involved through divergent thinking activities. Khatena (2000) believes in the close association of creative imagination and divergent thinking in the creative process.

3.4.4 Studies on Imagery and Creative Imagination Imagery

Imagery and creativity have often been linked especially when discussing about the creative person and the creative process. This is because to be able to think creatively, one has to have the ability to form vivid images. According to Gowan (1978), the “right-hemisphere imagery is the vehicle through which incubation produces creativity” (p. 23). But empirical studies linking imagery and creativity have been few to date and have not been able to show convincingly a consistent pattern of relationship (Shaw and DeMers, 1986-87). This perhaps can be attributed to the fact that imagery and creativity are complex concepts amenable to different definitions, theories, and
measurements. However, generally the findings suggest a positive relationship between the two concepts.

Studies conducted by Ernest (1977) and Shaw and Belmore (1982-83) found low but significant relationship between creativity and imagery especially between divergent thinking tasks and vividness of imagery. A study by Shaw (1985) investigated imagery and creativity while controlling the variable of intelligence. Subjects with high and low creativity scores were involved and it was discovered that the more creative subjects, made more use of imagery in their thinking strategies than the less creatively inclined subjects. It was also found that IQ scores did not necessarily correlate significantly with the variable of imagery.

An elaborate investigation by Shaw and DeMers (1986) that utilized three tests of imagery and three tests of creativity was carried out on high IQ subjects. The study revealed a strong relationship between imagery and creativity in high IQ subjects. In another study, Shaw and DeMers (1986-1987) compared high IQ subjects with normal subjects where their imagery scores and creativity scores on fluency, flexibility, and originality were concerned. The results showed that vividness of imagery was closely related to the flexibility and originality dimensions of creative thinking especially in the high IQ subjects. The above mentioned studies indicated that apart from relying solely on verbal creativity skills, the subjects involved in the studies also resorted to imaging skills in their quest for flexible and original creative responses. Campos and Perez (1989) undertook a study that focused on high and low imagers. They found significant differences between the high and low imagers in all the dimensions of creativity namely, fluency, flexibility, originality, and
elaboration. They findings suggest a pompous role for imagery in the creative process.

Studies on creativity with emphasis on creative imagination imagery are studies that place importance on originality as a key factor in the measurement of creativity. However, originality, purposefulness, and implementability are often inter-linked and are important considerations for transformational creativity (Wagner, 1996). To Wolff (1981), originality is a reflection of an individual’s uniqueness and Maltzman as early as the 1960’s brought us good news when he said that an individual’s originality can be greatly improved and increased mainly by training him or her to come up with different associations and combinations to the same or different stimuli. In a study by Maltzman, Bogartz, and Breger (1958) the importance of repeated responding to the same stimulus word was demonstrated. The first training method involved associating once to each of the given number of words and the second training method involved associating five times to each of the given number of words. Both methods resulted in originality gains on a free-association that followed, but only the repeated responding method yielded more original behaviour. The occurrence of original responses can be seen as self-reinforcing.

In the Thinking Creatively with Sounds and Words (TCSW) test battery that will be used in this study, its two sub-measures of Sounds and Images (S&I) and Onomatopoeia and Images (O&I) allow for the repetition of sounds and onomatopoeic words. In the S&I (Forms 1A and 1B), there are three repetitions of a group of four recorded audio effects and in the O&I (Forms 1A and 1B), there are four repetitions of a group of five recorded words. It will be interesting to see if the TCSW, especially its sub-measure of O&I, achieves creativity gains
as in the study by Maltzman et al. (1958) as well as in the other studies carried out after the 1960’s.

Manske and Davis (1968), cited in Bourne, Ekstrand, and Dominowski (1971), believe that it is possible to make people more original. To them the easiest approach is to directly request and encourage people to be original. In an experiment carried out by them, subjects who were just asked to give uses for a number of objects were then compared with subjects who were specifically instructed to be original. It was found that those instructed to be original gave a smaller number of uses but a larger number of original uses. According to Levy’s study (1968), cited in Bourne et al. (1971), it was discovered that during training, the greatest originality and transfer happened when subjects were not only instructed to play an original role but also reinforced for unique responses. Thus, external reinforcement (Levy, 1968) or internal reinforcement (Maltzman, 1960) can result in increased original responses (for further studies on creativity with emphasis on creative imagination imagery that places importance on originality as a key factor in the measurement of creativity, please refer to 3.5, in this Chapter).

3.4.5 Use of Sense Modality Types

Manohar (2007) has informed us that people learn best when more of their sense modalities are involved in the process of learning. To him, of the five external senses, the three most commonly used in the classroom environment are visual or seeing (thinking in pictures), auditory or hearing (thinking in sounds) and kinesthetic or feeling (thinking in feelings) and he has referred to them as the primary sense modalities. The other sense modalities (Khatena, 1978a; Campos & Gonzalez, 1995) are olfactory (smelling), gustatory (tasting),
tactile (touching), cutaneous (relating to the skin) and organic (relating to bodily organs). In a study of sense modalities, Khatena (1975d) found significant correlations between perception of subjects’ own creativity and visual, auditory, and cutaneous modalities.

Wheeler-Brownlee’s (1985) classified the perception-sensation modes as follows: visual (spacial, implied direction, gesture, colour, texture, and shape), auditory, tactile, gustatory, olfactory, kinesthetic (thermal, pain), symbolic (numerical, sound, movement), semantic, behavioral. While Bagley and Hess (1984) have recommended stimulating the different senses simultaneously, Wheeler-Brownlee (1985) has informed us that “the ability to shift from one mode to another or to combine them, adds to the possibilities of new concepts and unexpected associations” (p. 264). Tracy et al. (1985) and Tracy et al. (1988) are in concurrence with the views of Bagley and Hess (1984) and Wheeler-Brownlee (1985). While Tracy et al’s (1985) study revealed that memory recall was enhanced when non-visual modalities (auditory, kinesthetic, olfactory, gustatory) were added to the visual modality, Tracy et al’s (1988) study showed that visual imagination produced better associations than auditory imagination. This is because people are generally more familiar with seeing than with hearing objects. However, they have reminded us that the use of more sensory modalities can enhance memory, make the imagination more vivid, and foster meaningful interpretations. This in turn will enhance memory further.

In the light of what has been said above, there is the need to create an environment that will promote creative thinking by providing opportunities for learners to use their sense modalities with confidence. This in turn can result in unique ideas and imaginative solutions (Byrd & Brown, 2002). According to Koren et al. (2005), when we use multiple modalities to present knowledge, we
are exhibiting flexibility of thought. Forisha (1978b) even goes to the extent of speculating that “those who achieve the greatest integration of modalities may be closest to the self-actualizing creativity described by Maslow” (p. 225). However, Messaris (2001) has brought to our attention that generally schools do not encourage students enough in becoming knowledgeable, flexible, and creative in the use of the different sense modalities. Koren et al. (2005) too have lamented the fact that such knowledge and capabilities are scarce in the education system.

3.4.6 Use of Creative Imagery Types

Imagery like creativity is a multifaceted concept that has no universal definition (Shaw & DeMers, 1986). Hence Forisha (1978b) and Campos and Gonzalez (1993) have informed us that there are varied approaches to the relationship between imagery and creativity which at times can be contradictory. This is because some hold the view that imagery facilitates creativity while there are others who are of the opinion that imagery has no function in the thought processes. However, LeBoutiller and Marks (2003) have enlightened us that several researchers (Daniels-McGhee & Davis, 1994; Finke, 1990; Mavromatis, 1987; Rothenberg, 1995) have repeatedly reported of the positive association between mental imagery and creativity in the development of worthwhile ideas. To Shaw and DeMers (1986), there is a strong link between imagery and the originality and flexibility aspects of creative thinking and to Johnson (1978), “creative imagery is defined as the power of the imagination to break away from perceptual set to produce direct, personal, fantasy, and symbolic analogies with simple or complex image patterns” (p. 23). To Johnson (1978), using an analogy
allows a comparison to be made of the similarities between two dissimilar objects.

Siau (1995) has brought to our attention that direct analogy (using facts, knowledge or technology from one domain to another), personal analogy (using oneself to be the object with which one is working), symbolic analogy (using objective and impersonal images) and fantasy analogy (using imagination to express strange but fantastic ideas) are the popular mechanisms first identified by Gordon (1961) to facilitate creative thinking. To Schaefer (1975) and Ward et al. (1999), analogical or metaphorical thinking too is associated with divergent or creative production. Khatena (2000) is in agreement with the views of Johnson (1978), Siau (1995), Schaefer (1975), and Ward et al. (1999), for one of the most powerful mechanisms of thought is that of creating analogies. To Khatena, this is because creative imagination involves thinking as well as feeling, and approaches concerning creative imagination imagery include the use of creative thinking strategies, incubation, autonomous imagery, and multi-sense modalities, among others. To Forisha (1978b), “Imagery is generally defined as a representation of schematic sensory impressions, which operates across all sense modalities” (p. 212). Thus, though we have the capacity to image in all modalities, we may have preference for certain modalities. To Arieti (1976), visual imagery seems to predominate and in Khatena’s (1975d) study, visual and auditory imagery predominated. Imagery and modality are given special emphasis in this study (the different creative imagery types were discussed in Chapter Two, 2.6.1 and general studies on imagery, imagination, and creativity were discussed earlier in this Chapter, 3.4.4).
3.4.7 Studies on creative imagery and sense modality in writing

Over the years, only a few empirical studies have been undertaken to investigate the effects of creativity training through creative imagery and sense modality in the written component. Schaefer (1975) believes that “apart from formal tests, another approach to measuring metaphorical thinking in children and adolescents is to study the incidence of imaginative figures of speech in the stories and compositions they produce as part of class assignments” (p. 146). Thus, he investigated the use of imaginative figures of speech in stories and compositions that high school seniors produced and noted that creative students produced more metaphors and symbolisms in their written assignments than a comparable control group. His study suggests that being able to think in metaphors can differentiate creative persons from their peers. This is because metaphorical thinking is a novel-producing process in creativity. Metaphors acquaint the mind towards novelty and encourage risk-taking.

In the study by Long and Hiebert (1985) that involved elementary students, the aim was to compare an imagery training group (3 weekly sessions of 30-minutes each) and a practice writing group on two dimensions of creativity: originality, fluency. The results showed that the imagery training group performed significantly better than the writing practice group on both originality and fluency measures. In a follow-up study by Jampole, Konopak, Readence, and Mosher (1991), apart from the dimensions of originality and fluency, elaboration too was looked into. The purpose of adding the dimension of elaboration was to examine the subjects’ use of sensory descriptions in their writing. Imagery training was for four 30-minute sessions over a two-week period. The results revealed that the subjects in the imagery group used significantly more sensory descriptions than the subjects in the writing group.
However, the imagery group performed significantly better than the writing practice group only on originality and elaboration and not on fluency. This might be due to the fact that fluency is considered a quantitative measure while originality is acknowledged as a qualitative measure of creativity (Haley 1984; Shaw & DeMers, 1986). Besides, gains in originality are normal for those who are exposed to creativity training (Ferguson, 1982).

Jampole et al. (1994) also undertook a study that “focused on creative thinking as reflected in student writings and its enhancement through guided imagery practice” (p. 1). The 140 elementary students were stratified by high and low creativity level before being assigned to imagery training, writing practice, and reading groups. Training was for 45-minute sessions over a five-week period. Apart from a pretest and immediate posttest, assessment involved a delayed posttest and a descriptive examination of originality and sensory components. Where originality was concerned, a significant main effect was found for creativity level. The high creativity subjects exhibited more originality than the low creativity subjects. A significant difference was also found for the treatment groups. The imagery group showed more originality than the writing and the reading groups. Besides, the high creativity imagery group was found to be more original than all the other groups. Where sensory components were concerned, no significant main effects were found for creativity level or treatment groups as all subjects had given a similar number of descriptions. The immediate posttest contained more descriptions than the pretest and the delayed posttest. Though the high creativity subjects included more descriptions in the immediate posttest as compared to the low creativity subjects, the use of descriptions was somewhat similar for both groups in the pretest and dropping to similar levels in the delayed posttest. Besides, on the pretest, while the score
of the reading group was the highest, the scores of the imagery and writing groups were somewhat similar. However, the imagery group outscored the writing and the reading groups on the immediate posttest. On the delayed posttest, the scores of all groups decreased, the decrease being the greatest for the reading group that was lower than its pretest score. Overall, the study showed that elementary students’ creativity can be enhanced through imagery training.

3.5 Measurement and Creativity

The measurement of originality is of special concern in this experimental study. Originality is one of the creative thinking abilities, subsumed under divergent production which is one of the mental operations in Guilford’s Structure of Intellect model. In this study, verbal originality is measured by the Thinking Creatively with Sounds and Words (TCSW) test battery. The TCSW and its sub-tests are used as the dependent measure for the pretest and posttest. Thus, a discussion of the measurement of creativity is pertinent.

The human mind is such a complex mechanism that to try to describe how it functions in creative ways can only be a challenging, mammoth task (Khatena, 2000). However, this has not deterred researchers from devising measures to test creativity. Tests or measures of creativity are important instruments that guide educators in identifying individuals with creative thinking abilities. Though measures of creativity abound, there is no single measure of creative thinking that is universally accepted and which can claim to measure creative ability, talent or achievement comprehensively and in totality (Treffinger, 1981, 1986; Wakefield, 1991). Thus, there is difficulty in agreeing upon suitable instruments and methods (Cooper, 1991; Kerr & Gagliardi, 2005).
Cooper has emphasized the fact that since creativity is pervasive, illusive, and difficult to define, it is “a struggle for test designers hoping to capture and identify its unruly nature” (p. 204).

Just as creativity is a multidimensional and complex concept, there are also multifarious measures in the form of ability tests, personality tests, inventories, questionnaires, checklists, and activities. These can be used to measure creative attitude, interest, personality, talent, ability, behaviour, achievement, and product. To Ghiselin (1952), when creativity is identified using multiple methods and numerous measures, research subjects are ranked differently. Hence many of the identified measures of creativity do not consistently identify creativity (Moore, 1982). It is indeed unfortunate that there is no consensus on which measure or combination of measures are most effective to assess creative potential which involves a combination of abilities, attitudes, and personal traits. Thus, there can be no single test score or a range of test scores that can identify creative potential with total accuracy (Gilchrist, 1972). However, whatever measures are available can help us identify creative potential and assess creative ability or talent to some extent. To Clarizio and Mehrens (1985), for any test to be effective and useful, it must take into consideration basic psychometric standards with regards to factors such as validity, reliability, and adequacy of normative data.

3.5.1 Divergent Thinking Measures

Many researchers are of the view that an individual’s creativity level is determined to a large extent by mental abilities and in Guilford’s (1967) Structure of Intellect model, of the many different mental functions that relate to creativity, the operation of “divergent production” is particularly important for
creative behaviour and has been an important anchor in creativity research (Brown, 1989). Thus, creativity instruments to measure creativity are often called “tests of divergent thinking” or “tests of divergent-production abilities” (Gilchrist, 1972; Kim, 2006a; Sternberg, 2006).

Divergent thinking tests are a popular method for assessing creative potential (Mumford, Marks, Connelly, Zaccaro, & Johnson, 1998; Runco, 1993) and they focus on the generation of many alternative answers or the production of many appropriate responses (Brown, 1989). The number of ideas used in responding to a problem or the number of responses given in connection to a stimulus are counted and taken as a performance measure of creative thinking. Divergent thinking tests usually assess creative thinking abilities such as fluency, flexibility, originality, and elaboration. Outcomes of divergent thinking tests (depending on the tasks included) can inform us of an individual’s creativity in the verbal (semantic) and figural (symbolic) components (Cheung et al., 2003).

Divergent thinking tests have been criticized by some researchers who have said that the tests lack predictive and criterion validity (Gardner, 1988, 1993; Wallach, 1976) or they do not measure creativity per se but only reflect the specific abilities that are tested by the measures. Besides, the scoring of the tests is usually subjective and may not be reliable (Gale, 2005). However, to Runco (1991), divergent thinking tests may not be perfect measures of creativity but they are useful estimates of an individual’s potential for creative thinking. In this he is supported by a number of researchers (Kerr & Gagliardi, 2005; Okuda et al, 1991; Parkhurst, 1999; Plucker et al., 2006). Besides, Okuda et al. (1991) have informed us that, “recent research has yielded respectable predictive validity coefficients for tests of divergent thinking” (p. 9) and Plucker et al.
(2006) have brought to our attention that “divergent thinking is not synonymous with creative thought, but it can tell us a great deal about creative thought” (p. 56).

Many researchers took to divergent thinking test batteries with the start of the psychometric approach and the use of paper-and-pencil tasks (Plucker & Renzulli, 1999; Russo, 2004). They became a popular measure of creative potential and the creative process. They were also a convenient means of comparing individuals’ standard scores on a creativity scale (Sternberg & Lubart, 1999). We are assured by some prominent researchers (Guilford, 1975, 1986; Torrance, 1995; Khatena, 2000) that divergent thinking tests help us to measure creative behaviour and reveal creative talents in the dimensions of fluency, flexibility, originality, and elaboration. We are also reminded that research has demonstrated that the creative thinking dimensions can be improved with specific practices.

“Divergent thinking is cognition that leads in various directions, some conventional and some original” (Kerr & Gagliardi, 2005, p. 5) and “because some of the resulting ideas are original, divergent thinking represents the potential for creative thinking and problem solving” (Runco, 1999, p. 577). Since researchers generally think divergently about creativity, Ambrose (2006) “suggests that divergent thinking prevails at the macrolevel of the field of creative studies” (p. 80).

Cooper (1991) reviewed six popularly used measures of creativity in the published literature and two of the six measures are the Thinking Creatively with Sounds and Words (TCSW) and the Khatena Torrance Creative Perception Inventory (KTCPI). In this study, the TCSW test battery is the dependent variable that is used to measure creativity gains. The sub-measure of Something
About Myself (SAM) from the KTCPI is used to differentiate students according to their creative abilities (high creatives or low creatives) before being randomly assigned to the experimental and control groups.

The other creativity measures reviewed by Cooper (1991) were the Torrance Tests of Creative Thinking, Thinking Creatively in Action and Movement, Structure of the Intellect Learning Abilities, and the Creativity Assessment Packet. Cooper has said that these tests are useful measures of divergent or productive thinking. Since the TCSW and KTCPI are of interest in this study, they are discussed below.

3.5.2 Thinking Creatively with Sounds and Words

We are informed that for any test to be useful, it must meet certain basic psychometric standards where reliability, validity, and adequacy of normative data are concerned (Clarizio & Mehrens, 1985). The Thinking Creatively with Sounds and Words (TCSW), (Khatena & Torrance, 1973, 1981, 1998b; Torrance et al. 1973, 1990) has met the required standards. It is a timed measure of creative ability or talent that relates to originality, creative analogy, and verbal imagery (Khatena, 2002), cited in Aleinikov (2002). It encourages the use of creative imagination imagery in children, adolescents, and adults and challenges them to produce more original images and analogies.

Cooper (1991) has said that “the purpose of the TCSW is to stimulate originality under free associative conditions” (p. 200) and in her opinion the tests can be utilized effectively in the classroom situation to encourage creative thinking as well as to give students the opportunity to gain insight into their own thinking processes. The TCSW is based on the rationale that originality requires the imagination to be stretched in order to break away from perceptual set so
that the process of restructuring can take place which can result in new ideas, thoughts, and feelings. When the imagination is stretched, the mental processing involved activates as many mental representations as possible, maintaining only a weak link to the original stimulus (Molle et al., 1999). These thoughts are in keeping with the view of creativity put forward by the associationists who believe that giving subjects practice in producing short bursts of associations can facilitate test performance. Mednick (1962) and Wallach and Kogan (1965) have reminded us that early responses are usually common but successive associations and responses tend to be more original. This is perhaps due to ideational flow in terms of associations and transfer effects of creativity training that allow for more remote ideas to come in late in an individual’s output. Jalil (2007) too has informed us that “any repetitive cognitive process has the potential to developing into a full-fledged creative discovery” (p. 40). The TCSW has been used to identify creative and talented individuals, to place students in gifted programmes, and to research various problems (Khatena, 2002), (cited in Aleinikov, 2002).

The TCSW is a test battery, made up of two sub-tests of originality, namely Sound and Images (S&I), (Cunnington & Torrance, 1965a; Khatena & Torrance, 1973, 1998b; Torrance et al., 1973) and Onomatopoeia and Images (O&I), (Khatena, 1968, 1969a, 1971d; Khatena & Torrance, 1998b). The initial purpose of the sub-tests was to measure verbal originality but later it was made more flexible to include imagery and analogy (Khatena, 2002), cited in Aleinikov (2002). The sub-tests come in two sets. One set is for children and adolescents (Forms 1A & 1B) and the other is for adults (Forms 2A & 2B). The two creativity sub-tests, the S&I and the O&I of the TCSW are built on the rationale that sound and semantic elements have associative links of referential
and inferential meanings established through usage. Hence when presented to the listener, the sounds and words act as sets from which the listener must break away to produce new and original combination of meanings and images. The imaginative response is the result of the interaction of the intellect with emotion. According to Khatena (1984, 1987, 1992, 2000) the S&I and O&I tests engage the creative imagination in constructive fantasy. They also stimulate and organize the intellective and emotive systems in myriad and divergent ways to process informational contents as images.

The TCSW test battery has helped researchers to gain a better understanding of variables that encroach on creative imagery such as incubation-illumination imagery in problem-solving (Khatena, 1992). Strong and reliable techniques for incubation are difficult to find with the exception of the TCSW (Khatena & Torrance, 1998b). It has been said that in problem-solving activities, incubation is an important prerequisite for illumination and production of imagery that is associated with right-brain activity (Gowan, Khatena & Torrance, 1979; Ovlet, 2008). Thus, the TCSW is a viable test battery of creative imagery as it gives opportunity and encourages production of imagery and analogies. According to Khatena (1976b), related research has been carried out in developmental patterns in the generation of verbal images, creative imagination imagery, function of sense modalities, and variable training time intervals as related to level of creativity.

In the Malaysian educational context, so far only Gan (1998) has used the adult version of the TCSW (Form 2A), to measure the creativity level of female undergraduates. In this study, the adolescents’ version of the TCSW is used instead (Forms1A & 1 B) to measure the creativity gains of Form Four students. To the knowledge of the researcher, it has not been used before for
adolescents in Malaysia. The TCSW testing instruments used as the pre-test (Forms 1A of S&I and O&I) and the post-test (Forms 1B of S&I and O&I) of creativity in this study, will give the subjects in both the experimental and control groups the opportunity not only to listen to repeated stimuli but also to experience changing stimuli. With this dual approach, the chances for more original imagery to occur are enhanced.

3.5.2.1 Sounds and Images

The first sub-test of the TCSW is known as the Sounds & Images (S&I) and it presents auditory stimuli in the form of sounds. To Cooper (1991), this test seems to have great potential for evoking a creative response through imagery. S&I was designed as a testing instrument (Cunnington & Torrance, 1965a; Khatena & Torrance, 1973, 1998b; Torrance et al., 1973) to assess originality of thinking or as a training medium (Torrance & Khatena, 1969) to encourage creative activities.

In the S&I test, each sound stimulus (four sounds each on Forms 1A - thunder, audio generator sweeps, reverberating spring in echo chamber, abstract sounds in grand piano, and 1B - surf sound, electronically processed cymbal roll, sustaining pedal piano effects, blend of assorted abstract sounds) is presented with instructions on cassettes and is repeated three times (with a pause of 30 seconds after each repetition) so as to allow the imagination to produce more original verbal images. The repetitions are to prod and coax the listener into rejecting commonplace associations for more imaginative and novel ideas. The sound stimuli range from the simple to the complex and from the usual to the unusual so that listeners can break away from the usual way of thinking and experiment with different patterns of thinking in order to arrive at more unique
and original responses. Listeners are encouraged to be creative and also instructed to conceal their earlier responses so that their later responses will not be influenced by them.

The originality level of a given response is determined in accordance with the principle of statistical infrequency and relevance. Some examples of original responses for each of the eight sound stimulus mentioned above are taken from the Directions Manual and Scoring Guide (Torrance et al., 1973) and they are as follows: “thunder” – heart pumping blood; “audio generator sweeps” – clown singing; “reverberating spring in echo chamber” – birds from another planet; “abstract sounds in grand piano” – religious ceremony; “surf sound” – whale scratching its back; “electronically processed cymbal roll” – death approaching; “sustaining pedal piano effects” – fight between lizards; “blend of assorted abstract sounds” – house in hell.

Researchers believe that the S&I test is so unique and uncommon, that no age group is likely to have had more experience with it than any other (Dacey, 1989b). This is because “the test uses progressive warm-up, makes divergent thinking legitimate, provides freedom from the threat of evaluation, invites regression and aids the departure from inhibiting sound sets” (Khatena & Torrance, 1998b, p. 1).

Scoring procedure of the S&I and other information about reliability, validity, comparison group norms, and conversion tables can be found in the Norms-Technical Manual of the TCSW (Khatena & Torrance, 1998b).

3.5.2.2 Studies on Sounds and Images

In one of the earliest studies undertaken by Torrance and Khatena (1969) that involved 137 college students, the aim was to explore originality of
imagery in identifying creative talent in music. The key instrument used in this study was Sounds and Images (S&I - Forms 1 & 2). The instructions and audio effects encouraged the production of imaginative and original images. The results support the idea that students gifted in music can have rich, imaginative, and original imagery in comparison with unselected groups. The results also suggest that skills in producing imagery need to be developed among youths who show promise and interest in music.

A number of cross-sectional studies showed decrements in creative thinking, prior to entry into grade 1 and in about grade 4, 7, and 12 with growth peaks between grades 3 and 4 and again in about grade 11. Thus, Khatena (1972b) undertook a study (N = 665) to investigate if the same developmental pattern appears in the production of original verbal images of boys and girls between the ages of 9 and 19 as measured by the S&I (Forms 1 & 2 of the earlier version) measure. Four sounds were presented, each repeated 3 times after brief pauses. The subjects were encouraged to think of original verbal images. The findings showed that girls experienced a slump at 11 though it was not statistically significant. The boys seemed to do better at 9 but with increasing age, the differences evened out. At 12 years of age, both boys and girls experienced an increase in their productivity. Then there was a levelling off till 14 to 19 when they were at their peak. It was noted that fluctuations in variance were greatest between 10 and 12 for boys and 11 and 13 for girls. In this study, the S&I together with the O&I will be used with Form Four students who are about 16 years in age. According to the study mentioned above, the creativity level of the Form Four students should be at the peak. Since this study involves creativity training, it will be interesting to see if the subjects’ production of original verbal images increases substantially.
Khatena (1976c) also undertook a study to investigate the use of sense modalities in the generation of verbal originality. College students \((N = 77)\) who were roped in for the study were divided into two treatment groups using the two group, randomized posttest only design. The S&I (Form 2A) was the independent variable and the O&I (Form 2A) was the dependent variable. The results of the investigation revealed significant differences in mean scores for the use of the several sense modalities (visual, auditory, organic, visual-auditory, other two modalities combined, more than two modalities combined and symbolic). Original verbal images were largely produced by the visual and auditory or combined verbal and auditory modalities. Generally, it was noted that the use of more than one sense modality took precedence over the use of a single modality, even in other studies (Khatena, 1978a).

In 1983, Khatena and Pazivand undertook a study with a threefold purpose. Firstly, to explore the repeated presentation of the four sound effects in the S&I measure. Secondly, to ascertain the evocative power of these different sounds in the production of original verbal images. Thirdly, to determine interactions of sound stimuli by multiple presentations and their incubation properties. The S&I measure was administered to the 44 adult professionals involved in the study. The results of the study supported earlier findings that originality increases with repetition of stimuli, with no significant difference in the evoking potential of the different sounds or in their interaction.

A similar study was undertaken by Khatena et al. (1985) but it was conducted in India using college adults unlike the earlier study that used an American sample. The 63 randomly selected subjects involved in the study were given the S&I test. The findings of the study when compared to the earlier study carried out in 1983, showed similar patterns. However, unlike the earlier study,
the evoking potential of the four sounds was significant for the Indian subjects. This perhaps was because the Indian subjects involved in the study were more inclined toward auditory stimuli as the S&I is an auditory-verbal measure. The 1985 study concluded that repetition of sound stimuli could help in the production of original verbal images.

3.5.2.3 Onomatopoeia and Images

The second sub-test of the TCSW is entitled Onomatopoeia & Images (O&I), (Khatena, 1968, 1969a, 1971d; Khatena & Torrance, 1998b). According to the Merriam-Webster’s Dictionary (1989), onomatopoeia is “defined as the naming of a thing or action by a vocal imitation of the sound associated with it [and that] at one end of the continuum such a word contains greater sound quality than meaning, as in the word jingle, and at the other end contains greater meaning than sound quality, as in meander” (Khatena & Torrance, 1998b, p. 44). Alluding to this, Feldhusen and Clinkenbeard (1986) have said that “Khatena assumed that such words have the potency to produce original responses in free associations, both by their meaning and their music or sound” (p. 173). This is because the words contain intellectual and emotional elements that interact effectively in the creative process.

The O&I is a test of verbal originality and it presents onomatopoeic stimuli that are at once auditory, visual, and verbal. The multidimensional stimuli in the form of onomatopoeic words activate and stimulate both the left and right brain activity. They have the potency to evoke the production of original responses by both their meaning (semantic elements) and music (sound elements). The sound and meaning of the words are supposed to help the listener to break away from the former perceptual set and come up with unique
responses. Thus, the listener who is induced to be imaginative tends to generate original images as he goes through a process of destructuring, reintegration, and transformation. According to Johnson and Khatena (1975), the O&I test encourages cognitive-emotional interaction that can result in the production of non-sound images in response to auditory stimuli. In other words, the O&I test gives subjects the opportunity to stretch their imagination, to make the familiar strange, and to produce imaginative imagery or creative analogies.

Each onomatopoeic word stimulus (five words each on Forms 1A - crackle, buzz, boom, moan, growl and 1B - ouch, groan, jingle, zoom, fizzy) is presented with instructions on cassettes and is repeated four times so as to allow the imagination to produce more original verbal images. The originality level of a given response is determined in accordance with the principle of statistical infrequency and relevance. Some analogical examples of original responses to each of the ten onomatopoeic word stimulus are given by Khatena (1973d) and they are as follows: “crackle” – a bird landing heavily on her nest; “buzz” – fly-catching plant closing pores; “boom” – an anvil falling from a balloon; “moan” – a tree growing out of its bark; “growl” – a handful of fingernails scratching on a blackboard; “ouch” – violin on a dog’s nerves; “groan” – eraser tearing paper by mistake; “jingle” – a barber cutting a man’s hair fast; “zoom” – a frightened lizard; “fizzy” – a witch melting).

The O&I test has certain built-in conditions such as progressive warm-up (each word is followed by a pause of 30 seconds). Listeners are encouraged to be creative and also instructed to conceal their earlier responses so that their later responses will not to be influenced by them. The O&I can be used as a testing instrument or as a training medium to encourage creative activities. Scoring procedure of the O&I and other information about reliability, validity,
comparison group norms, and conversion tables, can be found in the Norms Technical Manual of the TCSW (Khatena & Torrance, 1998b).

3.5.2.4 Studies on Onomatopoeia and Images

The first validation study of the Onomatopoeia and Images (O&I) as a test of originality for adults \(N = 115\) was undertaken by Khatena (1969a). It was assumed that onomatopoeic words have potency to produce original responses both by their meaning (intellectual elements) and music (emotional elements). The reliability and validity indices obtained were indicative of the potential promise of the test as an instrument for the evocation of originality.

Encouraged by the results obtained by Khatena in his study, Schaefer (1970) undertook a study to further validate O&I as a measure of originality. A total of 25 undergraduates served as subjects in his study. The results of the study supported the findings in Khatena’s study, confirming O&I as a measure of originality.

Other studies that followed, reported data concerning construction, reliability, and validity relevant to the alternate forms of the adult and children’s version of the O&I measure. Khatena (1971e) carried out a study to elicit information on the O&I measure (Forms 1 & 2 of the earlier version) for children between the ages of 8 and 19 years. The children \(N = 208\) were encouraged to write original verbal responses. The data determined the instruments’ promise as a measure of originality for both children and adolescents.

Khatena (1972c) undertook another study to further validate the children’s version of the O&I measure. Children in grades 6 to 9 \(N = 118\) from two schools were involved in the study and were administered the O&I (Form 2
of the children’s earlier version) and Thinking Creatively with Words (TCW), a
test designed by Torrance (1966). The children’s verbal originality scores on the
O&I measure were correlated with scores on fluency, flexibility, and originality
for each of the seven scale activities on the TCW. The findings revealed that the
O&I measure could predict fluency, flexibility, and originality as measured by
the seven subtests of the TCW verbal scale. This further validated the O&I as a
suitable measure of creativity.

In a study carried out by Khatena (1973c), from a group of 1,556
children, 248 of them with standard scores of 66 and above on originality as
measured by the O&I measure were selected to see if their responses would
have greater potential for evidence of “analogy” at work. The results showed
that out of the 4,960 analogies produced, 83.6% were direct analogies and the
rest were personal or fantasy analogies. The findings revealed that the O&I
measure stimulates the imagination to produce original analogies, though the
majority of the analogies produced were of simple and not complex images.

Khatena (1977) also undertook a study to ascertain whether 100 college
adults identified as high and low creatives, when taught to use creative imagery
and analogy, would produce more original verbal images. After training, the
subjects were administered the O&I test and it was discovered that high and low
creative experimental subjects obtained significantly higher originality scores
than high and low creative control subjects. The results suggested that training
could enhance creativity. However, subjects in both the experimental and
control groups preferred to use direct analogy rather than personal, symbolic or
fantasy analogies.

Johnson (1975) used deaf children in his experimental study. Verbal
originality scores were obtained from the O&I (Form 1B) test that was
administered to 182 subjects, aged 10 to 19 years. The experimental group that received vocabulary training in onomatopoeic words had a significantly higher mean score than the subjects who were not trained. The success of this experiment suggests the need to teach onomatopoeic words so that students can produce relevant and original responses.

In another study by Johnson and Khatena (1975), the aim was to compare verbal originality in deaf (181) and hearing (236) children. The subjects aged 10 to 19 years were given the O&I test (Form 1B). The results revealed that the hearing subjects scored much higher than the deaf subjects and females scored slightly higher than males. However, the deaf subjects scored higher as their ages increased while the scores of the hearing subjects fluctuated.

In 1977, Johnson wanted to find out if blind adolescents were more creative in producing original verbal images than sighted adolescents. The testing measures used were the S&I and O&I. The results showed that blind adolescents produced more original verbal images as measured by both tests than sighted adolescents. It was also discovered that adolescents of high intelligence had more original verbal images than those who were of moderate and low intelligence. Johnson has informed us that the better performance and superiority of the blind subjects over sighted subjects in the production of original verbal images may be due to the fact that the use of the faculty of imagination and of creative thinking is more critical for the blind. From the three studies mentioned above, it can be concluded that the O&I and the S&I measures are effective in increasing verbal originality even in deaf and blind subjects.

A study was carried out by Parnes and Noller in 1973 to study longitudinally the effectiveness of the Creative Studies programs of the State
University College at Buffalo. Volunteer and non-volunteer experimental and control groups were used. The study showed evidence in support of the programmes. In 1974, Khatena and Parnes wanted to investigate if adult volunteer subjects who took creative studies would also fare better than non-volunteer subjects in the production of original verbal images. A total of 138 subjects were involved in the study. Subjects in the experimental group were exposed to a two-semester course in creative studies development. After training, both the experimental ($n = 88$) and control ($n = 50$) groups were administered the O&I measure (Form 2A). It was found that volunteers in the experimental group obtained higher mean originality scores and lower variance when compared to non-volunteer controls. The study not only points to the fact that the O&I is a good measure of verbal originality but also that the creative studies program can increase original image production and reduce the variance among the course participants, confirming the outcome of the Buffalo longitudinal study.

A longitudinal study of four years was undertaken by Khatena and Fisher (1974) on 48, eight-year-old children. The aim was to study their responses on the O&I (Forms 1A & 1B). The group was administered the same measures at four consecutive yearly intervals. Data for 35 children were analyzed. The study revealed that the loss in mean originality score at age nine, changed to some small gain at age ten. Then there was a rise to an even higher mean originality score at age eleven. The findings of this study seem to suggest that age is a factor to consider in the responses of the O&I, since original verbal responses on the O&I tend to increase from age ten. It is hoped that the subjects in this study who will be 16 years in age will experience gains in the O&I measure.
The O&I measure has also been used in other studies to determine the relationship of repeated presentation of stimuli and production of original responses; to discover the effects of time press; and to explore the relationship between autonomy of imagery and production of original verbal images. Though repeated presentation of stimuli, the effects of time press, and autonomous imagery are not explored in this study, nevertheless they are indirectly relevant. This is because the TCSW and its submeasures of S&I and O&I give subjects the freedom to think of original responses and original responses are usually based on unique and vivid imagery. Besides, each stimulus in the S&I (sound) and O&I (word) is repeated a number of times at 30 second intervals, to encourage the subjects to produce better original verbal images.

The following are some studies on repeated presentation of stimuli, effects on time press, and autonomous imagery. For the repeated presentation of stimuli and production of original responses, undergraduates and graduates were roped in as subjects \(N = 77\) in Khatena’s (1970b) study. The undergraduates \(n = 50\) who were involved in the basic study were given alternate forms of the O&I (Form 1 & Form 2 of the adult version) as tests of originality (a list of ten words were repeated four times, with 15 second pauses between the words). The graduates \(n = 27\) who were involved in the supplementary study were given Form 1 of the S&I and Form 1 of the O&I (there were three repetitions of the stimuli). An analysis of the responses of the subjects showed progressive increase of original responses with each repetition of the stimuli. The results supported the present mode of presentation of the O&I and S&I measures.

In another study undertaken by Khatena (1973b), 107 elementary school students (aged 8 to 11 years) and 100 junior high school students (aged 12 to 15 years) served as subjects. The elementary school subjects were administered the
Form 1 of the children’s version of the O&I measure while the junior high school subjects were given the Form 2 of the O&I measure. The aim was to examine the relationship between the production of original responses by children and repeated presentation of stimuli. The findings revealed a progressive increase in the mean originality scores on both Forms 1 and 2. Besides, the findings confirmed the results of the earlier study on college adults by Khatena (1970b).

The effect of “time press” on the production of originality was investigated by Khatena (1971a). Time press refers to the way people respond to stressful situations such as when time limits or repetitions are imposed on them. People under the stress of a time limit or when exposed to repeated presentations of the same verbal or auditory stimuli, may welcome it as a challenge and perform better. The study by Khatena involved 142 adolescent subjects from grades 10 to 12. The subjects were given the 50-item checklist entitled, Something About Myself (SAM) to differentiate them into high, middle, and low creative groups. The O&I measure (Form 1) was used as the evaluation instrument. Each onomatopoeic word was presented four times at 10 seconds, 20 seconds, 30 seconds, and unlimited time, instead of being presented four times at the regular 30 second interval. The results revealed that the mean originality scores of all the three creative groups showed a rise with increase in the time interval. While the high and middle creative groups showed marked gains with the increase of the time interval from 10 seconds to unlimited time, the low creative group showed marked gains only for the first three time intervals with only a little improvement between the 30 seconds time intervals and unlimited time. The gains in verbal originality made by all three groups with increase in time were highly significant. In the study by Chakraborty, Khatena,
and Morse (1993), it was revealed that incubation can happen not only during periods of non-focus to stimuli but also when shifting focus from the stimulus in question to some other stimulus.

Khatena (1976a) undertook a study to investigate the relationship between autonomous imagery and the production of verbal originality. He used college students as subjects of the study. According to their performance in the Gordon’s (1949) Test of Visual Imagery Control, they were placed in three groups, namely, moderately autonomous, less autonomous, and non-autonomous imagers. They were then administered the Onomatopoeia & Images measure (Form 2A). The results revealed that the moderately autonomous imagers produced more original verbal images compared to the other two groups. The less autonomous imagers too performed better than the non-autonomous imagers. The study proved that there is a strong and significant link between autonomous imagery and the production of verbal originality.

All the above studies reviewed, point to the fact that the TCSW test battery with its sub-measures of S&I and O&I are tests that can be used with assurance to test the production of original verbal images. In this study, the S&I and O&I will be used as pretest and posttest, to measure the subjects’ originality level.

3.5.3 Khatena Torrance Creative Perception Inventory

Davis (1983) has brought to our attention that divergent thinking tests and personality and biographical inventories work equally well. In this study, the main dependent variable is the TCSW test battery which is a divergent thinking test. The personality and biographical inventory chosen to differentiate the Form Four subjects in this study into high creatives and low creatives is the
Khatena Torrance Creative Perception Inventory (KTCPI), (Khatena & Torrance, 1976, 1990, 1998a). The KTCPI consists of two sub-measures or scales, namely, What Kind Of Person Are You? (WKOPAY) and Something About Myself (SAM). To Khatena and Torrance (1976), both the sub-measures which are effective for identifying creative talent “reflect the limits within which the subject’s creativity tends to operate” (cited in Campos and Gonzalez, 1995, p. 71). Gallucci, Middleton, and Kline (2000) have informed us that the 50 items on each of the sub-measures of WKOPAY and SAM were specially chosen to distinguish between groups that were more or less creative. The 50 items on each of the sub-measures are easy to administer, score, and interpret.

Construct and criteria validities have been established for both the sub-measures of the KTCPI (Khatena & Torrance, 1976, 1990, 1998a; Morse & Khatena, 1989). Significant correlations between WKOPAY and SAM and the Torrance Test of Creative Thinking (TTCT) test have been reported (Torrance, 1974), cited in Gallucci et al. (2000). WKOPAY and SAM have also been factor analysed and offer in addition to a creative index obtained by scoring responses to a total scale, finer dimensions of behaviour or orientations relative to creative functioning.

Data for the Malaysian sample were obtained by Palaniappan (1993) when he pilot tested the bilingual version (Bahasa Malaysia & English) of the KTCPI using 107 Form Four students. The same students were used for a retest after six months. For both sub-measures of the KTCPI, namely, WKOPAY and SAM, the test-retest reliabilities were significant \( p < .01 \). To determine the criterion validity of the KTCPI, the correlations between the measure and the TTCT were examined. The results indicated that the bilingual version of the KTCPI is a valid measure of creative perception.
In this study only SAM will be used as a screening and identification devise for the purpose of differentiating the subjects into high creatives and low creatives. This is because it has been found to be a better measure than WKOPAY for Malaysian students. In the cross-cultural study by Palaniappan (1996), it was found that Malaysian students scored higher than their American counterparts in SAM while the Americans scored higher in WKOPAY. The six orientations or factors in SAM are environmental sensitivity, initiative, self-strength, intellectuality, individuality, and artistry. All these orientations are components of creative behaviour and mental functioning and represent three categories of creative functioning, namely, personality traits, use of creative thinking strategies, and creative production. According to Khatena and Torrance (1976), “SAM is based on the rationale that creative functioning is reflected in the personality characteristics of the individual, in the way he thinks or the kind of thinking strategies he employs and in the products that emerge as a result of his creative strivings” (p. 10).

The sub-measure of SAM which is of interest in this study has been used by researchers in the United States (Khatena, 1971a, 1973a, 1975c, 1977; Khatena, Bledsoe, & Zetenyi, 1975; Khatena & Raina, 1977) and Malaysia (Joseph, 1998; Palaniappan, 1994, 1996, 2005; Zarrin, 2003). Joseph, Palaniappan, and Zarrin who used SAM in their studies found it to be a good creativity measure especially to examine creative personality on individuals’ creative performance. In the cross-cultural study of creative perceptions undertaken by Palaniappan (1996), it was revealed that Malaysians performed better and scored higher than American, Indian, and Hungarian students.

SAM will be used in this study to identify the creative potential and ability of the subjects. Based on their performance in SAM, the subjects will be
classified as high creatives (75th percentile or upper quartile) and low creatives (25th percentile or lower quartile) and then randomly assigned (stratified random sampling) in more or less equal numbers to the experimental and control groups. The purpose is to investigate if both the high creatives and the low creatives gain from creativity training as a result of being exposed to the Khatena Training Method (KTM) treatment.

3.6 Control Variables and Creativity

In this study, the independent or predictor variable is creativity training and the control variables are ability level (high creatives & low creatives), gender category (males & females) and academic stream (science & arts). These variables have been included in this study because studies that looked into the performance of high and low creatives, male and female subjects, as well as science and arts subjects have produced conflicting results. These studies were mainly carried out in the United States. In Malaysia, these variables have not been investigated as a result of creativity training of students. Thus, it will be interesting to examine the outcome of this study and to compare it to the results of the studies carried out in the United States.

3.6.1 Ability Level (High creatives and Low Creatives)

Studies that had looked into the performance of high creatives and low creatives as a result of creativity training did not produce consistent results. The study undertaken by Jampole et al. (1994) showed that the performance of the subjects designated as high creatives was better than the performance of low creatives after creativity training. However, the study carried out by Khatena (1973a) produced conflicting results. The studies are reviewed below.
In the study carried out by Jampole et al. (1994), 140 elementary students from three schools were differentiated into high and low creatives based on Williams’ (1980) Creativity Assessment Packet. With 131 points possible, a median split at 80/79 was used. Those who scored 80 points and above were considered high creatives and those whose points were 79 and below made up the low creative group. The subjects were then randomly assigned to an imagery training group, a writing practice group, and a reading group. The subjects in the imagery training group were involved in visualization and imaginative activities which gave them opportunities to use their sense modalities. The results revealed a significant main effect for creativity level. The high creative subjects were more original than the low creative subjects. Besides, the imagery group was more original than both the writing and reading groups, suggesting significant difference for treatment groups. There was also a significant interaction found between creativity level and treatment group as the high creativity imagery group was found to be more original than all other groups.

In the study by Khatena (1973a), 148 subjects were divided into high and low creative groups according to their performance in the creativity inventory of Something About Myself (SAM). The aim of the study was to ascertain the differential effects of creative level upon training the subjects who were randomly assigned to two treatment groups. The experimental group was trained in five creative training strategies. Khatena discovered that after creativity training, the high and low creatives in the experimental group did not differ greatly in their scores. Though this finding suggests that both the high and low creatives can gain from creativity training, it is unusual to expect the low creatives to perform just as well as the high creatives. This is an unusual finding.
that goes against normal expectation. Normally, the high creatives are expected to perform much better than the low creatives after training as in the study by Jampole et al. (1994). This discrepancy in the findings of the two studies discussed above provides the rationale for investigating the performance of the high and low creatives in this study that focuses on creativity training.

Khatena also undertook other studies to investigate the performance of high and low creative subjects. In one of the studies, Khatena (1971a) investigated the effects of “time press” on the production of originality. The subjects were given the 50-item checklist entitled SAM to differentiate them into high, middle, and low creative groups. The results showed that the mean originality scores of all the three creative groups rose with increases in the time interval. The gains in verbal originality made by all three groups with increase in time were highly significant.

In another study by Khatena (1975c), after creativity training, the high and low creative subjects in the treatment groups produced more original images than the high and low creative subjects of the control groups. Besides, more complex images were produced by the high and low creatives in the experimental groups compared to the subjects in the control groups. On the whole, the high creatives had more vivid images than the low creatives and a reason for this is given by Kosslyn (1985). In his study of mental imagery as a collection of distinct abilities, he came to the conclusion that people differ in the vividness of their imagery and in their ability to transform images. He also discovered that compared with low imagers or low creatives, vivid imagers or high creatives experience better and clearer mental images.

In 1977, Khatena conducted yet another study to determine if college subjects identified as high and low creatives would produce more original verbal
images after creativity training. The results showed that the high and low creatives in the experimental group produced significantly higher originality scores compared to the high and low creatives in the control group. The above mentioned studies conducted by Khatena have given us the assurance that creativity training can further increase the creativity thinking abilities especially the dimension of originality in both the high and low creative subjects.

Other researchers (Barron, 1969; Gamble & Kellner, 1968; Getzels & Jackson, 1962; Golden, 1975; Hersch, 1962; MacKinnon, 1978b) who also conducted studies on high and low creatives have informed us that high creatives are often high on psychological-mindedness of themselves and others, where responsiveness to inner needs, motives, feelings, and experiences are concerned. This mental strength coupled with their determination, enthusiasm, and inventiveness gives them the edge over the low creatives. To Hersch, high creatives also have greater availability of primitive or remote responses and to Getzels and Jackson, the personality structures of high creatives are congruent with recognized mature creatives. Jung (1971) strongly believes that high level creativity has to spring from a deeper source where all of a person’s past experiences are stored. Perhaps this explains the fact that highly creative people who are more intuitive, generally strive for more creative solutions to problems. To Wallach (1970), creative persons tend to perceive and define problems in a different way. They also take note of things that others tend to ignore.

There is some empirical evidence to support the claim that creative persons have more remote associations available to them than uncreative persons (Mednick, Mednick, & Jung, 1964, cited in Coney & Serna, 1995). This gives them greater ability to hold a lot of ideas in their heads at once and to combine more ideas with one another (McMullen, 1976, cited in Selby et al.,
This is in keeping with the associationists’ approach toward creativity and Milgram and Rabkin (1980) have reminded us that associative patterns can be examined by administering open-ended questions like those contained in divergent thinking tests.

In this study, it is hypothesized that the performance of the high creative and the low creative subjects can improve as a result of creativity training with the high creatives performing better than the low creatives. Maddi (1975) and Chia (1997) have informed us that creativity training can positively affect creativity level. One’s imagination can be strengthened by cognitive exercises such as restructuring problems and thinking through analogies. Thus, the high and low creatives in this study are expected to gain from creativity training through the Khatena Training Method. If the results are positive, this will give us the assurance that the creativity thinking abilities of the high creatives and the low creatives can be further enhanced through creativity training.

The gap between one’s potential creative talent and one’s lesser actual creative output can be narrowed to a great extent (Parnes, 1962). We also know that everyone is endowed with creative potential (Gute et al., 2008; Khatena, 2000; Nierenberg, 1982). So if the low creatives can gain from creativity training just as the high creatives, it will give us the confidence to further train students with low creative ability. The Study undertaken by Wallach and Kogan (1965) discovered that the non-creative subjects were fearful or reluctant of being original rather than unable to be original in their thinking. They further pointed out that the non-creative subjects, though highly intelligent, were disinterested and disinclined to use their imagination. It will indeed seem a waste of human resources if highly intelligent persons are not trained to be creative. The study by Wallach and Kogan was supported by the study of
Bowers (1965) for he too discovered that many people have the potential for higher creative performance which might be blocked from being unleashed by negative thinking like the reluctance to express creatively.

Studies carried out in the United States and in other parts of the world (Kim, 2008a; Silvia, 2008) including Malaysia (Chia, 1997; Gan, 1998; Palaniappan, 1994; Yong, 1986) found low correlations between intelligence and creativity, pointing to the fact that intelligence and creativity are different facets of mental functioning. However, Piaget (1962) is of the view that creativity and intelligence can work together in a synergetic manner to generate more productive activity. Thus, our educational system that believes in the all-round development of a person should encourage both intellectual and creative pursuits in an environment that is conducive. This is because Chia’s (1997) study revealed that there is a significant correlation between intelligence and creativity at the higher levels. Chia in her empirical study that focused on creativity training, investigated the creative thinking abilities of high creatives and low creatives in connection with their IQ levels. Her study, “found that significant improvement in creativity index via fluency and originality was obtained only for the high IQ-high creativity teacher trainees” (p. 4). However, the creativity of the high IQ-low creativity, high creativity-low IQ, and the low IQ-low creativity groups were not significantly improved as a result of creativity training. This study intends to investigate if creativity training can make a positive difference to the creative potential of both the high creative and the low creative subjects.

3.6.2 Gender Category (Males and Females)
In the studies carried out by some researchers (Feldhusen et al., 1969; Katiyar & Jari, 1983; Garaigordobil, 2006), the subjects in the experimental group were given creativity training but later when they were tested, it was discovered that sex did not make a difference where creativity was concerned. However, in other studies undertaken by Speedie, Treffinger, and Feldhusen (1971) and Liikanen (1975), it was found that females generally performed better than males and in the study by Khatena and Dickerson (1973) the males performed better than the females. In yet another study by O’Tuel (1989), it was discovered that females and males performed better in verbal and figural creativity respectively. The conflicting findings from the studies mentioned above regarding the gender issue provide the rationale for investigating the performance of males and females in this study that focuses on creativity training. This study intends to investigate firstly, if creativity can be increased in both the male and female subjects as a result of creativity training. Secondly, the study intends to determine if creativity training makes a greater difference to the male or female subjects.

The studies mentioned above are now reviewed in detail. The first evaluative research of the Purdue Creative Thinking Program by Feldhusen et al. (1969) involved 265 children. The Torrance Tests of Creative Thinking (TTCT) and the Metropolitan Achievement Test were used as criterion measures. Though the subjects who received creativity instruction scored higher than those who did not get the instruction, there were no significant differences between the scores of the male and female subjects. Similarly, in the study undertaken by Katiyar and Jari (1983), 80 high school subjects of grade nine were used. The study was a randomized control group, pretest-posttest design of experiment. The experimental group of 40 subjects were given creativity
training and later tested with the TTCT. The study established a significant effect for creativity training. However, it was revealed that sex had no significant effect on the development of the subjects’ creativity. The study carried out by Garaigordobil (2006) involved a play programme that was designed to stimulate verbal and figural creativity in 86 children. Though the results of the analysis of variance suggested a positive effect of the experimental treatment and a significantly greater change in the experimental subjects, the effects of the intervention was the same for the males and females. Males and females exhibited similar levels of change in verbal and figural creativity “suggesting that there was no differential effect of the program as a function of gender” (p. 341).

In contrast to the studies discussed above, researchers (Speedie et al., 1971; Liikanen, 1975; Khatena & Dickerson, 1973; O’Tuel, 1989) of other studies found different results. Speedie et al. (1971) carried out their study to investigate the long-term effects of the Purdue Creative Thinking Program. Students who were subjected to creativity training were tested seven months later. The study revealed consistent sex differences across all treatment conditions with females performing better than males on non-verbal elaboration and verbal fluency. Similar results were obtained by the study that was undertaken by Liikanen (1975) in Finland that involved 168 pre-school subjects. The subjects were exposed to creativity training for six weeks after which they were tested for creativity gains. It was discovered that the creativity scores of the females were higher than the scores obtained by the males in fluency, flexibility, and originality of ideas. In the study by Khatena and Dickerson (1973), males from the experimental group obtained higher mean fluency, flexibility and originality scores compared to the females. However, significant
interaction of training by sex was found only for originality scores. In 1989, O’Tuel undertook a study to see if there were sex differences on the Structure of Intellect Learning Abilities (SOI-LA). The study involved 300 gifted students in the fourth, seventh and tenth grade. There were significant differences by sex on five variables. Males scored significantly higher on visual closure and vocabulary whereas females scored significantly higher on analysis, verbal creative, and extended verbal systems. The results that showed females performing better on various verbal tasks and males performing better on a figural subtest of the SOI-LA were consistent with findings on sex differences by other studies.

A review of the literature has revealed that there is a dearth of studies that looked into the creative performance of males and females before and after creativity training. In the Malaysian educational context, the only study so far that focused on creativity training did not look into the creativity training-gender issue. However, the few studies reviewed above have revealed that though males and females gained from creativity training, there is no agreement that males are more creative than females or vice versa.

There are not only inconsistencies in the findings of studies that looked into the creativity-gender issue as a result of creativity training but there are also similar inconsistencies in the numerous investigatory studies that looked into the creativity-gender issue generally as a result of comparing the performance of males and females in creativity inventories and through testing measures (Baer & Kaufman, 2008; Barron & Harrington, 1981). Briefly, research findings about sex differences in creativity have been varied (Khaleefa, Erdos, & Ashria, 1996), revealing no agreement about gender differences in creativity scores (Kaufman, Baer, & Gentile, 2004). Generally, research findings about sex
differences in creativity have ranged from cases where no discernible sex differences were found (Baer & Kaufman, 2008; Barrantes-Vidal, Caparros, & Obiols, 1999; Richardson, 1995; Rodd, 1999; Saeki et al., 2001) to cases where such differences were rather pronounced (Abra, 1991; Baer, 1998; Boling & Boling, 1993; Dudek, Strobel, & Runco, 1993; Kim & Michael, 1995; Linn & Hyde, 1989; Richardson, 1986). What the above mentioned researchers have stated, points to the fact that there is no conclusive evidence to say with certainty that males are superior to females in creative ability or vice versa.

Malaysian researchers (Chan, 1986; Palaniappan, 1994; Yong, 1986) who investigated the gender issue as a result of creativity testing found that male Form Four students were generally more creative than female Form Four students or there were no gender differences (Palaniappan, 2000). However, this study will be different from the earlier studies as it intends to determine gender difference as a result of creativity training. It would be interesting to see if the gender differences found in the present study that focuses on creativity training, are similar to the common findings of previous Malaysian studies in which generally the female students fell behind the male students in creativity scores. If the results of the present study are consistent with the results of the earlier studies, then perhaps we need to think of the reasons as to why Form Four female students are not performing as well as their counterparts in creativity test scores and take appropriate measures.

The results of the Malaysian studies that showed males performing significantly better than females could be related to social and cultural factors, with regard to the role of women in Malaysian society just as in other similar societies and cultures such as in India (Gupta, 1981), Nigeria (Akinboye, 1982), Sudan (Khalefa et al., 1996), Kuwait (Soliman, 1989) and Egypt (Issa, 1985).
In the above mentioned studies, reasons for males exhibiting more creative potential than females may be due to the effects of cultural thinking, sexist thinking, and social roles, whereby females are generally given little encouragement, opportunity, and freedom to develop their creative potential which in turn leads to a lack of motivation and a sense of quest (Helson, 1978). Forisha (1978a) and Khatena (1992) too have informed us that a reason for the difference in creative talent can be due to sex-stereotyping of cultural and social roles that are usually highlighted in the mass media of especially under-developed and developing countries. Generally, females are encouraged to be more nurturing and to exhibit their creativity in ways related to the family and home, while males are expected to be more independent, achievement-oriented, and show their eminence in their professions and interests. Also, females are perceived as timid, shy, conforming, and lacking in motivation, expectation, and aspiration. On the other hand, males are portrayed as bold, vocal, assertive, attention-seeking, and attention-getting.

3.6.3 Academic Stream (Science and Arts)

We are informed that the difference in creativity between science and arts students as measured by divergent thinking tests is one of the controversial issues concerning creativity (Cheung et al., 2003). However, just as the paucity of research studies regarding the performance of high and low creatives as well as males and females as a result of creativity training, there are hardly any studies that looked into the creative thinking abilities of students in the science and arts streams.

Cheung et al. (2003) and Roskams and Fisher (2006) have informed us that a number of general studies reported differences in creativity between
university science and arts students on divergent thinking tests (Hartley & Greggs, 1997; Lloyd-Bostoc, 1979; Webster & Walker, 1981). The studies revealed that students of English and Arts in general performed better than students in Science and Business. In a study undertaken by Papworth and James (2003), the aim was to determine if undergraduate arts students were more creative than science students. A total of 104 undergraduates (36 arts & 68 science students) volunteered for the study which revealed that the students of science (Engineering) displayed lower creativity compared to the arts students (Fine Arts, \( n = 24 \) & English, \( n = 12 \)). According to Papworth and James (2003), a possible explanation for the better performance of the arts students may be that “the artists’ reduced levels of analytical thinking and their greater tendency to distort information, ‘frees them up’ to think more creatively” (p. 9). Besides, according to cognitive theories of creative thinking, there may be an association between artistic creativity and a divergent style of thinking that is distinguished by specific differences where logical appraisal skills are concerned (Papworth & James, 2003). Other researchers too have informed us that students in artistic fields generally display more imaginative, intuitive, and emotive forms of expression (Drewe, 1998; Ludwig, 1998; Runco & Bahleda, 1986) compared to students in the sciences who are more analytical in nature which can have adverse effects on creative performance (Dacey & Lennon, 1998; Simonton, 1994). In a study undertaken by Kapur, Subramanyam, and Shah (1997), (cited in Niu & Sternberg, 2002) who interviewed twenty Indian scientists about their views on creativity, it was discovered that among other things, the processes involved in artistic and scientific creativity are not the same. Scientific creativity involves more logic and rules than artistic creativity.
The studies mentioned above (Hartley & Greggs, 1997; Lloyd-Bostoc, 1979; Papworth & James, 2003; Webster & Walker, 1981) produced results in favour of arts’ students. However, to Gowan (1980), creativity is also an important aim in the teaching of science. To him, the stimulation of the right brain to produce imagery can be made in science as in art and music, if the appropriate creativity teaching and training methods are utilized. He believes that in science, it is the imagery as opposed to logic that leads to creative discovery. Gehlbach (1987) concurred with Gowan’s view when he said that “the kind of creativity demanded and practised in the sciences, engineering and everyday technology is much more important to the future of society” (p. 3). Gehlbach does not deny the impact of the arts especially the fine arts in adding to the richness of our lives but to him there is also the pressing need for effective and innovative solutions to problems in the other domains of human endeavor such as in the sciences. Kapur et al. (1997) have shared a similar view with Gehlbach as they too believe that scientific creativity can have a greater impact on society than artistic creativity. Shahrin, Toh, Ho, and Wong (2002) have informed us that “the call for the development of creativity in students has prompted educators, including those involved in science education, to seek new strategies that lead to higher-order thinking skills” (p. 77).

The controversy of whether science or arts students are more creatively inclined also brings into focus whether a person’s creativity is domain-specific, domain-general or both (Han and Marvin, 2002). While there are researchers (Cramond, 1994; Khatena, 2000; Milgram, 1990; Plucker, 1998; Torrance, 1988b) who are of the view that creativity is a generalized human ability that is applicable across domains, there are also other researchers (Csikszentmihalyi, 1990; Gardner, 1993; Han & Marvin, 2002; Jalongo, 2006; Piirto, 2004) who
believe that creativity is domain-specific, though research supporting this view is limited (Baer, 1998; Bamberger, 1990). This on-going debate over the domain-generality and domain-specificity issue of creativity may be due to the lack of empirical studies (Han & Marvin, 2002), or due to the “view that cognitive functions required for creativity in one domain might be different from those required for creativity in another domain” (Lee & Seo, 2006, p. 237). To further complicate the issue, there are still others who argue that creativity can be both a domain-general and domain-specific construct (Hong, Milgram, & Gorsky, 1995; Sternberg & Lubart, 1999). This is because they operate interactively to produce performance differences (Sternberg, 1989, cited in Diakidoy & Spanoudis, 2002). This controversy of creativity being a construct that is domain-general, domain-specific or both is indeed inconsistent and inconclusive and may be due to problems of interpretation of theories and limitation of methods (Han & Marvin, 2002; Plucker, 1998).

In this study, creativity is viewed as a general trait that can also run across many domains. If the assumption that domain-general creativity is wrong, then the current research practice of training and identifying creative children is a waste of time and resources (Baer, 1994). However, if creativity is looked upon as also domain-specific, then creative thinking skills can also be fostered within specific talent areas (Plucker, 1998) such as in the different academic streams (science and arts). In the Malaysian education system, the major division in subject area choice among students in secondary schools is usually between the sciences (natural sciences, technology) and the arts (humanities, fine arts, social sciences). In the Malaysian context, no study has been conducted so far to determine the performance of students from the science and arts streams in creativity tests as a result of creativity training.
3.7 Summary

Creativity is a multi-dimensional phenomenon that is paradoxical and so variegated in nature that the more research we do on it and its many correlates, the more it fills our minds with questions to wrestle with. However, one important question that researchers will generally answer in the affirmative is the question, Is it important to foster creative thinking in educational pursuits? This is because “creativity is one of the most highly valued qualities of human beings” (Sen & Hagtvet, 1993, p. 496) and the fostering of creative thinking skills should start with children for creativity is like a seed hidden in the dormant mind of a child (Amabile, 1983b; Williams, 2002).

Many prominent researchers such as Guilford (1967), Torrance (1970) and Khatena (2000) are of the opinion that students can be trained in creative thinking skills. The multitudinous number of empirical studies undertaken that involved children, youths, and adults, from pre-school to university level, attest to this fact. Training and testing for creativity have been made possible by the many creativity training techniques and strategies, creativity training procedures as well as empirically tested measures of creativity that are available.

Creativity is not a gift bestowed on a chosen few. Every child has the creative potential (Gute et al., 2008) and all it takes is to light the flame of creativity for it to glow and grow. Nierenberg (1982) is of the opinion that creativity is the result of using learned characteristics and that everyone is creative in different ways. We all possess a vast cauldron of latent creativity in us and all it takes is to express a positive attitude and interest to learn how to release or unleash this creative potential. Creative thinking abilities can be developed and it is the legitimate function of education to seek to develop these
abilities. In an age in which international competition for educational excellence seems to grow by leaps and bounds, we cannot afford to squander our national resource of creative talent in our educational institutions.

The review of literature on studies concerning creativity and its many correlates reveal that there are inconsistencies in findings and this is not surprising given the fact that creativity and its correlates are all complex and dynamic concepts. The lack of agreement on issues concerning creativity and its correlates has prevented the emergence of a commonly accepted construct of creativity. The inconsistencies in the results of the studies reviewed and reported, maybe due to a host of factors such as the definitions of creativity adopted, the theories and models of creativity subscribed to, the methodologies resorted to, the measurements utilized, the specific aims or objectives of the study looked into, the type of educational systems studied, the population samples chosen, and the statistical treatments used.

In view of the inconsistencies of the results obtained regarding creativity, and its correlates that are of interest in this study such as ability level (high creatives & low creatives), gender category (males & females), and academic stream (science & arts), it is difficult to make a general prediction of the results. However, in this study that involves Form Four students, it is hypothesized that there will be a significant gain in creativity scores in the experimental group (both the ability groups of high creatives and low creatives) as compared to the control group, after training and testing just as in Chia’s (1997) study that involved teacher trainees, though she utilized the Creative Problem Solving (CPS) programme and the Torrance Tests of Creative Thinking (TTCT) instrument. In this study, the Khatena Training Method (KTM) will give the subjects concerned, opportunities to improve and increase their creative
imagination imagery and the Thinking Creatively with Sounds and Words (TCSW) test battery will measure the increase in verbal originality.

CHAPTER FOUR
Research Methodology

4.0 Introduction

This chapter explains the methodology used to investigate the effectiveness of the adapted Khatena Training Method (KTM) treatment on a sample of Form Four subjects in a typical secondary school in relation to their creative ability level, gender category, and academic stream. The specific objectives of the study are restated and the research methodology used is discussed under headings such as experimental research, study sample, research measures, pilot study, data collection procedures, and data analysis procedures.

This study has three objectives. The first objective is to determine whether creative thinking abilities can be enhanced in the subjects from the experimental group who will receive the KTM treatment as compared to the subjects in the control group who will not receive the KTM treatment. The Thinking Creatively with Sounds and Words (TCSW) test battery is to be used for pretesting and posttesting to measure creativity gains. The second objective is to determine the effectiveness of the KTM treatment between the experimental and control groups for the high creatives, low creatives, males, females, science, and arts subjects as measured by the TCSW test battery. The third objective is to determine the effectiveness of the KTM treatment between the experimental and control groups as a result of pretesting and delayed
posttesting (after two weeks) based on the subjects written compositions. For this purpose the Using Modality and Imagery in Writing (UMIW) checklist is to be used to determine if any educational transfer effect has taken place after two weeks as a result of the KTM treatment.

4.1 Experimental Research

This study is based on empirical evidence and is discussed under headings such as research design, independent variables, dependent variables, internal validity, and external validity.

4.1.1 Research Design

The research design selected for this study that involves creativity training is the randomized groups, pretest-posttest design (Ary, Jacobs & Razavieh, 1972) as depicted in Figure 4.1.

<table>
<thead>
<tr>
<th>Group</th>
<th>Pretest</th>
<th>Independent Variable</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>(R)</td>
<td>E</td>
<td>Y1</td>
<td>X</td>
</tr>
<tr>
<td>(R)</td>
<td>C</td>
<td>Y1</td>
<td>-</td>
</tr>
</tbody>
</table>

*Figure 4.1: Randomized Groups, Pretest-Posttest Design*

The characteristics of the randomized groups, pretest-posttest design are firstly, subjects are randomly (R) assigned (stratified random sampling) to experimental (E) and control (C) groups. Randomization that was done for this study assures equivalence between the groups prior to experimentation. We are informed that “the most adequate all purpose assurance of lack of initial biases between groups is randomization” (Campbell & Stanley, 1966, p. 25). Thus with randomization it can be assumed that problems of differential selection of
subjects and statistical regression can be controlled to a great extent. Randomization in this design can also control extraneous variables such as effects of history, maturation, pretesting, and instrumentation (Sekaran, 2003).

Secondly, experimental and control groups are pretested on the dependent variable Y1. For the pretest in this study, the Thinking Creatively with Sounds and Words (TCSW) test battery (Forms 1A) was used. The pretest was administered before the commencement of creativity training. Control of the pretest can provide an additional check on the equality of the two groups on the dependent variable Y1.

Thirdly, treatment is given only to experimental subjects. Creativity treatment is the independent variable X that is of interest. In this study, creativity treatment was given to the experimental subjects over two days via the Khatena Training Method (KTM).

Fourthly, experimental and control groups are posttested on the dependent variable Y2. For the posttest in this study, the TCSW (Forms 1B) was used. The posttest was administered a day after the KTM treatment.

Fifthly, the average difference between the pretest and posttest (Y2 – Y1) is found for the experimental group and for the control group. The purpose is to ascertain whether the experimental treatment produced a greater change than the control situation.

According to Ary et al. (1972), the experimental method is “… a scientific investigation in which an investigator manipulates and controls one or more independent variables and observes the dependent variable or variables for variation concomitant to the manipulation of the independent variables” (p. 26). Besides, normally in instructional areas, gain scores are analyzed and the pretest score can be used as a statistical control (Wiersma, 1995). Zimmerman and
Williams (1982) too believe that gain scores are useful in experimental research. The randomized groups, pretest-posttest design has been used in experimental research that involved creativity training (Blissett, 1994; Chia, 1997).

Initially, the Solomon four-group design (Soloman, 1949; Wiersma, 1995) was considered for this study. It involves two experimental and two control groups but only one of each of the two types of groups is pretested. This design is advantageous in checking on possible effects of pretesting as well as to gain more confidence in internal and external validity in experimental designs. However, such a design was thought to be unnecessary as different sub-measures were used for the pretest and the posttest in this study. Forms 1A of the TCSW was used as pretest and Forms 1B of the TCSW was used as posttest. Besides, the design was unsuitable for this study as more students and time were needed. A secondary grade A school normally has about 200 to 300 Form Four students in the science and arts academic streams. Thus, the selection of students as high creatives and low creatives at the onset of the research based on extreme scores according to their performance in the creativity inventory of Something About Myself reduced the number drastically. Furthermore, the school concerned was apprehensive about allocating more time for the experiment as it could further disrupt the normal school schedule.

4.1.2 Independent Variables

This study investigated the effectiveness of creativity intervention via the Khatena Training Method (KTM) on the Form Four subjects in the experimental and control groups. Creativity training via the KTM was the independent or predictor variable. This study also determined the effectiveness of the KTM treatment between the experimental and control groups for the high
creative, low creative, male, female, science, and arts subjects. Creative ability level (high creatives & low creatives), gender category (males & females), and academic stream (science & arts) were the assigned independent variables or control variables in this study.

Creativity training which was the experimental or treatment variable of interest was deliberately manipulated by the researcher to determine if creativity training through the KTM could enhance the creative thinking abilities of the subjects in the experimental group. Creativity training was based on an adapted KTM that had been approved by Prof. Emeritus Dr. J. Khatena from Florida, USA. Khatena and other researchers have used the KTM strategies in a number of studies (these studies have been reviewed and reported in Chapter Three).

4.1.3 Dependent Variables

The Thinking Creatively with Sounds and Words (TCSW) test battery was the dependent variable of interest in this study. The test battery comprised two sub-tests, namely, Sounds and Images (S&I, Forms 1 A and B) and Onomatopoeia and Images (O&I, Forms 1 A and B). Forms 1 A of the S&I and O&I was used as the pretest and Forms 1 B of the S&I and O&I was used as the posttest. The pretest established a baseline of the subjects’ creative potential before the treatment and the posttest determined the extent of creative enhancement in the subjects after the treatment. Apart from the TCSW, the Using Modality and Imagery in Writing (UMIW) checklist was used as pretest and delayed posttest (the TCSW and UMIW are discussed further in this Chapter, 4.3 and were also discussed in Chapter Three).

4.1.4 Internal Validity
According to Campbell and Stanley (1966), internal validity is essentially a problem of control and is concerned with questions such as: Did the experimental variable really make a significant difference? The internal validity of an experimental study needs to be given due consideration, so that the findings obtained can be interpreted accurately and with confidence. Some of the factors that may affect the internal validity of the results of a study such as history, maturation, testing, instrumentation, selection, statistical regression, and mortality are discussed below.

4.1.4.1 History Effects

History refers to unexpected and uncontrollable events, both specific and general that may occur between pretesting and posttesting of the subjects or while the experiment is in progress. These events or factors can confound the independent variable-dependent variable or cause-and-effect relationship and thereby affect internal validity. However, if certain unforeseen events occur unexpectedly in the school environment, it is possible that subjects in both the experimental and control groups will be affected similarly. Thus, the effects of history on the study can be controlled.

4.1.4.2 Maturation Effects

Cause-and-effect inferences can be contaminated by the effects of the passage of time or maturation, both biological and psychological. Maturation processes will include growing older and wiser and this in turn can affect test scores. Besides, in a learning experiment, the performance of subjects can decrease after a length of time because of fatigue, boredom, and hunger. Thus, internal validity can get reduced due to the effects of maturation inasmuch as it
is difficult to pinpoint how much of the creativity gains are attributable to creativity training. However, since the subjects in the experimental and control groups in this study are of somewhat similar chronological age (average age was 16 years, 4 months) and the experimental schedule (while the experimentals were attending the training programme, the controls were occupied with their normal lessons) as well as the duration for testing were similar for both the groups, factors such as maturation or general developmental changes in subjects as well as fatigue, boredom, and hunger, if any, will similarly affect the subjects in both groups and hence controlled.

4.1.4.3 Testing Effects

Normally, to test the effects of a treatment or intervention, subjects are first asked to take a pretest. Then the treatment will be given before a posttest is administered. The difference between the posttest and the pretest scores is then attributed to the treatment. But the fact that the subjects are exposed to the pretest might influence their responses on the posttest and this can adversely affect internal validity of experimental designs. However, different submeasures were used for the pretest and the posttest in this study. Forms 1A of the TCSW was used as pretest and Forms 1B of the TCSW was used as posttest and this could minimize the threat of testing effects. Another problem can arise as a result of training the subjects in the experimental group by using many techniques and strategies and then making use of some of those techniques or strategies in the dependent variables. This may be seen as “teaching to the test”. However, to Kurtzberg and Reale (1999) this depends on whether we are viewing the criticism of “teaching to the test” as a training strategy or content. In this study, while the strategies taught to the subjects in the experimental
group to enhance their creative thinking skills could prepare them for the posttest, the content of the training was different compared to the content of the pretest and posttest. Besides, in the educational context, training of skills and then applying them to the curriculum is carried out routinely. Thus, testing effects will not be a threat to internal validity.

4.1.4.4 Instrumentation Effects

Instrumentation effects can be a threat to internal validity. This can happen because of a change in the testing instruments between pretest and posttest and not due to the treatment’s differential impact at the end. However, instrumentation effects will not be a threat to the validity of the study as the TCSW test battery is a “paper and pencil” test and does not require observation. Besides, the test conductors (researcher and assistant) were the same for all the tests administered. Also the researcher and her assistant were the only scorers for the tests.

4.1.4.5 Selection Bias Effects

The threat to internal validity can also be due to improper or unmatched selection of subjects for the experimental and control groups which may contaminate the cause-and-effect relationship. Thus, differential selection of subjects or bias in group composition which is an effect due to the groups of subjects not being randomly assigned and hence not equivalent can affect the study. But in this study the subjects were selected at the onset based on the principle of extreme scores according to their performance in the creativity inventory of Something About Myself (SAM). The purpose of administering the SAM was to differentiate the subjects into high creatives (75th percentile) and
low creatives (25th percentile). The selected subjects were then randomly assigned to either the experimental or control group, thereby providing an impartial method of assignment, free from personal biases. This also ensures a firm basis for the subsequent application of significance tests and statistical methods. Besides, random assignment of subjects can also reduce or distribute the effects of confounding factors such as socio-economic status, home environment, parental influence, cognitive levels, learning style, and motivation which are not investigated in this study.

4.1.4.6 Statistical Regression

The effects of statistical regression can happen when the subjects chosen for the experimental group have extreme scores on the dependent variable to begin with. From the laws of probability we know that those with very low scores on a variable have a greater probability of demonstrating improvement and scoring closer to the mean on the posttest after the treatment. Thus, low scorers tending to score nearer to the mean is known as statistical regression. In the same way, those with very high abilities could also regress toward the mean if they score lower on the posttest than on the pretest. The phenomenon of statistical regression can affect internal validity. However, though in the initial process, the principle of extreme scores was used to differentiate the high and the low creative subjects, the problem of statistical regression might not be a threat. This is because the subjects participating in the experiment were randomly assigned to the experimental and control groups. Thus, the problem of statistical regression affecting the experiment was controlled.
4.1.4.7 Mortality

The internal validity of a study can also be affected by experimental mortality or attrition of the subjects in both the experimental (during training and testing) and control (during testing) groups. However, to overcome this problem, the researcher explained to the school authorities that the subjects involved in the study cannot miss the training and testing sessions as it may affect the validity of the study. The subjects too were briefed of the importance of their attendance and participation. Besides, experimental mortality was not expected or not expected to be high as testing and training was conducted in seven days.

4.1.5 External Validity

According to Bracht and Glass (1968), external validity refers to the generalizability or representations of the findings and is concerned with questions such as: To what populations and/or conditions can these findings be generalized? Some of the factors that may affect the external validity of the findings of this study such as population sample differences, contrived study arrangements, and influence of testing and training are discussed below.

4.1.5.1 Population Sample Differences

For this study, Form Four students from a typical school were selected since in an experimental study using students from more than one school can cause internal validity problems. Thus, the results of the study are limited to only Form Four students in a typical secondary school and cannot be generalized to the population at large. A typical secondary school can be classified according to criteria such as the name of the school district, the type
of school, the school location, and the school grade (please refer to Study Sample below).

4.1.5.2 Contrived Study Arrangements

The idea of being involved in a special study that is not part of the routine of the students may affect their performance. However, many schools organize useful educational programmes for their students from time to time. As such the teachers and the school concerned welcomed this study. The students too viewed it as one of the normal programmes organized for their benefit. Besides, ordinary classrooms in the school that were available and conducive for the study were used for training and testing the subjects. Thus, the setting in which the study was carried out was that of the real world.

4.1.5.3 Pretest Influence

In this study the pretest can influence the subjects’ sensitivity or responsiveness to the experimental variable. Hence the results of a pretested sample may not be representative of the effects of the experimental variable for the unpretested population. The external validity of the study can also be threatened when the pretest interacts with the training. However, this threat is not considered to be serious because in an educational setting, students are used to taking all kinds of tests such as academic tests and attending various kinds of training such as training for debates and sports. Thus, this study which involves testing and training will not affect the subjects.

4.2 Study Sample
The typical secondary school selected and the subjects who participated in this experimental study are discussed below.

4.2.1 School

The school identified for the research was a typical secondary school in the state of Selangor, selected from a list of 237 schools provided by the Ministry of Education and constituted a nationally stratified and representative sample of students in urban and rural schools. Though the state of Selangor is one of the five states in Malaysia that has the most number of schools, it has the most number of students.

The rationale for selecting a typical secondary school in the state of Selangor to conduct the research was that the findings could be generalized to a larger population. A typical secondary school can be classified according to the following criteria: the name of the school district, the type of school, the school location, and the school grade.

The state of Selangor has a total of 237 secondary schools spread over 9 districts. However the district of Petaling has the most number of secondary schools (67 schools or 28%) compared to the district of Sabah Bernam which has the least number of secondary schools (10 schools or 4%). The other school districts are Hulu Langat (36 schools or 15%), Klang (35 schools or 15%), Gombak (31 schools or 13%), Kuala Selangor (16 schools or 7%) and Kuala Langat, Hulu Selangor, and Sepang (14 schools each or 6% each).

Although the state of Selangor has 237 secondary schools, the type of secondary school that makes up the majority (217) is the ordinary national secondary school or “Sekolah Menengah Kebangsaan Biasa, (SMK Biasa)”. The
remaining 20 schools are categorized as residential, technical, religious, and special schools. The district of Petaling has the most number of SMK Biasa (65 schools).

Out of the 217 SMK Biasa in the state of Selangor, 117 schools are located in urban areas and the rest (100) are located in rural areas. From the 117 schools in the urban areas, 71 are grade A and 46 are grade B. In the rural areas, out of the 100 schools, 68 are grade A and 32 are grade B. To be classified as a grade A school, the minimum student enrolment in an urban school should be 500 students and in a rural school, 150 students. The district of Petaling has the most number of urban schools (61) and the most number of grade A schools (37).

Thus, for this research study, a typical secondary school in the state of Selangor can be termed as a grade A, ordinary national secondary school (SMK Biasa) from an urban area in the district of Petaling.

4.2.2 Subjects

Form Four students who were studying in a typical grade A, government secondary school in an urban area in the state of Selangor during the school year of 2007 were chosen as the subjects for this study. Normally, students who are in Form Four have completed six years of primary education in the New Curriculum for Primary Schools or “Kurikulum Baru Sekolah Rendah” (KBSR) which ends with the year six national examination or “Ujian Penilaian Sekolah Rendah” (UPSR). They have also completed three years of lower secondary education in the New Curriculum for Secondary Schools or “Kurikulum Bersepadu Sekolah Menengah” (KBSM) which culminates in the Form Three national examination or “Penilaian Menengah Rendah” (PMR). Thus, they have
nine years of schooling experience, provided they have not been involved in automatic promotion to a higher standard during their primary school years or retained in the same standard during their lower secondary school years. They are generally of about the same age, that is, 16 years if they have completed nine years of schooling.

Form Four students were selected for this study because they can be considered as adolescents and according to Torrance (1962), youths who are 16 to 18 years in age are at that stage of their lives when they need outlets for their emotional energy and need to be given the full use of their imagination. Torrance also stressed that it is perhaps the best age for testing and guidance, for the potential to contribute to public creativity is attained during adolescence (Pickard, 1990). Gruber (1980) and Dacey (1989a) are in agreement with Torrance. To Gruber, when children move into adolescence and the formal operation stage that Piaget (1966) talked of, they discover and learn about their creative processes. Dacey (1989a) has also said that since in early adolescence one’s self-concept is being defined, it may be a good time for creativity to be fostered. According to Strom and Strom (2002), studies like the one conducted by Morris (1998), discovered that “adolescents are more interested in novelty than are children and adults” (pp.191-192). This is because adolescence is a period of being stimulated and attracted to what is extraordinary, seeking thrills, and taking risks (Howard, 2000). Thus, the Form Four students involved in this study may be receptive to creativity training and testing which will stretch their imagination. Creative strategies and activities usually stimulate imaginative and inventive thinking (De Bono, 1998).

Initially all the Form Four students ($N = 257$) in the selected typical school from the science ($n = 135$) and arts ($n = 122$) academic streams were
administered the sub-measure known as Something About Myself (SAM) from the Khatena Torrance Creative Perception Inventory (KTCPI). For the SAM inventory, the highest possible score is 50 (one point for each item) and the lowest is 0. For the maximum score of 50, the standard scores are 80 for males and 84 for females. The purpose of administering SAM was to differentiate the students into high creatives and low creatives according to their performance. The differentiation of the high and low creatives was done separately for the arts and science streams to ensure a more or less equal number of students for the experiment from the two academic streams. Those students obtaining scores above the 75th percentile (upper quartile) were designated as the high creative group and those below the 25th percentile (lower quartile) as the low creative group (Anderson, 1999; Keller, Warrack, & Bartel, 1994).

For the science stream (\(n = 135\)), the raw scores for the high creatives (\(n = 46\)) ranged from 34 to 44 and for the low creatives (\(n = 43\)) the raw scores ranged from 17 to 29. The rest of the science students (\(n = 46\)) whose raw scores ranged from 30 to 33, were not included in the study. From the initial number of 135 science students, a total of 89 students were selected based on their extreme scores on SAM.

Similarly, for the arts stream (\(n = 122\)), the raw scores for the high creatives (\(n = 31\)) ranged from 33 to 42 and for the low creatives (\(n = 41\)) the raw scores ranged from 16 to 25. The rest of the arts students (\(n = 50\)) whose raw scores ranged from 26 to 32, were not included in the study. From the initial number of 122 arts students, a total of 72 students were selected based on their extreme scores on SAM.

After the differentiation of the science and arts students into high creatives (\(n = 77\)) and low creatives (\(n = 84\)), the 161 students were ready to be
involved in the experimental study. However, they had to be first randomly assigned to the experimental or control groups. The male \((n = 88)\) and female \((n = 73)\) students from the science \((n = 89)\) and arts \((n = 72)\) streams, who were designated as high creatives \((n = 77)\), were then randomly assigned (stratified random sampling) to the experimental group \((n = 38)\) or to the control group \((n = 39)\). The same process was applied to the low creatives \((n = 84)\) who were also randomly assigned to the experimental \((n = 43)\) group or to the control group \((n = 41)\). According to Keller et al. (1994), “a stratified random sample is obtained by separating the population into mutually exclusive sets or strata and then drawing simple random samples from each stratum” (p. 223). The random assignment of subjects to the experimental or control groups was to equalize both groups on the basis of creative level (high creatives & low creatives), gender category (males & females) and academic stream (science & arts).

Finally, the experimental group \((n = 81)\) and the control group \((n = 80)\) had more or less equal numbers of high and low creatives, males and females as well as science and arts students (Figure 4.2, depicts the random assignment of subjects). The average age of the total number of subjects \((n = 161)\) who were ready to participate in the rest of this experimental study was 16 years and 4 months. The average age for the science subjects was 16 years and 5 months and that of the arts subjects was 16 years and 4 months.

A total number of 161 students were involved in this experimental study either in the testing and training sessions (experimental group) or only in the testing sessions (control group). Then the subjects in the experimental and control groups \((n = 161)\) were asked to take the Thinking Creatively with Sounds and Words (TCSW), (Forms 1A, of the S&I & the O&I) used as pretest of creativity. The TCSW pretest was to determine their baseline originality
scores. The subjects were also asked to take the Using Modality and Imagery in Writing (UMIW) measure used as pretest for the written component. The UMIW pretest was to determine their baseline modality and imagery scores.

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**Diagram:**

```
SAM
Subjects who participated in SAM (N=257)
Subjects selected through extreme scores (n=161)

Males (n=88, science=47 & arts=41)
  High Creatives (n=41) Low Creatives (n=47)
    Exp (n=20) Con (n=21) Exp (n=24) Con (n=23)
  Females (n=73, science=42 & arts=31)
  High Creatives (n=36) Low Creatives (n=37)
    Exp (n=18) Con (n=18) Exp (n=19) Con (n=18)

Pre Creativity Tests (TCSW & UMIW)
(Experimental & Control Groups)
Training (KTM)
(Experimental Group)
Post Creativity Test (TCSW)
(Experimental & Control Groups)
Delayed Post Creativity Test (UMIW)
(Experimental & Control Groups)
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<table>
<thead>
<tr>
<th>Experimental (Exp) Group (N=81)</th>
<th>Control (Con) Group (N=80)</th>
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</thead>
<tbody>
<tr>
<td>Science High Creative Males:</td>
<td>Science High Creative Males:</td>
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<tr>
<td>12</td>
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<tr>
<td>Science High Creative Females:</td>
<td>Science High Creative Females:</td>
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<td>11</td>
<td>11</td>
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<tr>
<td>Science Low Creative Males:</td>
<td>Science Low Creative Males:</td>
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<td>12</td>
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<td>Science Low Creative Females:</td>
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<td>10</td>
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<td>Arts High Creative Males:</td>
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</table>
Figure 4.2: Random Assignment of Subjects

The subjects in the experimental group \( n = 81 \) were then given the Khatena Training Method (KTM) treatment and the subjects in the control group \( n = 80 \) were not given the KTM treatment. When the experimental subjects were given the KTM treatment, the control subjects followed their routine schedule of classroom lessons with their respective subject teachers.

After the KTM treatment was completed, all the subjects in the experimental and control groups \( n = 161 \) were asked to take the posttest of creativity (TCSW, Forms 1B, of the S&I & the O&I). The TCSW posttest was to determine verbal originality gains. Then after a period of two weeks, all the subjects in the experimental and control groups were requested to take the UMIW delayed posttest of creativity. The UMIW delayed posttest was to determine if the experimental subjects could retain the creativity thinking skills learned as a result of the KTM treatment.

The researcher (assisted by an assistant) took charge of the administration of the SAM, pre-creativity tests (TCSW, Forms 1A of S&I & O&I and the UMIW), post-creativity test (TCSW, Forms 1B of S&I & O&I), and delayed post-creativity test (UMIW) in order to avoid any discrepancy in the administration of the tests. The researcher who is a certified trainer in creativity (trained in Institut Aminuddin Baki, Kementerian Pendidikan Malaysia) conducted the creativity training sessions via the Khatena Training Method (KTM).

4.3 Research Measures
The research measures utilized in this study were discussed earlier (please refer to Chapter Three, 3.5). However, a brief explanation of the three measures that are pertinent to this study is given below.

4.3.1 Something About Myself

The Khatena Torrance Creative Perception Inventory (KTCPI), (Khatena & Torrance, 1976, 1990, 1998a) is made up of two sub-measures of creative self-perception that can be used independently. The first sub-measure is What Kind of Person Are You (WKOPAY), and the second sub-measure is Something About Myself (SAM). These are measures specific to the assessment of creativity or creative potential and are popularly used to identify creative children, youths, and adults. Each measure contains a fifty item checklist of creative achievements and behaviours that a respondent checks as self-descriptive or not self-descriptive. In Malaysia, both the sub-measures of the KTCPI have been validated and found to be reliable to the Malaysian sample (Palaniappan, 1993, 1994, 2005). The sub-measure of SAM that places emphasis on six orientations, namely, Environmental Sensitivity, Initiative, Self-Strength, Intellectuality, Individuality, and Artistry was also found to be suitable by some local researchers (Joseph, 1998; Palaniappan, 1996; Zarrin, 2003).

In this study SAM was used as a preliminary assessment of creativity and to differentiate the subjects from the science and arts academic streams into high creatives and low creatives before randomly assigning them in more or less equal numbers of males and females to the experimental and control groups. The principle of extreme scores was used instead of the median split to differentiate the high creative from the low creative subjects. This was because of the
possibility that the median split of SAM scores may not create high and low creative groups sufficiently different in creative ability to affect creativity scores. Extreme scores as a means to differentiate subjects into high and low creatives have been used in creativity studies (Coney & Serna, 1995; Joseph, 1998).

Scoring of the SAM inventory was carried out based on the KTCPI Instruction Manual (Khatena & Torrance, 1998a). Scoring was easy and the maximum point that a respondent can get on SAM is 50. The Manual provides information on reliability, validity, and normative data. It also provides conversion tables for the conversion of raw scores into standard scores.

4.3.2 Thinking Creatively with Sounds and Words

The Thinking Creatively with Sounds and Words (TCSW) test battery (Khatena & Torrance, 1973, 1981, 1998b; Torrance et al., 1973, 1990) which comprises two sub-tests is a testing instrument of creative talent that measures originality. The first sub-test is known as Sounds & Images (S&I) which presents auditory stimuli in the form of sounds from the simple to the complex. The second sub-test is entitled Onomatopoeia & Images (O&I) which presents verbal and auditory stimuli in the form of onomatopoeic words. Both the sub-tests come in two sets. One set is for children and adolescents (Forms 1A & 1B) and the other set is for adults (Forms 2A & 2B). For this study, only Forms 1A and 1B were used.

The TCSW was the main dependent variable in this study that was used as pretest and posttest. The pretest (Forms 1A of S&I and O&I) established a baseline of the subjects’ creative potential before the KTM treatment and the
posttest (Forms 1B of S&I and O&I) determined the extent of creative gains in the subjects after the treatment.

Scoring of the TCSW test battery was carried out based on the Directions Manual and Scoring Guide (Torrance et al., 1973). The maximum point that a respondent can get on the S&I is 48 and on the O&I is 80. The Norms-Technical Manual of the TCSW (Khatena & Torrance, 1998b) provides information on reliability, validity, and normative data. It also provides conversion tables for the conversion of raw scores into standard scores.

4.3.3 Using Modality and Imagery in Writing

The Using Modality and Imagery in Writing (UMIW), a checklist (please refer to Appendix D) designed by the researcher was used as pretest and delayed posttest, to assess the subjects’ written compositions. The UMIW pretest and UMIW delayed posttest were to determine if the creative thinking abilities of the subjects in the experimental group can be retained after a period of two weeks. The items on the UMIW pretest checklist and UMIW delayed posttest checklist are the same. According to Milgram and Milgram (1976), scoring activity checklists have been used by assigning quality points to the various checklist items and then adding the points.

The use of sense modalities in the composition writing exercise was determined by assigning points to the various sense modality types that were thought to be original. The scoring format, modelled after Khatena’s (1976c) study, was as follows: zero (0) point for no sense modality used, one (1) point for single modality used, two (2) points for a combination of two modalities used, three (3) points for a combination of three modalities used, and four (4) points for a combination of more than three modalities used. Thus, the scoring
range was from 0 to 4 points. The maximum score that can be obtained by a subject for the sense modality types is 10. If similar words, phrases, and sentences depicting single or combination of modalities were used, the repetitions were not awarded any points.

Some of the creative phrases depicting the different sense modality types taken from Khatena (1976c) and Marks (1982), (cited in Daniels-McGhee and Davis, 1994) are as follows: examples of single modalities used are “melting butter” (visual), and “soft echoing vibrations” (auditory); examples of a combination of two modalities used are “coughing bird”, “murmur of gray twilight” (visual-auditory), and “dog sniffing around in the morning” (visual-olfactory); examples of a combination of three modalities used are “squeezing jello in your palm” (visual-kinesthetic-cutaneous), “music suddenly opened like a luminous book” (auditory-visual-kinesthetic), and “angry throat” (visual-auditory-organic); examples of a combination of more than three modalities used are “clash of horns when two bulls fight” (visual-auditory-kinesthetic-cutaneous), and “raindrops on scattering ants” (visual-auditory-kinesthetic-cutaneous).

The use of creative imagery in the composition writing exercise was determined by assigning points to the various analogy types that were thought to be original. The scoring format modelled after Khatena’s (1983) study, was as follows: zero (0) point for no creative imagery used, one (1) point for direct analogy used, two (2) points for personal analogy used, three (3) points for fantasy analogy used and four (4) points for symbolic analogy used. Thus, the scoring range was from 0 to 4 points. The maximum score that can be obtained by a subject for the category of creative imagery types is 10. If a creative
imagery was used more than once, points were awarded only for its first appearance and the repetitions were ignored.

The following are some examples of creative imagery taken from Khatena (1976c) and Johnson (1978). They are “John sings like a crow” (direct analogy); “my throat is red as a beet” (personal analogy); “death took her for his bride” (fantasy analogy); “the evil hawk of fortune swooped upon the dove of peace” (symbolic analogy).

The validity and reliability of the UMIW on the writing component was established before the study proper was carried out. To determine the content validity of the UMIW, the views of an expert in creativity was sought and to establish criterion-related validity of the UMIW with SAM and TCSW, a pilot test was conducted. To determine the reliability of the UMIW (inter-scorer and test-retest reliabilities), a pilot test was also conducted. The respondents for the pilot tests were not from the school chosen for the study proper but were somewhat the same age as they were Form Four students from a typical secondary school. The researcher and another English lecturer who is also knowledgeable in creativity were involved in scoring the respondents’ compositions using the UMIW checklist. After two weeks from the first administration of the written composition, a retest was carried out. The UMIW was deemed to be a reliable measure as it was able to obtain stable responses from the respondents.

4.4 Pilot Study

Three instruments were used in this research study. The first instrument used was Something About Myself (SAM), a published screening and identification inventory, to differentiate the subjects in this study into high
creatives and low creatives. The second instrument used was Thinking Creatively with Sounds and Words (TCSW), a published test-battery to measure verbal originality. It comprises two sub-measures, namely, Sounds and Images (S&I) and Onomatopoeis and Images (O&I). The third instrument used was Using Modality and Imagery in Writing (UMIW), a checklist designed by the researcher, to measure the use of modality and imagery in the written component.

According to researchers (Clarizio & Mehrens, 1985), testing instruments must meet certain basic psychometric standards of validity and reliability before they are utilized in research studies. The validities (content, construct, and criterion-related validities) and reliabilities (test-retest, interscorer, split-half, odd-even, and alternate forms of reliabilities) of SAM and TCSW are reviewed in detail in their respective manuals (also reported in Chapter Three under Measurement and Creativity). However, a pilot study was deemed necessary to establish criterion-related validities as well as interscorer and test-retest reliabilities of the instruments to be used in this study in the local context.

A total number of 78 Form Four subjects (34 males and 44 females) from one of the typical secondary schools in the district of Petaling in the state of Selangor were used for the pilot study. These subjects were from three intact classes, one a Science class \(n = 31\), one a Science and Technology class \(n = 24\), and the other an Arts class \(n = 23\). However, this typical school was not the one identified for the research proper.

The first purpose of the pilot study was to establish criterion-related validity. To determine the criterion validity of SAM, the correlations between the instrument and the other two instruments, namely, TCSW (Form 1B of S&I)
and UMIW were examined. Product-Moment Correlation Coefficients were computed and the correlation coefficients for SAM and TCSW ($r = .92$), SAM and UMIW ($r = .89$), as well as TCSW and UMIW ($r = .88$) were found to be significant ($p < .01$). The correlation coefficient obtained in this study for SAM and TCSW (Form 1B of S&I) was much higher than that obtained by a sample of American students of similar age ($r = .22$, $p < .05$) as reported in the Norms-Technical Manual of the TCSW (1998b).

The TCSW test battery is made up of two sub-measures, namely, Sounds and Images (S&I, Forms 1A & 1B), and Onomatopoeia and Images (O&I, Forms 1A & 1B). Forms 1A of S&I and O&I were to be used as pretests and Forms 1B of S&I and O&I as posttests in the study proper. Since Forms 1A and 1B of the S&I measure are similar in the number of sounds and Forms 1A and 1B of the O&I measure are similar in the number of onomatopoeic words and because of time constraints, initially the decision was made to pilot test only Forms 1B of S&I and O&I as they were going to be used as posttests. However, practical problems that arose after discussion with the school authorities concerned made it impossible to test both the Forms 1B of the S&I and O&I measures. This is because the school in question was willing to allocate only two double periods each (to be taken only from the English language subject) for the students in the Science class, Science and Technology class, and the Arts class in the first week and the same allocation of periods and students in the third week (ie. after two weeks especially for the test-retest reliability of the UMIW measure). Lengthy sessions of testing disrupt the time schedule for teaching and learning purposes and this is generally discouraged by the school authorities. Thus in the first week, SAM (to be used to differentiate high and low creatives in the research proper) and UMIW (to be used as pretest in the
research proper) were tested and in the third week, TCSW (Form 1B of S&I), (to be used as posttest in the research proper) and UMIW (to be used as delayed posttest in the research proper) were tested.

Scoring of the bilingual version of SAM was based on the Khatena Torrance Creative Perception Inventory, Instruction Manual (Khatena & Torrance, 1998a) and scoring of the TCSW auditory test battery was based on the Directions Manual and Scoring Guide (Torrance et al., 1973). Though the instructions of the TCSW auditory tapes are in English, the instructions were also explained to the subjects by the researcher in Bahasa Malaysia, the national language. Scoring of the UMIW checklist, which was devised by the researcher, was based closely on experimental studies carried out by Khatena (1976c, 1983). For SAM and TCSW, the raw scores were converted to standard scores, using the conversion tables based on American students’ samples reported in the Khatena Torrance Creative Perception Inventory, Instruction Manual (Khatena & Torrance, 1998a) and the TCSW Norms-Technical Manual (Khatena & Torrance, 1998b) respectively. For the UMIW, raw scores were used.

It was decided that no pilot study was necessary to establish the reliability of SAM as the bilingual version of SAM had been administered to Malaysian samples of similar age group and its reliability established (Palaniappan, 1993, 1994, 1996). Palaniappan (1993) pilot-tested SAM, using 70 Form Four Malaysian students comprising equal number of males and females and six months later a retest was carried out using the same students. The overall test-retest coefficient of reliability for SAM was significant ($r = .75$). The results indicated that the bilingual version of SAM is a valid measure of creative perception.
The second purpose of the pilot study was to establish inter-scorer reliability (TCSW and UMIW) and test-retest reliability (UMIW) of the instruments mentioned. The same subjects \((N = 78)\) were used. To determine the inter-scorer reliability of the TCSW (Form 1B of S&I) and UMIW, the researcher and another scorer who are both lecturers competent in the use of the English language and Bahasa Malaysia as well as knowledgeable about creativity, scored the responses of the subjects on Form 1B of Sounds and Images (S&I) and the UMIW (first test carried out in the first week). The subjects were given the option of writing their responses and compositions in either the English language or Bahasa Malaysia, the national language. A Product-Moment Correlation Coefficient revealed an interscorer coefficient \((r = .99)\) for the S&I which was significant \((p < .01)\). According to Amabile (1996), correlation coefficients between .70 and .80 indicate that there is strong agreement among scorers or raters. The interscorer coefficient of .99 obtained in this study was even better than the one reported in the Norms-Technical Manual of the TCSW (1998b). In the Manual it was stated that an interscorer reliability coefficient of .95 for TCSW (Form 1B of S&I) was obtained from a random sample of 51 subjects out of a total of 359 students. For interscorer reliability of the UMIW checklist (based on the first written component), the correlation coefficient \((r = .99)\) obtained was also significant \((p < .01)\).

Regarding the test-retest reliability of the UMIW checklist, the first written component of the UMIW was carried out in the first week and a similar written component was conducted after two weeks, that is, the third week. This investigation yielded a reliability coefficient of .92 \((p < .01)\) which can be considered as indicating a high reliability of the items in the instrument. To
Nunally (1978), a coefficient value closer to 1.0 indicates high reliability while a coefficient value of .70 is an acceptable reliability coefficient.

It can be concluded from the pilot tests carried out that the three testing instruments to be used in the research proper, namely, SAM, TCSW (sub-measure of Form 1B of S&I), and UMIW are valid and reliable. This is because they were able to obtain stable responses from the subjects involved in the pilot study.

The study proper with the identified school started with the administration of SAM \( (N = 257) \), the pretests of the TCSW \( (n = 161) \) and the pretest of the UMIW \( (n = 161) \). This was done before the start of creativity training via the Khatena Training Method (KTM). At this stage it was decided to carry out a second pilot study to test the validity and reliability of the sub-measure of the TCSW, namely, Onomatopoeia and Images (O&I) which could not be carried out during the first pilot study. The responses of 81 subjects (44 males & 37 females) were randomly chosen from the science and arts streams. To determine the criterion validity of the O&I (Form 1A) measure, the correlations between the O&I and the other two instruments, namely, SAM and UMIW were examined. Product-Moment Correlation Coefficients were computed and the correlation coefficient for O&I and SAM \( (r = .64) \) was significant \( (p < .001) \) and better than that reported in the Norms-Technical Manual of the TCSW (1998b). In the manual it was stated that the validity coefficient for Form 1A of the O&I and SAM was .22 \( (p < .05) \), \( (N = 159) \). In this study the validity coefficient for the O&I and UMIW \( (r = .54) \) was also significant \( (p < .05) \).

To determine the interscorer reliability of the O&I measure, the responses from the same sample \( (N = 81) \) was computed. A Product-Moment
Correlation Coefficient revealed an interscorer coefficient \((r = .98)\) which was significant \((p < .01)\) and comparable to the one reported in the Norms-Technical Manual of the TCSW (1998b). In the Manual it was stated that an interscorer reliability coefficient of \(.99 (p < .01)\) for O&I (Form 1A) was obtained from a sample of 50 American students.

In view of the positive results obtained from the first pilot study and the second pilot study conducted to determine validity and reliability of the instruments to be utilized in this study, it can be concluded that the instruments chosen for this experimental study were valid and reliable.

4.5 Data Collection Procedures

Permission to use the Khatena Training Method (KTM), the Thinking Creatively with Sounds and Words (TCSW) test battery, and the the submeasure of Something About Myself (SAM) from the Khatena Torrance Creative Perception Inventory, was obtained from the respective persons or organizations concerned before the study was conducted.

Vetting of the research proposal by the Faculty of Education, University Malaya was completed before approval from the Education Planning and Research Division (EPRD) Ministry of Education was sought and obtained to conduct the study. With the approval from the EPRD, the State Education Department in Selangor was contacted to obtain permission and clearance to carry out the pilot study and the study proper in the selected secondary schools.

To conduct the study proper, the researcher approached a number of typical schools with large enrolments of Form Four students (> 200). Only one school gave permission for the research to be carried out. The school was then given a copy of the letter of approval from the Selangor state education department to conduct the research study. After that the purpose and nature of
the research study was explained to the school administrators. On hearing of the complexity of the research method and schedule, the school had second thoughts of allowing the study to be carried out. It was indeed a daunting experience for the researcher to convince the school concerned to allow its students to participate in this experimental study as understandably the school was apprehensive about the possible disruption of its schedule. This is because intact classes of the Form Four students were not going to be used. Instead the students were going to be identified from a list of extreme scores according to their performance in the Something About Myself (SAM) inventory to differentiate them into high and low creative groups. Besides, the experiment was to be carried out in nine days and spread over four weeks.

The school concerned finally agreed to allow the experiment to be conducted but on two conditions. Firstly, the experiment was to be carried out after the final exams were completed. Secondly, the duration of the experiment was to be shortened from nine to seven days. The researcher shortened the days allocated for creativity training from four to two days. However, the number of hours (8) or minutes (480) originally allocated for the training remained the same. Instead of two hours of training per day, the subjects were to be given four hours of training that was to be conducted before the recess break (2 hours) and after the recess break (2 hours).

The class teachers of the Form Four classes in the school concerned were then contacted to seek their cooperation and help. Then a suitable day was fixed for all the students in the school to be administered the SAM measure of self-perception. On the day of the administration of the SAM measure, a total of 257 Form Four students were present in school. The SAM measure is an inventory of 50 items and can be completed in a short time. Students normally take
between 15 to 30 minutes. There were four sessions and each session involved students from two classes of 50 to 70 students. The students were asked to bring only their pencils, pens, and erasers. The researcher and her assistant took charge of the administration of SAM in a suitable place. The students were told to be serious and not to interact or communicate with the others while ticking the items in the SAM inventory.

According to the total scores obtained by the 257 subjects in the SAM inventory, they were differentiated into high creatives (75th percentile or upper quartile) and low creatives (25th percentile or lower quartile), (Anderson, 1999). The selected high creative and low creative subjects \((n = 161)\) from the science and arts academic streams were then assigned randomly (stratified random sampling) in more or less equal numbers of males and females to the experimental \((n = 81)\) or control \((n = 80)\) groups (please refer to Figure 4.2).

On the scheduled day, all the 161 subjects in the experimental and control groups were asked to take the pretest of creativity (TCSW, Forms 1A of S&I & O&I). The pretest was conducted in four sessions, two sessions before recess (8.00 – 9.00am & 9.00 – 10.00am) and two sessions after recess (10.30 – 11.30am & 11.30 – 12.30pm). Each session involved about 40 subjects. Since the TCSW is an auditory test of verbal originality, it has been said by Torrance, et al. (1973) that “administration of the tests to very large groups should be avoided, but groups of up to 40 subjects generally are suitable” (p. 2). A short interval of 5 minutes was given in between the tests of S&I and O&I, which are each of about 20 minutes duration. The subjects were informed earlier of the day, time, and venue of the pretest. On the day of the pretest, they were asked to take their pens, pencils, and erasers and go to the pre-arranged venue of the test which was suitable for the auditory test to be conducted. There were extra
pencils and erasers available for those who may need them and an extra tape recorder and test tapes as a precautionary measure. The subjects were not told that they will be taking a test. Instead they were informed that it was just an exercise to assess their creativity. However, they were not allowed to interact or communicate with each other while doing the exercise. The subjects were also not told of the posttest that was to be conducted after the training.

The next day, the UMIW pretest of creativity was carried out for all the subjects \( (n = 161) \) in the experimental and control groups. The 30 minutes test was conducted in two sessions. Each session involved about 80 subjects. On the same day that the UMIW pretest was completed, the subjects in the experimental group were informed of the training sessions that they will be involved in and they were briefed of the training schedule (please refer to Figure 4.3 for the testing and training schedule). The subjects were also given advice regarding the importance of completing the training sessions, to be present in school on the 2 days of training (four hours each day, two hours before recess and two hours after recess) as attendance will be taken. They were also reminded to be punctual and to give their cooperation. They were asked to bring only their pens, pencils, and erasers for the training sessions as the other materials needed for the training will be supplied by the researcher. There were extra pens, pencils, and erasers for those who may need them. The researcher managed to get two of the subjects’ class teachers and a school administrator to be around for the briefing so that the subjects involved will take the training programme and further tests seriously.

In the second week when the training sessions began, the subjects in the experimental group \( (n = 81) \) were given the KTM treatment over two days. During that time, the subjects in the control group \( (n = 80) \) followed their
routine schedule of classroom lessons under their respective subject teachers. The day after the final training session was completed all the 161 subjects in both the experimental and control groups were asked to take the posttest of creativity to assess creativity gains. Just as the pretest, the posttest too was conducted in four sessions of about 40 subjects each. Two weeks after the KTM treatment ended, the delayed posttest of 30 minutes was carried out for all the 161 subjects in two sessions of about 80 subjects. The testing (5 days) and training (2 days) schedule for this experimental study is shown in Figure 4.3.

Finally, the school administrators and teachers were thanked for their cooperation and assistance rendered.

<table>
<thead>
<tr>
<th>WEEK 1</th>
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<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; Day (Monday):</td>
<td>KTCPI (SAM) for all Form Four students ( N = 257 ) in the targeted school.</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Day (Thursday):</td>
<td>Creativity Pretest (TCSW, Forms 1A of S&amp;I &amp; O&amp;I) for all the subjects in the experimental and control groups ( n = 161 )</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; Day (Friday):</td>
<td>Creativity Pretest (UMIW) for all the subjects in the experimental and control groups ( n = 161 )</td>
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<th>WEEK 2</th>
<th>TRAINING</th>
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<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt; Day (Tuesday):</td>
<td>KTM treatment (8.00 - 10.00am) – General divergent thinking activities and KTM strategy 1. KTM treatment (10.30 – 12.30) – Continuation of KTM strategy 1 and KTM strategy 2.</td>
</tr>
<tr>
<td>5&lt;sup&gt;th&lt;/sup&gt; Day (Wednesday):</td>
<td>KTM treatment (8.00 - 10.00am) – Continuation of KTM strategy 2 and KTM strategy 3. KTM treatment (10.30 – 12.30) – KTM strategy 4.</td>
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</table>

KTM strategy 1 – Breaking Away from the Obvious and Commonplace (BAOC)
KTM strategy 2 – Synthesis-Destructuring-Restructuring (S-D-R)
KTM strategy 3 – Transposition (TR)
KTM strategy 4 – Analogy-Imagery (A-I)

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<th>TESTS</th>
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<tr>
<td>6&lt;sup&gt;th&lt;/sup&gt; Day (Thursday):</td>
<td>Creativity Posttest (TCSW, Forms 1B of S&amp;I &amp; O&amp;I) for all the subjects in the</td>
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</table>
experimental and control groups ($n = 161$).

WEEK 4

7th Day (Wednesday): Creativity Delayed Posttest (UMIW) for all the subjects in the experimental and control groups ($n = 161$), two weeks after the KTM treatment.

*Figure 4.3: Testing and Training Schedule*

### 4.6 Data Analysis Procedures

A total number of 161 subjects were expected to participate in this experimental study after they were differentiated into high creatives and low creatives according to their performance in SAM. However, since eight subjects (science high creative males – 2, science low creative males – 2, arts high creative male – 1, arts low creative males – 3) from the control group missed one or more of the testing/training sessions, their data were removed. Finally, the experimental group ($n = 81$) had the same number of subjects but the control group ($n = 80$) had a lesser number of subjects ($n = 72$). Thus, data from only 153 subjects were used for analyses of the TCSW and UMIW measures.

Three testing instruments were used in this study. Firstly, the submeasure known as Something About Myself (SAM) from the Khatena Torrance Creative Perception Inventory (KTCPI), (Khatena & Torrance, 1976, 1990, 1998a). Secondly, the Thinking Creatively with Sounds and Words (TCSW) test battery (Khatena & Torrance, 1973, 1981, 1998b; Torrance et al. 1973, 1990). Thirdly, the Using Modality and Imagery in Writing (UMIW) checklist. The KTCPI and TCSW are published testing measures that are popularly used by creativity researchers. The UMIW checklist designed by the researcher was pilot tested.
The Norms-Technical Manual for the KTCPI (Khatena & Torrance, 1998a), the Directions Manual and Scoring Guide (Torrance et al., 1973) and the Norms-Technical Manual (Khatena & Torrance, 1998b) for the TCSW and the checklist for UMIW were used for the purpose of scoring the data collected for this study. Scoring of the SAM (used as a screening device to differentiate high & low creatives), the TCSW (used as pretest and posttest to measure verbal originality), and the UMIW (used as pretest and delayed posttest to measure retention of creativity strategies learnt) was done manually by the researcher and assisted by a competent assistant who was also involved in the scoring during the pilot study.

The Statistical Package for the Social Sciences (SPSS) Version 11.0 for Windows was used for the purpose of coding and analyzing the data collected. The first set of data for the study was obtained from the subjects’ \( n = 161 \) performance on the SAM inventory. These 161 subjects were identified as high and low creatives out of all the students \( N = 257 \) who were present in the school concerned on the day that SAM was administered. The raw scores on SAM were converted to standard scores using the Norms-Technical Manual for the KTCPI (Khatena & Torrance, 1998a). The second set of data was obtained from the experimental and control groups’ \( n = 161 \) performance on the TCSW test battery. For the pretest, Forms 1A of Sounds and Images (S&I) and Onomatopoeia and Images (O&I) were used. For the posttest, Forms 1B of Sounds and Images (S&I) and Onomatopoeia and Images (O&I) were used. The raw scores on the TCSW were converted to standard scores using the Norms-Technical Manual (Khatena & Torrance, 1998b) The third set of data was obtained from the experimental and control groups’ \( n = 161 \) performance on
the UMIW checklist. For the UMIW that was used as pretest and delayed posttest, raw scores were used.

The research design for this study was the randomized group, pretest-posttest design (Ary et al., 1972). The researcher was mainly interested in the effect of the independent variable of training that used control variables of creative level, gender category, and academic stream. Briefly, the objectives of this study were firstly, to provide insight into the impact of the Khatena Training Method (KTM) treatment upon the creative thinking abilities of the Form Four subjects in the experimental and control groups. Secondly, to determine the effectiveness of the KTM treatment on the subjects in the experimental and control groups who were categorized as high creative, low creative, male, female, science, and arts, subjects. Thirdly, to investigate if creative strategies learned through the KTM can be retained and transferred to other areas of intellectual functioning such as in composition writing.

Descriptive statistics that were used in this study included frequency count, mean, standard deviation, median, minimum, maximum, skewness, and kurtosis. Frequency counts of the subjects involved in the study were recorded. Means, standard deviations, medians, minimums, and maximums were computed for all the testing instruments and reported. Skewness and kurtosis were computed for the whole sample to check if the scores obtained on the testing measures were within the threshold value, for a z-value for skewness or kurtosis that exceeds plus or minus 2.58 critical value, indicates that we can reject the assumption about the normality of the distribution at .01 probability level (Hair, Anderson, Tatham, & Black, 1998). Skewness and kurtosis were also computed and recorded separately for the experimental and control groups.
as well as for the sub-groups identified as high creative, low creative, male, female, science, and arts, subjects.

Apart from descriptive statistics, the data were also analyzed using parametric methods (Ary et al., 1972; Coakes, 2005) such as Independent samples \(t\)-tests, Pearson product-moment correlation coefficient and Analysis of Covariance (ANCOVA).

Independent samples \(t\)-tests were used to determine the comparability of the subjects on the TCSW (pretest) before commencement of creativity training. The mean pretest TCSW scores were computed for the subjects in the experimental and control groups, and for the high creative, low creative, male, female, science, and arts, subjects in the experimental and control groups. The results of the Independent samples \(t\)-tests provided answers on the comparability of subjects. Pearson product-moment correlation coefficients were also used to confirm the comparability of the subjects on the TCSW (pretest/posttest) and UMIW (pretest/delayed posttest) instruments.

The KTM treatment was completed before the mean posttest TCSW scores were computed to determine if there were any significant differences in the gains in creativity between the subjects in the experimental and control groups and for the high creative, low creative, male, female, science, and arts, subjects in the experimental and control groups. Independent \(t\)-tests and ANCOVA were used to determine whether creativity training through the KTM treatment had any effect on the creativity scores of the TCSW (posttest) after adjustments were made to the TCSW pretest scores. The results of the Independent \(t\)-tests and ANCOVA provided answers for research questions one through four.
Two weeks after the KTM treatment ended, to determine if there were any significant differences in the gains in creativity between the subjects in the experimental and control groups as measured by the UMIW scores, the mean gain in the UMIW was computed. Independent \( t \)-tests and ANCOVA were computed to determine if creativity training through the KTM treatment had any effect on the creativity scores of the UMIW (delayed posttest) after adjustments were made to the UMIW pretest scores. The results of Independent \( t \)-tests and ANCOVA provided answers for research question five.

### 4.7 Research Schedule

The research schedule below (Figure 4.4) gives a summary of the procedures involved before, during, and after data collection.

<table>
<thead>
<tr>
<th>December 2004:</th>
<th>Appointment of new supervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preliminary preparation</td>
</tr>
<tr>
<td></td>
<td>Approval of creativity training programme (by Prof. Emeritus Dr. J. Khatena)</td>
</tr>
<tr>
<td></td>
<td>Purchase of testing instruments (from Scholastic Service, USA)</td>
</tr>
<tr>
<td>June 2006:</td>
<td>Completion of research proposal</td>
</tr>
<tr>
<td>Nov 2006/May 2007:</td>
<td>Vetting and approval of research proposal</td>
</tr>
<tr>
<td>May 2007:</td>
<td>Approval from EPRD, Ministry of Education</td>
</tr>
<tr>
<td></td>
<td>Approval from Selangor Education Department</td>
</tr>
<tr>
<td>June 2007:</td>
<td>Pilot study</td>
</tr>
<tr>
<td>Oct/Nov. 2007:</td>
<td>Meeting with school principal and teachers concerned</td>
</tr>
<tr>
<td></td>
<td>Data collection from selected school</td>
</tr>
<tr>
<td></td>
<td>Administration of KTCPI (SAM)</td>
</tr>
<tr>
<td></td>
<td>(to identify high and low creatives)</td>
</tr>
<tr>
<td></td>
<td>Administration of pretest (TCSW)</td>
</tr>
<tr>
<td></td>
<td>Administration of pretest (UMIW)</td>
</tr>
<tr>
<td></td>
<td>Creativity training sessions (KTM treatment – 2 days)</td>
</tr>
<tr>
<td></td>
<td>Administration of posttest (TCSW)</td>
</tr>
<tr>
<td></td>
<td>Administration of delayed posttest (UMIW)</td>
</tr>
<tr>
<td>Dec/Jan. 2007/2008:</td>
<td>Scoring of the measures</td>
</tr>
<tr>
<td>Feb/March 2008:</td>
<td>Analysis of data</td>
</tr>
<tr>
<td>April/June 2008:</td>
<td>Preparation of findings and conclusions</td>
</tr>
<tr>
<td>April 2009:</td>
<td>Revision of drafts and Completion of thesis</td>
</tr>
<tr>
<td></td>
<td>Viva Voce</td>
</tr>
</tbody>
</table>

*Figure 4.4: Research Schedule*
5.0 Introduction

This experimental study was based on three objectives. The first objective was to determine if creative thinking abilities could be enhanced in the subjects from the experimental group who received the Khatena Training Method (KTM) treatment as compared to the subjects in the control group who were not given the KTM treatment. The second objective was to determine the effectiveness of the KTM on the high creative, low creative, male, female, science, and arts, subjects in the experimental group as compared to the control group. The third objective was to investigate if creative thinking skills learned via the KTM treatment could be retained by the subjects in the experimental
group after a period of two weeks as compared to the subjects in the control group.

To realize the objectives of this study, two creativity testing instruments were used. The first instrument was the TCSW test battery comprising two sub-measures, namely, Sound and Images (S&I) and Onomatopoeia and Images (O&I). The TCSW was used as pretest (Forms 1A of S&I & O&I) and posttest (Forms 1B of S&I & O&I) to determine if creative thinking abilities could be enhanced in the experimental subjects who received the KTM treatment. The second instrument was the Using Modality and Imagery in Writing (UMIW) checklist used as pretest and delayed posttest. The purpose was to determine if the experimental subjects could retain the creative thinking skills learned as a result of the KTM treatment. KTM treatment was the independent or predictor variable while the creativity scores measured by the Thinking Creatively with Sounds and Words (TCSW) was the main dependent variable.

The Something About Myself (SAM) inventory, which is a sub-measure of the Khatena Torrance Creative Perception Inventory (KTCPI), was used as a screening device with the purpose of differentiating the subjects into high creatives and low creatives. This was done before the TCSW and UMIW were administered to the experimental and control groups and before the KTM treatment was given to the experimental group.

This chapter presents findings on the Form Four subjects’ creative abilities. Firstly, their comparability before creativity training as measured by the TCSW pretest scores was determined. Secondly, the effectiveness of creativity training as measured by the TCSW posttest scores was ascertained. Thirdly, the effectiveness of creativity training as measured by the UMIW delayed posttest scores was established.
Analyses of the interval data obtained for this study were executed using the Statistical Package for the Social Sciences (SPSS), Version 11.0 for Windows. Statistical approaches such as descriptive and inferential statistics were employed. Descriptive statistics such as frequency count, mean, standard deviation, median, minimum, maximum, skewness, and kurtosis were computed to analyze the quantitative data. A number of inferential statistics were also utilized on the parametric data obtained. These inferential statistics, namely, Independent samples $t$-tests, Pearson product-moment correlations, and Analysis of Covariance (ANCOVA) were used to compare group differences before creativity training and to compare group gains after creativity training between the experimental and control subjects.

The results of the data analyses and interpretations are arranged in the following manner:

Descriptive Statistics

1. Descriptive statistics of the whole sample.
2. Descriptive statistics of SAM.
3. Descriptive statistics of TCSW.
4. Descriptive statistics of UMIW
5. Descriptive statistics of TCSW & UMIW for experimentals and controls
6. Descriptive analyses of pretest scores of TCSW & UMIW

Inferential Statistics

7. Results for research question one
   Are there any significant differences in the gains between the subjects in the experimental and control groups, as measured by the TCSW (Forms 1B of S&I and O&I) scores?
8. Results for research question two
Are there any significant differences in the gains between the experimental and control groups, in the TCSW for the a) high creative and b) low creative subjects?

9. Results for research question three

Are there any significant differences in the gains between the experimental and control groups, in the TCSW for the a) male and b) female subjects?

10. Results for research question four

Are there any significant differences in the gains between the experimental and control groups, in the TCSW for the a) science and b) arts subjects?

11. Results for research question five

Are there any significant differences in the gains between the subjects in the experimental and control groups, as measured by the Using Modality and Imagery in Writing (UMIW, pretest & delayed posttest) scores?

12. Summary of gains for research questions one through five

13. Results and interpretations

Effectiveness of training as measured by TCSW posttest scores

Effectiveness of training as measured by UMIW delayed posttest scores

5.1 Descriptive Statistics

The descriptive statistics of the sample as a whole, of SAM, TCSW, and UMIW are reported. Descriptive statistics are also shown for the experimental and control groups as well as for the high creative, low creative, male, female, science, and arts, subjects in the experimental and control groups. Descriptive analyses of pretest scores of TCSW and UMIW are then discussed.
5.1.1 Descriptive Statistics of the whole sample

Data concerning the frequency distribution of the subjects \((N = 153)\) involved in this study according to their categorization into experimental and control groups as well as high creative, low creative, male, female, science, and arts subgroups are displayed in Table 5.1.

Initially 161 subjects were selected through the principle of extreme scores to form the high and low creative groups based on their performance on SAM. However, the data of only 153 subjects (95%) was used in subsequent analyses as eight of the subjects did not attend one or more of the testing or training sessions. The loss of the four male subjects from the science stream (2 high creatives & 2 low creatives) and the four male subjects from the arts stream (1 high creative & 3 low creatives) due to absence during the experiment reduced the size of the control group from 80 to 72 subjects. However, the subjects from the experimental group \((n = 81)\) remained intact.

Table 5.1

<table>
<thead>
<tr>
<th>Gender Category</th>
<th>Group</th>
<th>Creative Level</th>
<th>Academic Stream</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experimental</td>
<td>High</td>
<td>Science</td>
<td>12</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>((n = 81))</td>
<td></td>
<td></td>
<td>Arts</td>
<td>8</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Low</td>
<td>((n = 43))</td>
<td></td>
<td>Science</td>
<td>12</td>
<td>10</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Arts</td>
<td>12</td>
<td>9</td>
<td>21</td>
</tr>
<tr>
<td>Control</td>
<td>((n = 72))</td>
<td>High</td>
<td>Science</td>
<td>10</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>((n = 36))</td>
<td></td>
<td></td>
<td>Arts</td>
<td>8</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Low</td>
<td>((n = 36))</td>
<td></td>
<td>Science</td>
<td>9</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Arts</td>
<td>9</td>
<td>8</td>
<td>17</td>
</tr>
</tbody>
</table>

5.1.2 Descriptive Statistics of SAM
SAM was used to assess the initial creative ability of the subjects \((N = 161)\). This was done in order to differentiate them into high creatives (above 75th percentile or upper quartile) and low creatives (below 25th percentile or lower quartile) as was the case in some studies (Khatena, 1971h, 1972c, 1973a; Murphy, 1985) that focused on creativity training. The process involved in differentiating the high creatives and low creatives for this study was explained earlier (Chapter Four, 4.2.2).

Table 5.2 presents the results of the descriptive analyses for SAM. The SAM scores were examined in terms of their mean, standard deviation, median, minimum, and maximum. The mean standard creativity score for the whole sample was 45.39 \((SD = 10.27)\). The median was 44.00 and the range was from 27.00 to 67.00. Z - scores for skewness and kurtosis were obtained by dividing the values by their respective standard error. A z-value for skewness or kurtosis that exceeds plus or minus the 2.58 critical value indicates that we can reject the assumption about the normality of the distribution at .01 probability level (Hair, Anderson, Tatham, & Black, 1998). From the data in Table 5.2 it can be seen that the scores for SAM were within the critical value for skewness. A kurtosis check showed that the distribution for the SAM measure exceeded the threshold value.

Table 5.2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Med</th>
<th>Min</th>
<th>Max</th>
<th>Z-Skewness</th>
<th>Z-Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAM</td>
<td>45.39</td>
<td>10.27</td>
<td>44.00</td>
<td>27.00</td>
<td>67.00</td>
<td>-0.38</td>
<td>-3.22</td>
</tr>
</tbody>
</table>

Med - Median, Min - Minimum, Max - Maximum
The raw scores from SAM, which has a score range of 0-50, were assessed manually. Then the raw scores were converted to standard scores using the conversion table based on the KTCPI Instruction Manual (Khatena & Torrance, 1998a). In the manual, raw scores were converted to standard scores with a mean of 5 and a standard deviation of 1. To date, only limited studies (Gan, 1998; Joseph, 1998; Palaniappan, 1993, 1994, 1996, 2005; Zarrin, 2003) have been carried out to obtain the SAM norm scores of Malaysian samples. Thus for this study, the normative data in the KTCPI Instruction Manual (Khatena & Torrance, 1998a) based on regular American students were used to make comparisons and facilitate interpretations.

The mean standard score of 45.39 (SD = 10.27) obtained by the subjects on SAM was comparable with the USA indices that were obtained from a sample of regular students (N = 2,475) aged between 8 and 17 years. The mean of the American sample was 53.00 and in an earlier sample that involved 7,934 regular students aged 16 to 17 years, the mean obtained was 48.00 (Khatena & Torrance, 1998a). The data on SAM tell us that the subjects who participated in this study have more or less similar creative ability as the students in the USA. Though the subjects who participated in this study were differentiated as high and low creatives according to the scores obtained on SAM, they were considered as regular students. This was because in the KTCPI, Instruction Manual (Khatena & Torrance, 1998a), it was recommended that conversion table 17 be used “to determine how a student in the general class or school population compares with others according to sex and total group” (p. 30). Figure 5.1 shows the distribution of SAM scores. The data indicate that the scores of the subjects (N = 161) were normal in distribution with a mean of 45.39 (SD = 10.27).
5.1.3 Descriptive Statistics of TCSW

The sub-measures of Thinking Creatively with Sounds and Words (TCSW), namely, Sound and Images (S&I) and Onomatopoea and Images (O&I) come in two Forms. Forms 1A of S&I and O&I were used as pretest and Forms 1B of S&I and O&I were used as posttest. The raw scores from the S&I and O&I measures were assessed manually. The S&I measure has a score range of 0-48 and the O&I measure has a score range of 0-80. The raw scores of the S&I and O&I measures were converted to standard scores, using the conversion tables based on American students’ samples reported in the TCSW Norms-Technical Manual (Khatena & Torrance, 1998b). In the manual, raw scores were converted to standard scores with a mean of 100 and a standard deviation of 20.
To date, only one study (Gan, 1998) has been carried out to obtain the TCSW norm scores of Malaysian adult samples. Hence for this study, the normative data in the TCSW Norms-Technical Manual (Khatena & Torrance, 1998b) based on regular American students were used to make comparisons and facilitate interpretations.

Table 5.3 presents the results of the descriptive analyses for the S&I and O&I sub-measures of the TCSW. The scores for each measure were examined in terms of their mean, standard deviation, median, minimum, and maximum. From the data it can be seen that the scores for the S&I and O&I, pretest and posttest measures were within the critical value for skewness (plus or minus 2.58). Perhaps this was because the sample size for each of the experimental \((n = 81)\), control \((n = 72)\), high creative \((n = 74)\), low creative \((n = 79)\), male \((n = 80)\), female \((n = 73)\), science \((n = 85)\), and arts \((n = 68)\) groups was above 30. Besides, the lowest sample size \((32)\) that belonged to the arts subjects in the control group was still above 30. Sample sizes of more than 30 and less than 500 are adequate for most research and for sub-samples a minimum sample size of 30 is appropriate (Sekaran, 2003). A kurtosis check showed that the distribution for the overall sample on the sub-measures of the TCSW did not exceed the threshold value of -2.58.

The TCSW sub-measures of S&I and O&I (Forms 1A) were used as pretest. For the S&I measure, the data in Table 5.3 show that the subjects \((N = 153)\) in the experimental and control groups have a verbal originality mean score of 115.91 \((SD = 19.54)\). The median, minimum, and maximum are 116.00, 75.00, and 169.00 respectively.
The mean score of 115.91 obtained by the subjects was higher than the American mean scores that were obtained from a couple of samples of male and female students (Khatena & Torrance, 1998b). The mean score for the first sample \(N = 20\) of regular male and female students aged 15 to 17 years was 97.00 and the mean score for the second sample \(N = 2,384\) of regular male and female students aged 8 to 18 years was 109.00. Based on the mean scores obtained by the subjects in this study, it seems that the Form Four students from the selected typical school in the state of Selangor have higher creative potential compared to American students of more or less similar age.

Figure 5.2 presents the distribution of the S&I pretest scores. The data indicate that the scores of the subjects \(N = 153\) were normal in distribution with a mean of 115.91 \((SD = 19.54)\).
The subjects ($N = 153$) in the experimental and control groups had a verbal originality mean score of 114.73 ($SD = 14.46$) for the O&I measure. The median, minimum, and maximum were 116.00, 77.00, and 152.00 respectively. The mean score of 114.73 obtained by the subjects was comparable to those of regular male and female American students ($N = 45$) aged 16 to 19 years whose mean score was 115.00 (Khatena & Torrance, 1998b).

Figure 5.3 displays the distribution of the O&I pretest scores. The data show that the scores of the subjects ($N = 153$) were normal in distribution with a mean of 114.73 ($SD = 14.46$).
Figure 5.3: Histogram and Descriptive Statistics of O&I Pretest

The TCSW sub-measures of S&I and O&I (Forms 1B) were used as posttest. From the data in Table 5.3, it can be seen that the overall posttest mean scores obtained by the subjects in the experimental and control groups were higher than the pretest mean scores for both the S&I and O&I sub-measures of the TCSW. This was an initial indication of the positive effect of creativity training through the Khatena Training Method (KTM) treatment.

The data in Table 5.3 show that the subjects (\(N = 153\)) in the experimental and control groups attained a verbal originality mean score of 120.78 (\(SD = 24.32\)) for the S&I posttest measure. The median, minimum, and maximum were 122.00, 65.00, and 170.00 respectively. The mean score of 120.78 obtained by the subjects was better than the American mean scores that were obtained from a couple of samples of male and female students. The mean score for the first American sample of regular students (\(N = 64\)) aged 16 to 17
years was 104.00 and in the second sample that also involved regular male and female students \((N = 2,896)\) aged 8 to 18 years, the mean score was 101.00 (Khatena & Torrance, 1998b).

Figure 5.4 shows the distribution of the S&I posttest scores. The data indicate that the scores of the subjects \((N = 153)\) were normal in distribution with a mean of 120.78 \((SD = 24.32)\).

\[\text{Figure 5.4: Histogram and Descriptive Statistics of S&I Posttest}\]

From the data in Table 5.3, it can be seen that the subjects \((N = 153)\) in the experimental and control groups obtained a verbal originality mean score of 126.33 \((SD = 18.60)\) for the O&I measure. The median, minimum, and maximum were 126.00, 77.00, and 174.00 respectively. The mean score of 126.33 obtained by the subjects was better than the American mean score that was obtained from a sample of regular male and female students aged 16 to 19.
years. The mean score for the USA sample \((N = 77)\) was 104.00 (Khatena & Torrance, 1998b).

Figure 5.5 shows the distribution of the O&I posttest scores. The data tell us that the scores of the subjects \((N = 153)\) were normal in distribution with a mean of 126.33 \((SD = 18.60)\).

![Figure 5.5: Histogram and Descriptive Statistics of O&I Posttest](image)

In conclusion, based on the S&I and O&I posttest mean scores, the subjects in this study performed better than their American counterparts. This perhaps was because the subjects in this study were given creativity training before being tested, whereas the American students were only tested in creativity. This difference in scores suggests that creativity training can enhance the creative thinking abilities of students.
5.1.4 Descriptive Statistics of UMIW

The checklist named Using Modality and Imagery in Writing (UMIW) was used as pretest and delayed posttest. The purpose of the delayed posttest was to ascertain if the subjects in this study could retain their creative thinking skills acquired through the KTM treatment even after a period of two weeks. The UMIW was designed and pilot tested by the researcher. It has a score range of 0-20 and for statistical analyses raw scores that were assessed manually were used.

Table 5.4 presents the results of the descriptive analyses for the UMIW pretest and delayed posttest measures. The scores for each measure were examined in terms of their mean, standard deviation, median, minimum, and maximum. From the data it can be seen that the scores for the measures were within the critical value for skewness. A kurtosis check showed that the distribution for the UMIW measures did not exceed the threshold value.

Table 5.4
Means, Standard Deviations, Minimums and Maximums for UMIW (N = 153)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Med</th>
<th>Min</th>
<th>Max</th>
<th>Z-Skewness</th>
<th>Z-Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>UMIW Pretest</td>
<td>7.59</td>
<td>2.61</td>
<td>8.00</td>
<td>3.00</td>
<td>14.00</td>
<td>0.06</td>
<td>-1.57</td>
</tr>
<tr>
<td>UMIW Delayed Posttest</td>
<td>8.92</td>
<td>3.71</td>
<td>8.00</td>
<td>3.00</td>
<td>17.00</td>
<td>1.09</td>
<td>-2.50</td>
</tr>
</tbody>
</table>

Med - Median, Min - Minimum, Max - Maximum

The data in Table 5.4 show that the subjects (N = 153) in the experimental and control groups had a verbal originality score of 7.59 (SD = 2.61) for the UMIW used as pretest. The median, minimum, and maximum were 8.00, 3.00, and 14.00 respectively.
Figure 5.6 presents the distribution of the UMIW pretest scores. The data show that the scores of the subjects \((N = 153)\) were normal in distribution with a mean of 7.59 \((SD = 2.61)\).

The data in Table 5.4 indicate that the subjects \((N = 153)\) attained a mean verbal originality score of 8.92 \((SD = 3.71)\) for the UMIW used as delayed posttest. The median, minimum, and maximum were 8.00, 3.00, and 17.00 respectively. From the data it can be seen that the delayed posttest mean score obtained by the subjects in the experimental and control groups was higher than the pretest mean score. The mean score \((1.33)\) difference was an initial indication that creativity training through the KTM was effective in enabling the subjects to retain the creativity skills learnt especially in the use of modality and imagery in writing even after a period of two weeks.
Figure 5.7 displays the distribution of the UMIW delayed posttest scores. The data indicate that the scores of the subjects \( n = 153 \) were normal in distribution with a mean of 8.92 \( (SD = 3.71) \).

![Histogram and Descriptive Statistics of UMIW Delayed Posttest](image)

\[ \text{Frequency} \]

\[ \text{UMIW Posttest} \]

\[ \text{Mean} = \text{Std. Dev.} = 3.706 \]

\[ N = 153 \]

*Figure 5.7: Histogram and Descriptive Statistics of UMIW Delayed Posttest*

5.1.5 Descriptive Statistics of TCSW and UMIW for Experimentals and Controls

Descriptive statistics of the TCSW and UMIW measures were presented earlier on for the whole sample \( (N = 153) \) in Tables 5.3 and 5.4 and their means, standard deviations, medians, minimums, and maximums were reported. A check on skewness (symmetry of a distribution) and kurtosis (peakedness of a distribution), the two statistical components of normality showed that their values were within the critical limit of plus or minus 2.58. This suggested that the TCSW and UMIW scores were normal in distribution.
Descriptive statistics are now presented separately for the experimental and control groups as well as for the other sub-categories in the experimental and control groups made up of high creative, low creative, male, female, science and arts, subjects. Tables 5.5 to 5.11 present the results of the descriptive analyses for the the TCSW (S&I pretest, O&I pretest, S&I posttest, O&I posttest) and the UMIW (pretest, delayed posttest) measures. The scores for each measure were examined in terms of their mean, standard deviation, median, minimum, maximum, skewness, and kurtosis. Z-scores for skewness and kurtosis were obtained by dividing the values by their respective standard errors. It has been said that a variable is reasonably close to normal if its skewness and kurtosis have values between -1.0 and +1.0 (Hair et al., 1998).

Table 5.5 presents the descriptive statistics for the experimental and control groups ($N = 153$). From the data it can be seen that the scores for the S&I and O&I, pretest and posttest measures as well as the UMIW pretest and delayed posttest measures for both the experimental ($n = 81$) and control ($n = 72$) groups were within the critical value for skewness and kurtosis, except for the UMIW delayed posttest (control group) which exceeded the threshold value of skewness (2.80) slightly. While the S&I and O&I are published auditory measures of verbal originality, the UMIW is a measuring checklist designed by the researcher, approved, pilot tested, and used for the first time. The UMIW measures the use of seven modality types (visual, auditory, kinesthetic, olfactory, gustatory, cutaneous, organic) and four imagery types (direct, personal, fantasy, symbolic) in the written component.
Means, Standard Deviations, Minimums and Maximums for Experimentals and Controls of the Overall Sample (N = 153)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Med</th>
<th>Min</th>
<th>Max</th>
<th>Z-Skewness</th>
<th>Z-Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experimental (n = 81)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S&amp;I Pretest</td>
<td>117.59</td>
<td>17.36</td>
<td>116.00</td>
<td>77</td>
<td>157</td>
<td>0.12</td>
<td>-0.07</td>
</tr>
<tr>
<td>O&amp;I Pretest</td>
<td>117.90</td>
<td>13.03</td>
<td>119.00</td>
<td>83</td>
<td>152</td>
<td>-0.66</td>
<td>0.24</td>
</tr>
<tr>
<td>S&amp;I Posttest</td>
<td>133.69</td>
<td>17.42</td>
<td>138.00</td>
<td>93</td>
<td>170</td>
<td>-0.63</td>
<td>-1.34</td>
</tr>
<tr>
<td>O&amp;I Posttest</td>
<td>136.62</td>
<td>14.16</td>
<td>138.00</td>
<td>101</td>
<td>174</td>
<td>0.14</td>
<td>-0.23</td>
</tr>
<tr>
<td>UMIW Pretest</td>
<td>8.54</td>
<td>2.36</td>
<td>9.00</td>
<td>3</td>
<td>14</td>
<td>-0.80</td>
<td>-0.30</td>
</tr>
<tr>
<td>UMIW Delayed Posttest</td>
<td>11.06</td>
<td>3.24</td>
<td>11.00</td>
<td>3</td>
<td>17</td>
<td>-1.62</td>
<td>-0.68</td>
</tr>
<tr>
<td><strong>Control (n = 72)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S&amp;I Pretest</td>
<td>114.01</td>
<td>21.70</td>
<td>110.00</td>
<td>75</td>
<td>169</td>
<td>1.50</td>
<td>-0.96</td>
</tr>
<tr>
<td>O&amp;I Pretest</td>
<td>111.17</td>
<td>15.22</td>
<td>111.00</td>
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<td>22.80</td>
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<td>115.50</td>
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<td>6.00</td>
<td>3</td>
<td>14</td>
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<td>1.13</td>
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Med - Median, Min - Minimum, Max - Maximum

Descriptive statistics for the high creatives (N = 74) in the experimental and control groups are presented in Table 5.6. It can be seen from the data that the scores for the S&I and O&I, pretest and posttest measures as well as the UMIW pretest and delayed posttest measures for the high creatives in the experimental (n = 38) and control (n = 36) groups did not exceed the critical value for skewness and kurtosis. The scores of the measures could be considered as normal in distribution for the high creatives.

Table 5.6
Means, Standard Deviations, Minimums and Maximums
for High Creative Experimentals and Controls ($N = 74$)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
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<th>Med</th>
<th>Min</th>
<th>Max</th>
<th>Z-Skewness</th>
<th>Z-Kurtosis</th>
</tr>
</thead>
<tbody>
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<td>13.59</td>
<td>131.00</td>
<td>104</td>
<td>157</td>
<td>0.44</td>
<td>-0.88</td>
</tr>
<tr>
<td>O&amp;I Pretest</td>
<td>126.13</td>
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<td>126.50</td>
<td>106</td>
<td>152</td>
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<td>0.56</td>
</tr>
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<td>S&amp;I Posttest</td>
<td>145.53</td>
<td>10.89</td>
<td>144.00</td>
<td>125</td>
<td>170</td>
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<td>-0.70</td>
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<td>8.99</td>
<td>147.00</td>
<td>134</td>
<td>174</td>
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<td>0.84</td>
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<td>1.83</td>
<td>10.00</td>
<td>5</td>
<td>14</td>
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<td>S&amp;I Posttest</td>
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<td>126.00</td>
<td>104</td>
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<td>0.83</td>
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Med - Median, Min - Minimum, Max - Maximum

Table 5.7 presents the descriptive statistics for the low creatives ($N = 79$) in the experimental and control groups. The data show us that the scores for the S&I and O&I pretest and posttest measures, as well as the UMIW pretest and delayed posttest measures for the low creatives in the experimental ($n = 43$) and control ($n = 36$) groups were all well within the critical value for skewness and kurtosis. Thus, the scores of the measures used in this study were normal in distribution not only for the high creative subjects but also for the low creative subjects.

Table 5.7
Means, Standard Deviations, Minimums and Maximums
for Low Creative Experimentals and Controls (N = 79)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
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<th>Med</th>
<th>Min</th>
<th>Max</th>
<th>Z-Skewness</th>
<th>Z-Kurtosis</th>
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<td>12.64</td>
<td>109.00</td>
<td>77</td>
<td>128</td>
<td>-1.71</td>
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</tr>
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<td>O&amp;I Pretest</td>
<td>110.63</td>
<td>11.03</td>
<td>113.50</td>
<td>83</td>
<td>133</td>
<td>-0.96</td>
<td>-0.07</td>
</tr>
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<td>S&amp;I Posttest</td>
<td>123.23</td>
<td>15.33</td>
<td>122.00</td>
<td>93</td>
<td>156</td>
<td>1.05</td>
<td>-0.79</td>
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<td>9.68</td>
<td>126.00</td>
<td>101</td>
<td>146</td>
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<td>0.97</td>
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<td>11</td>
<td>-0.77</td>
<td>-0.92</td>
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<td>13</td>
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<td>120</td>
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</table>

Med - Median, Min - Minimum, Max - Maximum

Descriptive statistics for the males (N = 80) in the experimental and control groups are presented in Table 5.8. From the data it can be seen that the scores for the S&I and O&I pretest and posttest measures, as well as the UMIW pretest and delayed posttest measures for the males in the experimental (n = 44) and control (n = 36) groups did not exceed the critical value for skewness or kurtosis. Thus, the scores could be considered as normal in distribution for the male subjects in this study.

Table 5.8
Means, Standard Deviations, Minimums and Maximums
for Male Experimentals and Controls (N = 80)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Med</th>
<th>Min</th>
<th>Max</th>
<th>Z-Skewness</th>
<th>Z-Kurtosis</th>
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<tbody>
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<tr>
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<td>117.64</td>
<td>18.28</td>
<td>116.00</td>
<td>77</td>
<td>157</td>
<td>0.61</td>
<td>-0.33</td>
</tr>
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<td>O&amp;I Pretest</td>
<td>119.84</td>
<td>13.07</td>
<td>120.50</td>
<td>83</td>
<td>141</td>
<td>-1.59</td>
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<td>18.21</td>
<td>138.00</td>
<td>93</td>
<td>170</td>
<td>-0.41</td>
<td>-1.10</td>
</tr>
<tr>
<td>O&amp;I Posttest</td>
<td>134.93</td>
<td>15.51</td>
<td>137.50</td>
<td>101</td>
<td>164</td>
<td>0.01</td>
<td>-0.75</td>
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<td>9.00</td>
<td>3</td>
<td>14</td>
<td>-0.67</td>
<td>0.58</td>
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<td>10.89</td>
<td>3.17</td>
<td>11.50</td>
<td>3</td>
<td>16</td>
<td>-1.35</td>
<td>0.57</td>
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<td>Posttest</td>
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</tr>
<tr>
<td><strong>Control</strong></td>
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<tr>
<td>(n = 36)</td>
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</tr>
<tr>
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<td>144</td>
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<td>25.47</td>
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<td>67</td>
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</table>

Med - Median, Min - Minimum, Max - Maximum

Table 5.9 presents descriptive statistics for the females (N = 73) in the experimental and control groups. The data indicate that the scores for the S&I and O&I pretest and posttest measures, as well as the UMIW pretest and delayed posttest measures for the females in the experimental (n = 37) and control (n = 36) groups were well within the critical value for skewness and kurtosis. Hence the scores of the measures used in this study were normal in distribution not only for the male but also for the female sub-categories.

Table 5.9  
*Means, Standard Deviations, Minimums and Maximums*
Table 5.10 presents the descriptive statistics for the science subjects \(N = 85\) in the experimental and control groups. From the data it can be seen that the scores for the S&I and O&I pretest and posttest measures, as well as the UMIW pretest and delayed posttest measures for the science subjects in the experimental \(n = 45\) and control \(n = 40\) groups were within the range of the critical value for skewness and kurtosis and hence were normal in distribution.

Table 5.10

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<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Med</th>
<th>Min</th>
<th>Max</th>
<th>Z-Skewness</th>
<th>Z-Kurtosis</th>
</tr>
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<tbody>
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<td>16.44</td>
<td>119.00</td>
<td>78</td>
<td>155</td>
<td>-0.72</td>
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<td>12.79</td>
<td>118.00</td>
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<td>103</td>
<td>163</td>
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<td>-0.78</td>
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<td>174</td>
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<td>9.00</td>
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<td>11.00</td>
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<td>109.00</td>
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Med - Median, Min - Minimum, Max - Maximum
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<th>Variable</th>
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<th>SD</th>
<th>Med</th>
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<th>Max</th>
<th>Z-Skewness</th>
<th>Z-Kurtosis</th>
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<td>163</td>
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<td>UMIW Pretest</td>
<td>8.80</td>
<td>2.04</td>
<td>9.00</td>
<td>5</td>
<td>13</td>
<td>-0.05</td>
<td>-0.34</td>
</tr>
<tr>
<td>UMIW Delayed Posttest</td>
<td>11.40</td>
<td>2.67</td>
<td>11.00</td>
<td>6</td>
<td>16</td>
<td>-0.13</td>
<td>-1.03</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( n = 40 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S&amp;I Pretest</td>
<td>116.93</td>
<td>21.48</td>
<td>114.50</td>
<td>75</td>
<td>169</td>
<td>1.20</td>
<td>-0.31</td>
</tr>
<tr>
<td>O&amp;I Pretest</td>
<td>112.10</td>
<td>13.34</td>
<td>111.00</td>
<td>89</td>
<td>137</td>
<td>0.37</td>
<td>-1.40</td>
</tr>
<tr>
<td>S&amp;I Posttest</td>
<td>110.80</td>
<td>20.41</td>
<td>106.00</td>
<td>72</td>
<td>166</td>
<td>1.82</td>
<td>0.90</td>
</tr>
<tr>
<td>O&amp;I Posttest</td>
<td>117.13</td>
<td>14.73</td>
<td>116.00</td>
<td>93</td>
<td>152</td>
<td>0.73</td>
<td>-0.75</td>
</tr>
<tr>
<td>UMIW Pretest</td>
<td>6.93</td>
<td>2.37</td>
<td>7.00</td>
<td>3</td>
<td>13</td>
<td>0.48</td>
<td>-0.31</td>
</tr>
<tr>
<td>UMIW Delayed Posttest</td>
<td>6.95</td>
<td>2.35</td>
<td>7.00</td>
<td>3</td>
<td>14</td>
<td>1.96</td>
<td>1.38</td>
</tr>
</tbody>
</table>

Med - Median, Min - Minimum, Max - Maximum

Descriptive statistics for the arts subjects \((N = 68)\) in the experimental and control groups are presented in Table 5.11. From the data it can be viewed that the scores for the S&I and O&I pretest and posttest measures, as well as the UMIW pretest and delayed posttest measures for the arts subjects in the experimental \((n = 36)\) and control \((n = 32)\) groups were within the critical value for skewness and kurtosis (plus or minus 2.58). However, for the UMIW delayed posttest, the threshold value for skewness (2.70) was above the critical value. Thus, while the distribution of scores for the science subjects were normal, that of the arts subjects were sightly skewed.
### Table 5.11
*Means, Standard Deviations, Minimums and Maximums for Arts Experimental and Controls (N = 68)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Med</th>
<th>Min</th>
<th>Max</th>
<th>Z-Skewness</th>
<th>Z-Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experimental</strong> <em>(n = 36)</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S&amp;I Pretest</td>
<td>117.64</td>
<td>18.25</td>
<td>117.50</td>
<td>77</td>
<td>157</td>
<td>0.23</td>
<td>-0.03</td>
</tr>
<tr>
<td>O&amp;I Pretest</td>
<td>116.44</td>
<td>15.06</td>
<td>117.00</td>
<td>83</td>
<td>152</td>
<td>0.05</td>
<td>0.09</td>
</tr>
<tr>
<td>S&amp;I Posttest</td>
<td>133.22</td>
<td>18.56</td>
<td>135.00</td>
<td>103</td>
<td>170</td>
<td>0.26</td>
<td>-1.07</td>
</tr>
<tr>
<td>O&amp;I Posttest</td>
<td>135.08</td>
<td>15.19</td>
<td>135.00</td>
<td>101</td>
<td>174</td>
<td>0.10</td>
<td>0.28</td>
</tr>
<tr>
<td>UMIW Pretest</td>
<td>8.22</td>
<td>2.70</td>
<td>9.00</td>
<td>3</td>
<td>14</td>
<td>-0.42</td>
<td>-0.57</td>
</tr>
<tr>
<td>UMIW Delayed Posttest</td>
<td>10.64</td>
<td>3.83</td>
<td>12.00</td>
<td>3</td>
<td>17</td>
<td>-1.06</td>
<td>-1.08</td>
</tr>
<tr>
<td><strong>Control</strong> <em>(n = 32)</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S&amp;I Pretest</td>
<td>110.38</td>
<td>21.76</td>
<td>107.00</td>
<td>77</td>
<td>154</td>
<td>1.11</td>
<td>-1.06</td>
</tr>
<tr>
<td>O&amp;I Pretest</td>
<td>110.00</td>
<td>17.45</td>
<td>110.00</td>
<td>77</td>
<td>144</td>
<td>-0.32</td>
<td>-0.88</td>
</tr>
<tr>
<td>S&amp;I Posttest</td>
<td>100.56</td>
<td>24.62</td>
<td>95.00</td>
<td>65</td>
<td>151</td>
<td>1.58</td>
<td>-0.82</td>
</tr>
<tr>
<td>O&amp;I Posttest</td>
<td>111.81</td>
<td>17.39</td>
<td>112.50</td>
<td>77</td>
<td>154</td>
<td>0.34</td>
<td>-0.35</td>
</tr>
<tr>
<td>UMIW Pretest</td>
<td>6.03</td>
<td>2.56</td>
<td>6.00</td>
<td>3</td>
<td>12</td>
<td>1.76</td>
<td>0.07</td>
</tr>
<tr>
<td>UMIW Delayed Posttest</td>
<td>5.94</td>
<td>2.68</td>
<td>5.50</td>
<td>3</td>
<td>13</td>
<td>2.70</td>
<td>1.41</td>
</tr>
</tbody>
</table>

Med - Median, Min - Minimum, Max – Maximum

5.1.6 Descriptive Analyses of Pretest Scores for TCSW and UMIW

To determine the comparability of the subjects on the TCSW and UMIW before the commencement of creativity training via the Khatena Training Method (KTM), procedures of between-subjects *t*-tests (Independent-samples *t*-tests) for the experimental and control groups were applied. All statistical tests were considered significant at *p* < .05. For the judgement of effect size, Cohen *d* was used where an effect size of < 0.2 is small, 0.5 is medium and > 0.8 is large.
Firstly, the comparability of the subjects in the experimental \((n = 81)\) and control \((n = 72)\) groups in the TCSW measure was determined. Table 5.12 presents the results of the Independent-samples \(t\)-tests that tested the equality of means \((t\text{-test})\) for the subjects in the experimental and control groups. The TCSW mean pretest scores for the experimental and control groups together with their standard deviations and \(t\)-values are reported. The purpose was to determine if there were any differences in the scores between the experimental and control groups before creativity training.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental ((n = 81))</th>
<th>Control ((n = 72))</th>
<th>(t)</th>
<th>(p &lt; .05)</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;I Mean</td>
<td>117.59</td>
<td>114.01</td>
<td>1.12</td>
<td>NS</td>
<td>0.18</td>
</tr>
<tr>
<td>SD</td>
<td>17.36</td>
<td>21.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O&amp;I Mean</td>
<td>117.90</td>
<td>111.17</td>
<td>2.92</td>
<td>Sig</td>
<td>0.48</td>
</tr>
<tr>
<td>SD</td>
<td>13.03</td>
<td>15.22</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NS - Not Significant, Sig - Significant

The data for the S&I pretest show that the subjects in the experimental group had a mean of 117.59 \((SD = 17.36)\) compared to the subjects in the control group who obtained a mean of 114.01 \((SD = 21.70)\). The experimental group performed better than the control group in the S&I, \(t\) \((151) = 1.12, p > .05\). Where the O&I pretest was concerned, the subjects in the experimental group obtained a mean of 117.90 \((SD = 13.03)\) compared to the subjects in the control group who had a mean of 111.17 \((SD = 15.22)\). The experimental subjects did better than the control subjects in the O&I, \(t\) \((151) = 2.92, p < .05\).

To determine if the differences in the mean scores were significant, the results of the independent-samples \(t\)-test were resorted to. It can be seen that
there were no significant differences in the S&I pretest scores between the experimental and control groups ($t = 1.12, p > .05$). The effect size (0.18) was small and indicated that the two groups had similar S&I verbal originality scores before the commencement of creativity training and hence were on par where their level of creativity was concerned. However, this was not the case with the O&I scores as they differed significantly between the experimental and control groups ($t = 2.92, p < .05$) though the effect size (0.48) could be considered as moderate. The mean score for the experimental group (117.90) was higher by 6.73 compared to the control group’s mean score (111.17). Thus, the experimental and control groups were dissimilar on the O&I pretest measure before creativity training as they had obtained significantly different O&I verbal originality scores. However, these differences were partialled out during the ANCOVA analyses where both pretest scores of O&I and S&I were used as covariates.

Secondly, the comparability among the high creative subjects and among the low creative subjects between the experimental and control groups in the TCSW measure was determined. The results of the Independent-samples $t$-tests that tested the equality of means ($t$-test) for the high creative subjects in the experimental and control groups and for the low creative subjects in the experimental and control groups are presented in Tables 5.13 and 5.14 respectively. The TCSW (S&I & O&I) mean pretest scores for the high creatives in the experimental ($n = 38$) and control ($n = 36$) groups and for the low creatives in the experimental ($n = 43$) and control ($n = 36$) groups together with their standard deviations and $t$-values are stated. The objective was to determine if there were any differences in the scores between the experimental and control groups before the commencement of creativity training.
Table 5.13  
*Independent t-test Comparisons of Pretest TCSW Scores on Experimental and Control groups for High Creatives (N = 74)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental (n = 38)</th>
<th>Control (n = 36)</th>
<th>( t )</th>
<th>( p &lt; .05 )</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;I</td>
<td>Mean</td>
<td>129.74</td>
<td>128.25</td>
<td>0.40</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>( SD )</td>
<td>13.59</td>
<td>17.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O&amp;I</td>
<td>Mean</td>
<td>126.13</td>
<td>122.00</td>
<td>1.68</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>( SD )</td>
<td>9.91</td>
<td>11.14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NS - Non Significant

The data for the high creative subjects in the S&I measure indicate that the experimental group obtained a mean of 129.74 (\( SD = 13.59 \)), whereas the control group had a mean of 128.25 (\( SD = 17.90 \)). The subjects in the experimental group did better than the control group in the S&I measure. Regarding the performance of the high creative subjects in the O&I measure, the experimental group obtained a mean of 126.13 (\( SD = 9.91 \)), whereas those in the control group had a mean of 122.00 (\( SD = 11.14 \)). The experimental group performed better than the control group in the O&I measure. The high pretest scores obtained by the high creatives in the experimental and control groups for the S&I and O&I measures that reached statistical significance were unexpected. This could be attributed to SAM, used to differentiate high and low creatives, as being a good predictor of creative ability or talent. SAM could also be considered a suitable screening tool to identify creative people as a couple of earlier studies (Khatena, 1971g, 1971h) that analyzed SAM scores of adults and adolescents and their originality scores in the S&I and O&I measures found that high creatives were significantly more original than low creatives.

To investigate if the differences in the mean scores were significant, the results of the independent-samples \( t \)- tests were referred to. For the high
creatives in the experimental and control groups, there were no significant differences in the S&I pretest \( t (72) = 0.40, p > .05 \) and in the O&I pretest \( t (72) = 1.68, p > .05 \) scores before creativity training. The effect size for the S&I (0.09) was minimal and the effect size for the O&I (0.39) was small. Since the scores of the high creatives were alike on the pretest measures, they could be considered as similar on their level of creativity.

Table 5.14

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental ( (n = 43) )</th>
<th>Control ( (n = 36) )</th>
<th>( t )</th>
<th>( p &lt; .05 )</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;I Mean</td>
<td>106.86</td>
<td>99.78</td>
<td>2.27</td>
<td>Sig</td>
<td>0.52</td>
</tr>
<tr>
<td>SD</td>
<td>12.64</td>
<td>14.76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O&amp;I Mean</td>
<td>110.63</td>
<td>100.33</td>
<td>4.30</td>
<td>Sig</td>
<td>0.97</td>
</tr>
<tr>
<td>SD</td>
<td>11.03</td>
<td>10.23</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sig - Significant

The performance of the low creative subjects (Table 5.14) in the S&I measure was investigated. The experimental group obtained a mean of 106.86 \( (SD = 12.64) \), whereas the low creatives in the control group had a mean of 99.78 \( (SD = 14.76) \). The low creative experimental subjects performed better than the low creative control subjects in the S&I measure. Where the performance of the low creative subjects in the O&I measure was concerned, the experimental group had a mean of 110.63 \( (SD = 11.03) \) whereas the low creatives in the control group obtained a mean of 100.33 \( (SD = 10.23) \). The low creative experimental subjects did better than the low creative control subjects in the O&I measure.

To examine if the differences in the mean scores were significant, the results of the independent-samples \( t \)-tests were utilized. For the low creatives in
the experimental and control groups, there were significant differences in the
S&I pretest \((t (77) = 2.27, p < .05)\) scores and the O&I pretest \((t (77) = 4.30, p < .05)\) scores before training. The effect size for the S&I (0.52) could be
considered as average but for the O&I (0.97) the effect size was large. Hence the
low creatives in the experimental and control groups were not equivalent on the
S&I and O&I pretest measures as they had obtained significantly different S&I
and O&I verbal originality scores before creativity training.

In reference to the \(t\)-tests results presented in Tables 5.13 and 5.14 on the
differences in the TCSW pretest mean scores of the high creatives and of the
low creatives between the experimental and control groups before training, it
could be concluded that the S&I and O&I pretest scores were significantly
different only for the low creative subjects in the experimental and control
groups. However, these differences were partialled out during the ANCOVA
analyses where both pretest scores of S&I and O&I were used as covariates.

Thirdly, the comparability among the male subjects and among the
female subjects between the experimental and control groups in the TCSW
measure was determined. Table 5.15 below presents the results of the
Independent-samples \(t\)-test that tested the equality of means \((t\)-test\) for the male
subjects in the experimental and control groups and for the female subjects in
the experimental and control groups. The TCSW (S&I and O&I) mean pretest
scores of the male subjects in the experimental \((n = 44)\) and control \((n = 36)\)
groups and for the female subjects in the experimental \((n = 37)\) and control \((n = 36)\)
groups together with their standard deviations and \(t\)-values are reported. The
purpose was to determine if there were any differences in the scores between the
experimental and control groups before creativity training.

Table 5.15
### Independent t-test Comparisons of Pretest TCSW Scores on Experimental and Control groups for Males (N = 80)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental (n = 44)</th>
<th>Control (n = 36)</th>
<th>( t )</th>
<th>( p &lt; .05 )</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;I</td>
<td>Mean 117.64</td>
<td>120.39</td>
<td>-.57</td>
<td>NS</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>SD 18.28</td>
<td>23.77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O&amp;I</td>
<td>Mean 119.84</td>
<td>113.58</td>
<td>2.02</td>
<td>Sig</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>SD 13.07</td>
<td>14.41</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NS - Not Significant, Sig - Significant

The data for the male subjects in the S&I measure indicate that the experimental group had a mean of 117.64 (SD = 18.28) whereas the male subjects in the control group attained a mean of 120.39 (SD = 23.78). The male control subjects had done better than the male experimental subjects in the S&I measure. Where the performance of the male subjects in the O&I measure was concerned, the experimental group got a mean of 119.84 (SD = 13.07), whereas the male subjects in the control group had a mean of 113.58 (SD = 14.41). This time the male experimental subjects performed better than the male control subjects in the O&I measure.

To investigate if the differences in the mean scores were significant, the results of the independent-samples \( t \)-test were used. For the males in the experimental and control groups, it can be seen that there were no significant differences in the S&I pretest \( (t (78) = -.57, p > .05) \) scores. The effect size (0.13) was small. Thus, the males in the experimental and control groups were comparable in their S&I pretest scores before creativity training and similar on their creativity level. However, on the O&I pretest scores they were not equivalent. This was because there were significant differences \( (t (78) = 2.02, p < .05) \) in the mean scores of the males in the experimental (119.84) and control (113.58) groups, though the effect size (0.40) could be considered as medium.
However, these differences were partialled out during the ANCOVA analyses where both the S&I and O&I pretest scores were used as covariates.

Table 5.16
Independent t-test Comparisons of Pretest TCSW Scores on Experimental and Control groups for Females (N = 73)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental (n = 37)</th>
<th>Control (n = 36)</th>
<th>t</th>
<th>p &lt; .05</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;I Mean</td>
<td>117.54</td>
<td>107.64</td>
<td>2.49</td>
<td>Sig</td>
<td>0.58</td>
</tr>
<tr>
<td>SD</td>
<td>16.44</td>
<td>17.51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O&amp;I Mean</td>
<td>115.59</td>
<td>108.75</td>
<td>2.03</td>
<td>Sig</td>
<td>0.48</td>
</tr>
<tr>
<td>SD</td>
<td>12.79</td>
<td>15.83</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sig - Significant

The performance of the female subjects (Table 5.16) in the S&I measure was examined. The females in the experimental group attained a mean of 117.54 (SD = 16.44), whereas the females in the control group had a mean of 107.64 (SD = 17.51). The female experimental subjects performed much better than the female control subjects in the S&I measure. Where the performance of the female subjects in the O&I measure was concerned, the experimental group obtained a mean of 115.59 (SD = 12.79), whereas the female subjects in the control group managed to get a mean of 108.75 (SD = 15.83). The female experimental subjects had done better than the female control subjects in the O&I measure.

To ascertain if the differences in the mean scores were significant, the results of the independent-samples t-test were referred to. For the females it can be seen that there were significant differences in the S&I pretest ($t (71) = 2.49, p < .05$) scores and in the O&I pretest ($t (71) = 2.03, p < .05$) scores between the experimental and control groups. The experimental group acquired significantly higher scores on both the S&I and O&I measures compared to the control group.
However, these differences were partialled out during the ANCOVA analyses where both the S&I and O&I pretest scores were used as covariates.

In reference to the $t$-tests results presented in Tables 5.15 and 5.16 on the difference in the TCSW pretest mean scores of the males and females before training, it could be concluded that the female subjects in the experimental and control groups were found to be not comparable in their pretest scores for both the S&I and O&I measures. For the males, it was earlier determined that they were not equal only on the O&I measure. However, the problems of incomparability were contained with ANCOVA analyses.

Fourthly, the equivalence among the science subjects and among the arts subjects between the experimental and control groups in the TCSW measure was determined. Table 5.17 presents the results of the Independent-samples $t$-tests that tested the equality of means ($t$-test) for the science subjects in the experimental and control groups and for the arts subjects in the experimental and control groups. The TCSW (S&I & O&I) mean pretest scores of the science subjects in the experimental ($n = 45$) and control ($n = 40$) groups and of the arts subjects in the experimental ($n = 36$) and control ($n = 32$) groups together with their standard deviations and $t$-values are stated. The purpose was to establish if there were any differences in the scores between the experimental and control groups before creativity training.

Table 5.17

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental ($n = 45$)</th>
<th>Control ($n = 40$)</th>
<th>$t$</th>
<th>$p &lt; .05$</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;I Mean</td>
<td>117.56</td>
<td>116.93</td>
<td>0.15</td>
<td>NS</td>
<td>0.03</td>
</tr>
<tr>
<td>SD</td>
<td>16.82</td>
<td>21.48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O&amp;I Mean</td>
<td>119.07</td>
<td>112.10</td>
<td>2.59</td>
<td>Sig</td>
<td>0.57</td>
</tr>
</tbody>
</table>
The data for the science subjects in the S&I measure show that the experiment group obtained a mean of 117.56 ($SD = 16.82$), whereas the science subjects in the control group had got a mean of 116.93 ($SD = 21.48$). The science experimental subjects performed better than the science control subjects in S&I measure. Where the O&I measure was concerned, the science subjects in the experimental group attained a mean of 119.07 ($SD = 11.20$), whereas the science subjects in the control group managed to obtain only a mean of 112.10 ($SD = 13.34$). The science subjects in the experimental group had done better than their counterparts in the control group in the O&I measure.

To determine if the differences in the mean scores were significant, the results of the independent-samples $t$-test were utilized. For the science subjects in the experimental and control groups, it can be seen that there were no significant differences in the S&I pretest scores ($t (83) = .15, p > .05$). The effect size (0.03) was small and so for the S&I measure, the science subjects in the experimental and control groups were more or less equal before creativity training and hence considered similar on their creative thinking ability level. However, in the O&I pretest scores, there were significant differences ($t (83) = 2.59, p < .05$) between the experimental and control groups. The effect size (0.57) could be considered more than moderate and this indicated that for the O&I measure, the science subjects in the experimental and control groups were not similar in their creative abilities before creativity training. However, these differences were partialled out during the ANCOVA analyses where both the S&I and O&I pretest scores were used as covariates.
Table 5.18
*Independent t-test Comparisons of Pretest TCSW Scores on Experimental and Control groups for Arts subjects (N = 68)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental (n = 36)</th>
<th>Control (n = 32)</th>
<th>t</th>
<th>p &lt; .05</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;I Mean</td>
<td>117.64</td>
<td>110.38</td>
<td>1.48</td>
<td>NS</td>
<td>0.36</td>
</tr>
<tr>
<td>SD</td>
<td>18.25</td>
<td>21.76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O&amp;I Mean</td>
<td>116.44</td>
<td>110.00</td>
<td>1.62</td>
<td>NS</td>
<td>0.40</td>
</tr>
<tr>
<td>SD</td>
<td>15.06</td>
<td>17.45</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NS - Not Significant

The performance of the arts subjects in the S&I measure was investigated. From the data in Table 5.18, it can be seen that the experimental group attained a mean of 117.64 (SD = 18.25), whereas the arts subjects in the control group had a mean of 110.38 (SD = 21.76). The arts subjects in the experimental group performed better than their counterparts in the control group in the S&I measure. Where the performance of the arts subjects in the O&I measure was concerned, the experimental group obtained a mean of 116.44 (SD = 15.06), whereas the arts subjects in the control group managed to get a mean of 110.00 (SD = 17.45). Just as in the S&I, the arts subjects in the experimental group had done better than the arts subjects in the control group in the O&I measure.

To establish if the differences in the mean scores were significant, the results of the independent-samples *t*-test were examined. For the arts subjects in the experimental and control groups, it can be seen that there were no significant differences in the S&I pretest scores (*t* (66) = 1.48, *p* > .05) and the effect size (0.36) could be considered small. Based on the O&I pretest scores (*t* (66) = 1.62, *p* > .05), there were also no significant differences between the experimental and control groups. The effect size (0.40) was below average and this indicated that
the arts subjects in the experimental and control groups did not differ significantly on the S&I and O&I pretest scores before creativity training. Thus, they could be considered to be similar in their creative thinking abilities.

Based on the t-tests results presented in Tables 5.17 and 5.18 on the difference in the TCSW pretest mean scores of the science subjects in the experimental and control groups and of the arts subjects in the experimental and control groups before creativity training, it could be concluded that while the arts subjects were equivalent on both the S&I and the O&I measures, the science subjects were only comparable on the S&I measure. However, the differences were partialled out during the ANCOVA analyses where both the S&I and O&I pretest scores were used as covariates.

Fifthly, the comparability of the subjects between the experimental (n = 81) and control (n = 72) groups in the UMIW measure was determined. Table 5.19 presents the results of the Independent-samples t-tests that tested the equality of means (t-test) for the subjects in the experimental and control groups. The UMIW mean pretest scores for the experimental and control groups together with their standard deviations and t-values are reported. The purpose was to determine if there were any differences in the scores between the experimental and control groups before creativity training.

Table 5.19

Independent t-test Comparisons of Pretest UMIW Scores on Experimental and Control Groups for the Whole Sample (N = 153)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental (n = 81)</th>
<th>Control (n = 72)</th>
<th>t</th>
<th>p &lt; .05</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>UMIW Mean</td>
<td>8.54</td>
<td>6.53</td>
<td>5.15</td>
<td>Sig</td>
<td>0.83</td>
</tr>
<tr>
<td>SD</td>
<td>2.36</td>
<td>2.48</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sig - Significant
The data for the UMIW pretest show that the subjects in the experimental group had a mean of 8.54 ($SD = 2.36$) compared to the subjects in the control group who obtained a mean of 6.53 ($SD = 2.48$). The experimental group performed better than the control group in the UMIW, $t (151) = 1.15, p < .05$.

To determine if the differences in the mean scores were significant, the results of the independent-samples $t$-test were resorted to. It can be seen that there were significant differences in the UMIW pretest scores between the experimental and control groups ($t = 1.15, p < .05$). The effect size (0.83) was large. Thus, the experimental and control groups were dissimilar on the UMIW pretest measure before creativity training as they had obtained significantly different UMIW verbal originality scores. However, these differences were partialled out during the ANCOVA analyses where the pretest scores of UMIW were used as covariates.

In summary, computations of $t$-tests for equality of means (Tables 5.12 – 5.19) revealed that significant differences still existed for some categories of subjects that made them incomparable. However, these differences were later partialled out during ANCOVA analyses. The categories of subjects were as follows: experimental and control subjects in the O&I ($t = 2.92, p < .05$); low creatives in the S&I ($t = 2.27, p < .05$) and O&I ($t = 4.30, p < .05$); males in the O&I ($t = 2.02, p < .05$); females in the S&I ($t = 2.49, p < .05$) and O&I ($t = 2.03, p < .05$); science subjects in the O&I ($t = 2.59, p < .05$), and experimental and control subjects in the UMIW ($t = 5.15, p < .05$).

On a positive note, there were no significant differences discerned for some categories of subjects and this made them similar in their creative thinking.
abilities. The categories were as follows: experimental and control subjects in the S&I ($t = 1.12, p > .05$); high creatives in the S&I ($t = .40, p > .05$) and O&I ($t = 1.68, p > .05$); males in the S&I ($t = .57, p > .05$); science subjects in the S&I ($t = .15, p > .05$); and arts subjects in the S&I ($t = 1.48, p > .05$) and O&I ($t = 1.62, p > .05$).

The comparability of the subjects on the S&I pretest measure was better than on the O&I pretest measure for a number of groups as mentioned above. This could be because the 50 items on the Something About Myself (SAM) inventory that was used as an initial measure of creative ability correlated better with the items in the S&I measure than in the O&I measure for the subjects in this study. This argument is supported by what was reported in the Instruction Manual of the Khatena Torrance Creative Perception Inventory (Khatena & Torrance, 1998a). It was stated that to determine content validity, the items on SAM were correlated with originality scores of the S&I and the O&I measures using responses of adolescents and adults. The correlation was better for the S&I measure with $r$s ranging from .20 to .39 ($p < .05$) compared to the O&I measure with $r$s ranging from .15 to .34 ($p < .05$). This explanation may be also true for the subjects in this study who are adolescents.

5.2 Inferential Statistics

The intent of this study was to determine if creativity training had an effect on the experimental subjects who were exposed to the Khatena Training Method (KTM) as compared to the control subjects who were not given the KTM or any other treatment.

Statistical tests such as independent $t$-tests computed earlier on showed that the subjects in the experimental and control groups were not comparable on the O&I pretest measure. Likewise, some of the sub-categories of subjects in the
experimental and control groups (low creatives in the S&I and O&I, males in
the O&I, females in the S&I and O&I, science in the O&I) were not comparable
on the pretest measures of S&I or O&I or both. Thus, it was decided that to
answer research questions one through five that focus on gains due to creativity
training, apart from independent \( t \)-tests, Analysis of Covariance (ANCOVA)
procedures would be undertaken. This is because according to Wiersma (1995),
“Analysis of covariance is a procedure for statistical adjustment or statistical
control over variation” (p. 384). ANCOVA assumes that there is a linear
relationship between the dependent variables (posttest scores) and the covariates
(pretest scores). This allows for the examination of group differences while
taking individual differences into account.

Other studies on creativity training had used ANCOVA on posttest
scores, using the pretest as the baseline to indicate any significant differences
produced by the treatment conditions (Curnow & Turner, 1992; Goff, 1992,
cited in Ma, 2006; Jaben, 1985; Murphy, 1985). In Jaben’s study, while there
was a significant group difference for originality, no significance was found for
fluency. In the study by Curnow and Turner, there was a noticeable increase in
mean originality scores but it was not significant.

The probability level was set at .05 and statistical adjustments were
made to the posttest scores of the S&I and O&I measures with the pretest scores
of the S&I and O&I measures as covariates. Statistical adjustments were also
made to the delayed posttest scores of the UMIW with the pretest scores of the
UMIW as covariates. Adjusted means would be those with the effect of pretest
scores removed. By reducing error variance, conclusions and inferences could
be made to adjusted population dependent variable means. For the judgement of
effect size, partial eta squared was used where an effect size of < 0.01 is small, 0.06 is medium and > 0.14 is large.

5.2.1 Results for Research Question One

The first research question is “Are there any significant differences in the gains between the subjects in the experimental and control groups as measured by the TCSW (Forms 1B of S&I & O&I) scores?” The question focused on determining the gains between the experimental \( (N = 81) \) and control \( (N = 72) \) groups, in the TCSW measure after creativity training.

Computations to assess the gains for the S&I posttest showed that the experimental group obtained a positive mean score of 16.10 \( (SD = 11.50) \) compared to the control group which had a negative mean score of -7.76 \( (SD = 8.16) \). The \( t \)-test comparison of these gain scores indicated that the experimental group had significantly higher gains than the control group \( (t = 14.93, p < .05) \).

For the O&I posttest, the experimental group had a mean score of 18.72 \( (SD = 8.40) \) but the control group had only a mean score of 3.60 \( (SD = 7.21) \). The \( t \)-test comparison of these gain scores showed that the experimental group had significantly higher gains than the control group \( (t = 11.97, p < .05) \).

ANCOVA was then used to analyse the S&I and O&I posttest scores with the S&I and O&I baseline pretest scores as covariates to control for initial group differences. However, before conducting ANCOVA to test the effect of training on S&I posttest scores, the assumption of homogeneity of slopes which is necessary to run ANCOVA was tested using a scatterplot. Figure 5.8 shows the scatter plot for experimental and control groups with the pretest S&I scores as covariate on the X-axis and the S&I posttest as dependent variable on the Y-axis.
The scatter plot shows that the slopes were homogeneous and there were no interactions between the covariate (S&I pretest) and the factors (experimental and control groups). Hence, ANCOVA could be carried out to test the effect of the treatment with the pretest scores as covariate. ANCOVA then adjusted the S&I posttest means for the subjects in the experimental and control groups. The experimental group had a mean of 133.69 (SD = 17.42) while the control group obtained a mean of 106.25 (SD = 22.80).

The assumption of homogeneity of slopes was tested, before computing ANCOVA to test the effect of training on O&I posttest scores. Figure 5.9 shows the scatter plot for experimental and control groups with the O&I pretest scores as covariate on the X-axis and the O&I posttest as dependent variable on the Y-axis.
Figure 5.9: Scatterplot Testing the Homogeneity-of-groups Assumption for O&I Scores

The scatter plot shows that the slopes were homogeneous and there were no interactions between the covariate (S&I pretest) and the factors (experimental and control groups). Thus, ANCOVA could be carried out to test the effect of the treatment with the pretest scores as a covariate. ANCOVA then adjusted the O&I posttest means for the subjects in the experimental and control groups. The experimental group had a mean of 136.62 ($SD = 14.16$) while the control group managed to get a mean of 114.76 ($SD = 16.07$).

The adjusted posttest mean scores of the S&I and the O&I measures for the subjects in the experimental and control groups were compared. For both measures the experimental subjects performed better than the control subjects. However, the experimental subjects had performed better in the O&I ($M =$
136.62, $SD = 14.16$) compared to the S&I ($M = 133.69, SD = 17.42$) measure. This perhaps could be attributed to the effectiveness of the KTM treatment that had made it easier for the subjects to generate original verbal responses on the O&I measure (possible reasons for this are explored in Chapter Six, 6.3). Though the S&I and O&I sub-tests of the TCSW are separate testing measures of sounds and onomatopoeic words respectively, the similarities are that they are both auditory measures and focus on verbal originality. The KTM treatment too focuses on the creativity dimension of originality which is of concern in this study.

Based on the mean and standard deviation of the S&I measure, the $F$-test was used to test the significance of the difference among the subjects in the experimental and control groups at $p < .05$. The dependent variable was the S&I posttest and the covariate was the S&I pretest. Table 5.20 presents the $F$-ratio and significance level of the analyses of covariance for the S&I sub-measure of the TCSW.

Table 5.20
*ANCOVA Comparisons of Posttest S&I Scores with Pretest S&I scores as Covariates on Experimental and Control Groups for the whole Sample (N = 153)*

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>$df$</th>
<th>Mean Square</th>
<th>$F$-value</th>
<th>Sig</th>
<th>Partial Eta Sq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>75175.826</td>
<td>2</td>
<td>37587.913</td>
<td>383.221</td>
<td>.000</td>
<td>.836</td>
</tr>
<tr>
<td>Intercept</td>
<td>1053.617</td>
<td>1</td>
<td>1053.617</td>
<td>10.742</td>
<td>.001</td>
<td>.067</td>
</tr>
<tr>
<td>S&amp;I Pretest</td>
<td>46472.165</td>
<td>1</td>
<td>46472.165</td>
<td>473.799</td>
<td>.000</td>
<td>.760</td>
</tr>
<tr>
<td>Exp – Con</td>
<td>22181.030</td>
<td>1</td>
<td>22181.030</td>
<td>226.143</td>
<td>.000</td>
<td>.601</td>
</tr>
<tr>
<td>Error</td>
<td>14712.619</td>
<td>150</td>
<td>98.084</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2321741.000</td>
<td>153</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
There was a significant difference in post training S&I scores for the subjects between the experimental and control groups when the pretest S&I scores were partialled out, $F(1,150) = 226.14$, $p < .05$. Creativity training through the KTM had an effect size (.60) that could be judged to be large.

The better S&I posttest means (133.69, $SD = 17.42$) indicated that the experimental group had gained significantly in the S&I from the KTM treatment compared to the control group (106.25, $SD = 22.80$) and this gain is presented in the profile plot shown in Figure 5.10.

\[\text{Figure 5.10: Estimated Marginal Means of S&I Posttest for Experimentals and Controls on the Whole Sample}\]
Based on the mean and standard deviation of the O&I measure, the $F$-test was used to test the significance of the difference between the experimental and control groups at $p < .05$. The dependent variable was the O&I posttest and the covariate was the O&I pretest. Table 5.21 presents the $F$-ratio and significance level of the analyses of covariance for the O&I sub-measure of the TCSW.

There was a significant difference in post training O&I scores for subjects in the experimental and control groups when the pretest O&I scores were partialled out, $F(1,150) = 145.55, p < .05$.

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>$F$-value</th>
<th>Sig</th>
<th>Partial Eta Sq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>43430.488</td>
<td>2</td>
<td>21715.244</td>
<td>356.552</td>
<td>.000</td>
<td>.826</td>
</tr>
<tr>
<td>Intercept</td>
<td>970.428</td>
<td>1</td>
<td>970.428</td>
<td>15.934</td>
<td>.000</td>
<td>.096</td>
</tr>
<tr>
<td>O&amp;I Pretest</td>
<td>25226.510</td>
<td>1</td>
<td>25226.610</td>
<td>414.207</td>
<td>.000</td>
<td>.734</td>
</tr>
<tr>
<td>Exp – Con</td>
<td>8864.292</td>
<td>1</td>
<td>8864.296</td>
<td>145.547</td>
<td>.000</td>
<td>.492</td>
</tr>
<tr>
<td>Error</td>
<td>9135.512</td>
<td>150</td>
<td>60.903</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2494463.000</td>
<td>153</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>52566.000</td>
<td>152</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Computed using alpha = .05; R Squared = .826 (Adjusted R Squared = .824)
Sig - Significance; Exp – Con (Experimental, $n = 81$ – Control, $n = 72$)

Creativity training through the KTM had an effect size (.49) which could be considered high. The higher O&I posttest means (136.62, $SD = 14.16$) showed that the experimental group had gained significantly in the O&I from
the KTM treatment compared to the control group (114.76, $SD = 16.07$) and this gain is depicted in the profile plot shown in Figure 5.11.

In this study the S&I and O&I posttest means indicated that the subjects in the experimental group had gained significantly from the KTM treatment compared to the subjects in the control group. This suggests that creativity training enables students to have the creative strength to generate ideas that are expected to be unique and relevant.

Figure 5.11: Estimated Marginal Means of O&I Posttest for Experimentals and Controls on the Whole Sample

In order to further confirm the effectiveness of the KTM treatment on the dependent variables of the S&I and O&I measures, Pearson product-moment
correlation was used. The purpose was to determine if there were any significant relationships between the posttest scores (S&I and O&I) of the TCSW and treatment. The intercorrelations were found to be significant at the 0.01 level. Table 5.22 shows Pearson product-moment correlations.

The intercorrelations between TREATMENT (used as a dummy variable) denoted by 1 for presence of treatment and 0 for no treatment; and the S&I and O&I scores were found to be positive, \( r (151) = .57, p < .01 \), and \( r (151) = .59, p < .01 \) respectively.

Table 5.22
Correlation Matrix: Correlations between Treatment and Dependent Variables of S&I and O&I (N = 153)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;I Posttest</td>
<td>Pearson Correlation .565**</td>
</tr>
<tr>
<td></td>
<td>Sig (2-tailed) .000</td>
</tr>
<tr>
<td>O&amp;I Posttest</td>
<td>Pearson Correlation .588**</td>
</tr>
<tr>
<td></td>
<td>Sig (2-tailed) .000</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level

The results confirmed that the experimental and control groups were similar on the S&I and O&I measures before creativity training through the KTM was undertaken. The \( r \)-values obtained for the S&I (0.57) and the O&I (0.59) measures could be considered large (\( > .50 \)), (Cohen, 1988, cited in Hittner & Daniels, 2002) and a reliable indication of a substantial correlation (Connolly & Sluckin, 1971).

5.2.2 Results for Research Question Two

The second research question is “Are there any significant differences in the gains between the experimental and control groups in the TCSW (Forms 1B
of S&I and O&I) for the high creative and for the low creative subjects?" The question focused on determining the gains among the high creative subjects in the experimental \((n = 38)\) and control \((n = 36)\) groups and among the low creative subjects in the experimental \((n = 43)\) and control \((n = 36)\) groups in the TCSW measure after creativity training.

The gain score on the S&I posttest for the high creative subjects in the experimental group was calculated and it registered a positive mean score of 15.79 \((SD = 10.65)\) in comparison to the control group that had a negative mean score of -8.75 \((SD = 8.46)\). The \(t\)-test comparison of these gain scores indicated that the gains of the experimental group were significantly higher than the control group \((t = 11.00, p < .05)\). Where the O&I posttest was concerned, the high creatives of the experimental group managed to get a mean score of 21.76 \((SD = 8.33)\) while the control group had only a mean score of 4.64 \((SD = 7.06)\). The \(t\)-test comparison of these gain scores showed that the experimental group had significantly higher gains than the control group \((t = 9.56, p < .05)\).

The computations to gauge the gains on the S&I posttest for the low creative subjects in the experimental group revealed that they had a positive mean score of 16.37 \((SD = 12.31)\). However, the low creatives in the control group had a negative mean score of -6.78 \((SD = 7.84)\). The \(t\)-test comparison of these gain scores showed that the gains made by the experimental group were significantly higher than the control group \((t = 10.12, p < .05)\). For the O&I posttest, the low creative subjects in the experimental group had a mean score of 16.02 \((SD = 7.59)\) compared to the control group that had only a mean score of 2.56 \((SD = 7.31)\). The \(t\)-test comparison of these gain scores showed that the experimental group had significantly higher gains than the control group \((t = 8.01, p < .05)\).
ANOVA was then used to analyse the S&I and O&I posttest scores with the S&I and O&I baseline pretest scores as covariates to control for initial group differences. However, before ANCOVA was computed, the test of the assumption of the homogeneity of slopes for the high creative group and low creative group using scatterplots showed that this assumption was met. Hence ANCOVA was used with S&I posttest as dependent variable and S&I pretest scores as a covariate as well as with O&I posttest as dependent variable and O&I pretest scores as a covariate.

ANOVA adjusted the S&I posttest means for the high creative subjects in the experimental and control groups. The experimental group acquired a mean of 145.53 (SD = 10.89) while the control group had a mean of 119.50 (SD = 20.54). ANCOVA also made adjustments to the O&I posttest means for the high creative subjects in the experimental and control groups. The experimental group obtained a mean of 147.89 (SD = 8.99) while the control group reached a mean of 126.64 (SD = 10.99). The high creative experimental subjects performed better than high creative control subjects in the S&I and O&I measures after the effect of pretest scores was removed. This suggests that the KTM treatment may be used successfully to further enhance the creative thinking abilities of similar adolescent students.

ANOVA corrected the S&I posttest means for the low creative subjects in the experimental and control groups. The experimental group had a mean of 123.23 (SD = 15.33) while the control group obtained a mean of 93.00 (SD = 16.47). ANCOVA also corrected the O&I posttest means for the low creative subjects in the experimental and control groups. The experimental group secured a mean of 126.65 (SD = 9.68) while the control group had a mean of 102.89 (SD = 10.62). Low creative experimental subjects performed better than...
low creative control subjects in the S&I and O&I measures after the effect of pretest scores was removed. This tells us that the KTM treatment is a viable creativity training programme that may be used to increase the creative potential of adolescent students even though they are of low creative ability.

The adjusted mean scores of the S&I and O&I posttest measures for the high creatives and for the low creatives between the experimental and control groups were compared. For both measures the high creatives and the low creatives in the experimental group performed better than the control group. This showed that both the high and low creatives had gained from the KTM treatment. The high creative experimental subjects had performed better in the O&I ($M = 147.89$, $SD = 8.99$) compared to the S&I ($M = 145.53$, $SD = 10.89$) measure. The low creative experimental subjects in this study had also done better in the O&I ($M = 126.65$, $SD = 9.68$) compared to the S&I ($M = 123.23$, $SD = 15.33$) measure. This might be due to the effectiveness of the KTM treatment which had made a greater impact on the creative thinking abilities of the subjects in the O&I measure.

Based on the mean and standard deviation of the S&I measure, the $F$-test was used to test the significance of the difference among the high creatives between the experimental and control groups at $p < .05$. The dependent variable was the S&I posttest and the covariate was the S&I pretest. Table 5.22 presents the $F$-ratio and significance level of the analyses of covariance for the S&I sub-measure of the TCSW.

Table 5.23

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>$F$-value</th>
<th>Sig</th>
<th>Partial Eta Sq</th>
</tr>
</thead>
</table>
There was a significant difference in post training S&I scores for the high creative subjects between the experimental and control groups when the pretest S&I scores were partialled out, $F(1,150) = 128.09, p < .05$. Creativity training through the KTM had an effect size (.64) that could be considered large.

The higher S&I posttest means ($M = 145.53, SD = 10.89$) showed that the experimental group had gained significantly in the S&I from the KTM treatment compared to the control group ($M = 119.50, SD = 20.54$) and this gain is depicted in the profile plot in Figure 5.12.
Figure 5.12: Estimated Marginal Means of S&I Posttest for High Creatives

The mean and standard deviation of the O&I measure was used and the $F$-test tested the significance of the difference among the high creatives between the experimental and control groups at $p < .05$. The dependent variable was the O&I posttest and the covariate was the O&I pretest. Table 5.24 presents the $F$-ratio and significance level of the analyses of covariance for the O&I sub-measure of the TCSW.

Table 5.24
*ANCOVA Comparisons of Posttest O&I Scores with Pretest O&I Scores as Covariates on Experimental and Control groups for High Creatives (N = 74)*

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<th>Sig</th>
<th>Partial Eta Sq</th>
</tr>
</thead>
</table>


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<th>F</th>
<th>Sig.</th>
<th>R Squared</th>
</tr>
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<tr>
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<td>.289</td>
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<tr>
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<td>.514</td>
</tr>
<tr>
<td>Exp – Con</td>
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<td>122.382</td>
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<td>.633</td>
</tr>
<tr>
<td>Error</td>
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<td></td>
<td></td>
</tr>
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</tbody>
</table>

Computed using alpha = .05; R Squared = .775 (Adjusted R Squared = .768)

Sig - Significance; Exp – Con (Experimental, n = 38 – Control, n = 36)

There was a significant difference in post training O&I scores for the high creative subjects between the experimental and control groups when the pretest O&I scores were partialled out, $F(1,150) = 122.38$, $p < .05$. Creativity training through the KTM had a large effect size (.63). The higher O&I posttest means ($M = 147.89$, $SD = 8.99$) suggested that the experimental group had gained significantly in the O&I from the KTM treatment compared to the control group ($M = 126.64$, $SD = 10.99$) and this gain is shown in the profile plot in Figure 5.13.
Figure 5.13: Estimated Marginal Means of O&I Posttest for High Creatives

Based on the mean and standard deviation of the S&I measure, the $F$-test was used to test the significance of the difference among the low creatives between the experimental and control groups at $p < .05$. The dependent variable was the S&I posttest and the covariate was the S&I pretest. Table 5.25 presents the $F$-ratio and significance level of the analyses of covariance for the S&I submeasure of the TCSW.
Table 5.25

ANOVA Comparisons of Posttest S&I Scores with Pretest S&I Scores as Covariates on Experimental and Control Groups for Low Creatives (N = 79)

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<tr>
<th>Source</th>
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<th>F-value</th>
<th>Sig</th>
<th>Partial Eta Sq</th>
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<td>Corrected Model</td>
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<td>14481.898</td>
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<td>.777</td>
</tr>
<tr>
<td>Intercept</td>
<td>398.580</td>
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<td>398.580</td>
<td>3.647</td>
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<td>.046</td>
</tr>
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<td>S&amp;I Pretest</td>
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<td>.000</td>
<td>.571</td>
</tr>
<tr>
<td>Exp – Con</td>
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<td>.560</td>
</tr>
<tr>
<td>Error</td>
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</tbody>
</table>

Computed using alpha = .05; R Squared = .777 (Adjusted R Squared = .771)

Sig - Significance; Exp – Con (Experimental, n = 43 – Control, n = 36)

There was a significant difference in post training S&I scores for the low creative subjects between the experimental and control groups when the pretest S&I scores were partialled out, $F (1,150) = 96.75, p < .05$. Creativity training through the KTM indicated an effect size (.56) that could be considered large. The better S&I posttest means ($M = 123.23, SD = 15.33$) stated that the experimental group had gained significantly in the S&I from the KTM treatment compared to the control group ($M = 93.00, SD = 16.47$) and this gain is presented in the profile plot in Figure 5.14.
Figure 5.14: Estimated Marginal Means of S&I Posttest for Low Creatives

The mean and standard deviation of the O&I measure were resorted to and the $F$-test tested the significance of the difference among the low creatives between the experiment and control groups at $p < .05$. The dependent variable was the O&I posttest and the covariate was the O&I pretest. Table 5.26 presents the $F$-ratio and significance level of the analyses of covariance for the O&I submeasure of the TCSW.
Table 5.26
*ANCOVA Comparisons of Posttest O&I Scores with Pretest O&I Scores as Covariates on Experimental and Control Groups for Low Creatives (N = 79)*

<table>
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<tr>
<th>Source</th>
<th>Sum of Squares</th>
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<th>Mean Square</th>
<th>F-value</th>
<th>Sig</th>
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</tr>
</thead>
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<tr>
<td>Corrected Model</td>
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<td>166.106</td>
<td>.000</td>
<td>.814</td>
</tr>
<tr>
<td>Intercept</td>
<td>1274.967</td>
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<td>1274.967</td>
<td>27.465</td>
<td>.000</td>
<td>.265</td>
</tr>
<tr>
<td>O&amp;I Pretest</td>
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<td>4357.338</td>
<td>93.866</td>
<td>.000</td>
<td>.553</td>
</tr>
<tr>
<td>Exp – Con</td>
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<td>4316.469</td>
<td>92.986</td>
<td>.000</td>
<td>.550</td>
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<td>Error</td>
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</table>

Computed using alpha = .05; R Squared = .814 (Adjusted R Squared = .809)

Sig - Significance; Exp – Con (Experimental, n = 43 – Control, n = 36)

There was a significant difference in post training O&I scores for the low creative subjects between the experimental and control groups when the pretest O&I scores were partialled out, $F(1,150) = 92.99, p < .05$. Creativity training through the KTM resulted in a large effect size (.55). The higher O&I posttest means ($M = 126.65, SD = 9.68$) signalled that the experimental group had gained significantly in the O&I from the KTM treatment compared to the control group ($M = 102.89, SD = 10.62$) and this gain is depicted in the profile plot in Figure 5.15.
5.2.3 Results for Research Question Three

The third research question is “Are there any significant differences in the gains between the experimental and control groups in the TCSW (Forms 1B of S&I & O&I) for the male and for the female subjects?” The question focused on determining the gains among the male subjects in the experimental \( (n = 44) \) and control \( (n = 36) \) groups and among the female subjects in the experimental \( (n = 37) \) and control \( (n = 36) \) groups in the TCSW measure after creativity training.

Calculations regarding the gains made on the S&I posttest by the male subjects in the experimental group showed that the males had a positive mean score of 15.23 \( (SD = 12.48) \) compared to the control group that recorded a

![Estimated Marginal Means of O&I Posttest for Low Creatives](image)

*Figure 5.15: Estimated Marginal Means of O&I Posttest for Low Creatives*
negative mean score of -9.17 ($SD = 7.50$). The $t$-test comparison of these gain scores showed that the gains of the experimental group were significantly higher than the control group ($t = 10.79, p < .05$). For the gains on the O&I posttest, the male subjects in the experimental group also had a positive mean score of 15.09 ($SD = 7.79$) while the control group had a negative mean score of -1.61 ($SD = 4.64$). The $t$-test comparison of these gain scores showed that the experimental group had significantly higher gains than the control group ($t = 11.88, p < .05$).

Gains on the S&I posttest by the female subjects in the experimental group showed that their mean score was positive ($M = 17.14, SD = 10.27$) compared to the negative mean score of -6.36 ($SD = 8.65$) obtained by the control group. The $t$-test comparison of these gain scores showed that the gains made by the experimental group were significantly higher than the control group ($t = 10.59, p < .05$). Where the gains on the O&I posttest for the females in the experimental group was concerned, the mean score was 23.03 ($SD = 7.03$) compared to the control group’s mean score of 8.81 ($SD = 5.31$). To decide if the mean scores were significant, independent-samples $t$-test was used. The $t$-test comparison of the gain scores indicated that the experimental group had significantly greater gains than that of the control group ($t = 9.77, p < .05$).

ANCOVA was then used to analyse the S&I and O&I posttest scores with the S&I and O&I baseline pretest scores as covariates to control for initial group differences. However, before ANCOVA was computed, the test of the assumption of the homogeneity of slopes for the males and females using scatterplots showed that this assumption was adhered to. Since there were no interactions, ANCOVA was applied with S&I posttest as dependent variable and S&I pretest scores as a covariate as well as with O&I posttest as dependent variable and O&I pretest scores as a covariate.
ANCOVA then made adjustments to the S&I posttest means for the male subjects in the experimental and control groups. The experimental group acquired a mean of 132.86 ($SD = 18.21$) while the control group had a mean of 111.22 ($SD = 25.47$). ANCOVA also adjusted the O&I posttest means for the male subjects in the experimental and control groups. The experimental group obtained a mean of 134.93 ($SD = 15.51$) while the control group had a mean of 111.97 ($SD = 15.44$). Male experimental subjects performed better than male control subjects in the S&I and O&I measures after the effect of pretest scores was removed. This suggests that the KTM treatment can be successfully used to enhance the creative thinking abilities of male adolescent students just as in this study.

ANCOVA corrected the S&I posttest means for the female subjects in the experimental and control groups. The experimental group secured a mean of 134.68 ($SD = 16.64$) while the control group obtained a mean of 101.28 ($SD = 18.84$). ANCOVA also corrected the O&I posttest means for the female subjects in the experimental and control groups. The experimental group had a mean of 138.62 ($SD = 12.26$) while the control group managed to get a mean of 117.56 ($SD = 16.41$). Female experimental subjects performed better than female control subjects in the S&I and O&I measures after the effect of pretest scores was removed. This gives us the assurance that the KTM treatment can be confidently used to enhance the creative thinking abilities of female adolescent students.

The adjusted mean scores of the S&I and O&I posttest measures for the males and the females were compared. For both measures, the males and the females in the experimental group performed better than the control group. This signalled that the KTM treatment had benefited the male and female
experimental subjects. The male experimental subjects had performed better in the O&I ($M = 134.93$, $SD = 15.51$) compared to the S&I ($M = 132.86$, $SD = 18.21$) measure. The female experimental subjects too had done better in the O&I ($M = 138.62$, $SD = 12.26$) compared to the S&I ($M = 134.68$, $SD = 16.64$) measure. The O&I measure seems to have appealed to the male and female experimental subjects just as it had for the high and low creative experimental subjects. It appears that the KTM treatment can impact students’ creative thinking abilities better via the O&I measure.

Based on the mean and standard deviation of the S&I measure, the $F$-test was used to test the significance of the difference among the males between the experimental and control groups at $p < .05$. The dependent variable was the S&I posttest and the covariate was the S&I pretest. Table 5.27 presents the $F$-ratio and significance level of the analyses of covariance for the S&I submeasure of the TCSW.

Table 5.27

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<tr>
<th>Source</th>
<th>Sum of Squares</th>
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Computed using alpha = .05; R Squared = .818 (Adjusted R Squared = .813)
Sig - Significance; Exp – Con (Experimental, $n = 44$ – Control, $n = 36$)
There was a significant difference in post training S&I scores for the male subjects between the experimental and control groups when the pretest S&I scores were partialled out, $F(1,150) = 105.18; p < .05$. The effect size (.58) obtained as a result of creativity training through the KTM could be considered large. The higher S&I posttest means ($M = 132.86, SD = 18.21$) indicated that the experimental group had gained significantly in the S&I as a result of the KTM treatment compared to the control group ($M = 111.22, SD = 25.47$) and this gain is presented in the profile plot in Figure 5.16.

![Estimated Marginal Means of S&I Posttest for Males](image)

**Figure 5.16:** Estimated Marginal Means of S&I Posttest for Males

Based on the mean and standard deviation of the O&I measure, the $F$-test was used to test the significance of the difference among the males between
the experimental and control groups at $p < .05$. The dependent variable was the O&I posttest and the covariate was the O&I pretest. Table 5.28 presents the $F$-ratio and significance level of the analyses of covariance for the O&I sub-measure of the TCSW.

Table 5.28
*ANCOVA Comparisons of Posttest O&I Scores with Pretest O&I Scores as Covariates on Experimental and Control Groups for Males (N = 80)*

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<tr>
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<th>Sig</th>
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</tr>
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<td>.005</td>
</tr>
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<td>15336.573</td>
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<td>.821</td>
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Computed using alpha = .05; R Squared = .885 (Adjusted R Squared = .882)
Sig - Significance; Exp – Con (Experimental, $n = 44$ – Control, $n = 36$)

There was a significant difference in post training O&I scores for the male subjects between the experimental and control groups when the pretest O&I scores were partialled out, $F (1,150) = 118.21, p < .05$. Creativity training through the KTM resulted in a large effect (.61) size. The better O&I posttest means ($M = 134.93, SD = 15.51$) suggested that the experimental group had gained significantly in the O&I from the KTM treatment compared to the control group ($M = 111.97, SD = 15.44$) and this gain is shown in the profile plot in Figure 5.17.
Figure 5.17: Estimated Marginal Means of O&I Posttest for Males

The mean and standard deviation of the S&I measure was used and the $F$-test tested the significance of the difference among the female subjects between the experimental and control groups at $p < .05$. The dependent variable was the S&I posttest and the covariate was the S&I pretest. Table 5.29 presents the $F$-ratio and significance level of the analyses of covariance for the S&I submeasure of the TCSW.
Table 5.29

**ANCOVA Comparisons of Posttest S&I Scores with Pretest S&I Scores as Covariates on Experimental and Control Groups for Females (N = 73)**

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
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<th>F-value</th>
<th>Sig</th>
<th>Partial Eta Sq</th>
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<td>495.701</td>
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</tr>
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<td>.724</td>
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<tr>
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Computed using alpha = .05; R Squared = .856 (Adjusted R Squared = .852)
Sig - Significance; Exp – Con (Experimental, n = 37 – Control, n = 36)

There was a significant difference in post training S&I scores for the female subjects between the experimental and control groups when the pretest S&I scores were partialled out, $F(1,150) = 115.07, p < .05$. Creativity training through the KTM had an effect size (.62) which was large. The S&I posttest means ($M = 134.68, SD = 16.64$) showed that the experimental group had gained significantly in the S&I from the KTM treatment compared to the control group ($M = 101.28, SD = 18.84$) and this gain is depicted in the profile plot in Figure 5.18.
Based on the mean and standard deviation of the O&I measure, the $F$-test was used to test the significance of the difference among the female subjects between the experimental and control groups at $p < .05$. The dependent variable was the O&I posttest and the covariate was the O&I pretest. Table 5.30 presents the $F$-ratio and significance level of the analyses of covariance for the O&I submeasure of the TCSW.
Table 5.30
$\textit{ANCOVA Comparisons of Posttest O&I Scores with Pretest O&I Scores as Covariates on Experimental and Control Groups for Females (N = 73)}$

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
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<th>$F$-value</th>
<th>Sig</th>
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<td>10142.187</td>
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<td>.884</td>
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<td>Intercept</td>
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<td>.821</td>
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<td>1</td>
<td>3789.231</td>
<td>100.068</td>
<td>.000</td>
<td>.588</td>
</tr>
<tr>
<td>Error</td>
<td>2650.668</td>
<td>70</td>
<td>37.867</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1223323.000</td>
<td>73</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>22935.041</td>
<td>72</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Computed using alpha = .05; R Squared = .884 (Adjusted R Squared = .881)  
Sig - Significance; Exp – Con (Experimental, $n = 37$ – Control, $n = 36$)

There was a significant difference in post training O&I scores for the female subjects between the experimental and control groups when the pretest O&I scores were partialled out, $F(1,150) = 100.07, p < .05$. The effect size (.59) obtained as a result of creativity training through the KTM was large. The higher O&I posttest means ($M = 138.62, SD = 12.26$) indicated that the experimental group had gained significantly in the O&I from the KTM treatment compared to the control group ($M = 117.56, SD = 16.41$) and this gain is presented in the profile plot in Figure 5.19.
5.2.4 Results for Research Question Four

The fourth research question is “Are there any significant differences in the gains between the experimental and control groups in the TCSW (Forms 1B of S&I & O&I) for the science and for the arts subjects?” The question concentrated on determining the gains between the science subjects in the experimental \( (n = 45) \) and control \( (n = 40) \) groups and between the arts subjects in the experimental \( (n = 36) \) and control \( (n = 32) \) groups in the TCSW measure after creativity training.

The gain score for the science subjects in the experimental group on the S&I posttest was calculated. Their mean score was positive \( (M = 16.51, SD = \)
10.63) compared to the mean score of the control group which was negative ($M = -6.13, SD = 7.63$). The $t$-test comparison of these gain scores revealed that the gains made by the experimental group were significantly higher than that of the control group ($t = 11.36, p < .05$). For the O&I posttest, the gain score for the science subjects in the experimental group was 18.78 ($SD = 9.02$) compared to the control group’s mean score that was only 5.02 ($SD = 6.82$). To establish if the mean scores were significant, independent-samples $t$-test was used. The $t$-test comparison of these gain scores indicated that the gains of the experimental group was significantly higher than that of the control group ($t = 7.98, p < .05$).

The gains for the arts subjects in the experimental group on the S&I posttest was also determined. Their mean score was positive ($M = 15.58, SD = 12.63$) while the mean score of the control group was negative ($M = -9.81, SD = 8.45$). The $t$-test comparison of these gain scores revealed that the experimental group had significantly higher gains than that of the control group ($t = 11.36, p < .05$). Regarding the gains on the O&I posttest, the arts subjects in the experimental group managed to get a mean score of 18.64 ($SD = 7.69$) while the control group had a mean score of only 1.18 ($SD = 7.39$). To conclude if the mean scores were significant, independent-samples $t$-test was used. The $t$-test comparison of these gain scores showed that the gains made by the experimental group were significantly higher than that of the control group ($t = 7.98, p < .05$).

ANCOVA was then computed to analyse the S&I and O&I posttest scores with the S&I and O&I baseline pretest scores as covariates to control for initial group differences. However, before ANCOVA was used, the test of the assumption of the homogeneity of slopes for the science and arts subjects using scatterplots showed that this assumption was met. As there were no interactions, ANCOVA was applied with S&I posttest as dependent variable and S&I pretest
scores as covariates as well as with O&I posttest as dependent variable and O&I pretest scores as covariates.

ANOVA then corrected the S&I posttest means for the science subjects in the experimental and control groups. The experimental group secured a mean of 134.07 ($SD = 16.66$) while the control group had a mean of 110.80 ($SD = 20.41$). ANOVA also corrected the O&I posttest means for the science subjects in the experimental and control groups. The experimental group obtained a mean of 137.84 ($SD = 13.32$) while the control group managed to get a mean of 117.13 ($SD = 14.73$). Science experimental subjects performed better than the science control subjects in the S&I and O&I measures after the effect of pretest scores was removed. This brings to our attention that the KTM treatment may be successfully used to enhance the creative thinking abilities of similar adolescent students who are in the science stream.

ANOVA adjusted the S&I posttest means for the arts subjects in the experimental and control groups. The experimental group attained a mean of 133.22 ($SD = 18.56$) while the control group had a mean of 100.56 ($SD = 24.62$). ANOVA also adjusted the O&I posttest means for the arts subjects in the experimental and control groups. The experimental group obtained a mean of 135.08 ($SD = 15.19$) while the control group acquired a mean of 111.81 ($SD = 17.39$). Arts experimental subjects performed better than arts control subjects in the S&I and O&I measures after the effect of pretest scores was removed. This tells us that the creative thinking abilities of similar adolescent students in the arts stream can be enhanced if they are subjected to the KTM treatment.

The adjusted mean scores of the S&I and O&I posttest measures for the science and the arts subjects were compared. For both measures the science and the arts subjects in the experimental group performed better than the control
group. This signalled that the KTM treatment had benefited the experimental science and arts subjects.

The science experimental subjects had performed better in the O&I \( (M = 137.84, SD = 13.32) \) compared to the S&I \( (M = 134.07, SD = 16.66) \) measure. The arts experimental subjects too had done better in the O&I \( (M = 135.08, SD = 15.19) \) compared to the S&I \( (M = 133.22, SD = 18.56) \) measure. Just as the high and low creative experimental subjects and the male and female experimental subjects, the science and arts experimental subjects too seem to have found it easier to give original verbal responses on the O&I measure (possible reasons for this pattern of performance are discussed in Chapter Six, 6.3).

Based on the mean and standard deviation of the S&I measure, the \( F \)-test was used to test the significance of the difference among the science subjects between the experimental and control groups at \( p < .05 \). The dependent variable was the S&I posttest and the covariate was the S&I pretest. Table 5.31 presents the \( F \)-ratio and significance level of the analyses of covariance for the S&I sub-measure of the TCSW.
**ANCOVA Comparisons of Posttest S&I Scores with Pretest S&I Scores as Covariates on Experimental and Control Groups for Science Subjects (N = 85)**

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F-value</th>
<th>Sig</th>
<th>Partial Eta Sq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>33370.463</td>
<td>2</td>
<td>16685.232</td>
<td>208.936</td>
<td>.000</td>
<td>.836</td>
</tr>
<tr>
<td>Intercept</td>
<td>1137.897</td>
<td>1</td>
<td>1137.897</td>
<td>14.249</td>
<td>.000</td>
<td>.148</td>
</tr>
<tr>
<td>S&amp;I Pretest</td>
<td>21906.840</td>
<td>1</td>
<td>21906.840</td>
<td>274.322</td>
<td>.000</td>
<td>.770</td>
</tr>
<tr>
<td>Exp – Con</td>
<td>10939.486</td>
<td>1</td>
<td>10939.486</td>
<td>136.987</td>
<td>.000</td>
<td>.626</td>
</tr>
<tr>
<td>Error</td>
<td>6548.360</td>
<td>82</td>
<td>79.858</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1328345.000</td>
<td>85</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Corrected Total</td>
<td>39918.824</td>
<td>84</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Computed using alpha = .05; R Squared = .836 (Adjusted R Squared = .832)

Sig - Significance; Exp – Con (Experimental, n = 45 – Control, n = 40)

There was a significant difference in post training S&I scores for the science subjects between the experimental and control groups when the pretest S&I scores were partialled out, $F(1,150) = 136.99, p < .05$. Creativity training through the KTM had an effect size (>.63) that was large. The better S&I posttest means ($M = 134.07, SD = 16.66$) showed that the experimental group had gained significantly in the S&I from the KTM treatment compared to the control group ($M = 110.80, SD = 20.41$) and this gain is depicted in the profile plot in Figure 5.20.
Based on the mean and standard deviation of the O&I measure, the $F$-test gauged the significance of the difference among the science subjects between the experimental and control groups at $p < .05$. The dependent variable was the O&I posttest and the covariate was the O&I pretest. Table 5.32 presents the $F$-ratio and significance level of the analyses of covariance for the O&I submeasure of the TCSW.

*Figure 5.20: Estimated Marginal Means of S&I Posttest for Science Subjects*
Table 5.32  
*ANCOVA Comparisons of Posttest O&I Scores with Pretest O&I Scores as Covariates on Experimental and Control Groups for Science Subjects (N = 85)*

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F-value</th>
<th>Sig</th>
<th>Partial Eta Sq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>20009.280</td>
<td>2</td>
<td>10004.640</td>
<td>153.400</td>
<td>.000</td>
<td>.789</td>
</tr>
<tr>
<td>Intercept</td>
<td>342.909</td>
<td>1</td>
<td>342.909</td>
<td>5.258</td>
<td>.024</td>
<td>.060</td>
</tr>
<tr>
<td>O&amp;I Pretest</td>
<td>10918.319</td>
<td>1</td>
<td>10918.319</td>
<td>167.410</td>
<td>.000</td>
<td>.671</td>
</tr>
<tr>
<td>Exp – Con</td>
<td>3943.259</td>
<td>1</td>
<td>3943.259</td>
<td>60.462</td>
<td>.000</td>
<td>.424</td>
</tr>
<tr>
<td>Error</td>
<td>5347.967</td>
<td>82</td>
<td>65.219</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1420046.000</td>
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<td></td>
<td></td>
<td></td>
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<td>Corrected Total</td>
<td>25357.247</td>
<td>84</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Computed using alpha = .05; R Squared = .789 (Adjusted R Squared = .784)  
Sig - Significance; Exp – Con (Experimental, n = 45 – Control, n = 40)

There was a significant difference in post training O&I scores for the science subjects between the experimental and control groups when the pretest O&I scores were partialled out, \( F (1,150) = 60.46, p < .05 \). The effect size (.42) obtained as a result of creativity training through the KTM could be considered large. The higher O&I posttest means \( (M = 137.84, SD = 13.32) \) suggested that the experimental group had gained significantly in the O&I from the KTM treatment compared to the control group \( (M = 117.13, SD = 14.73) \) and this gain is shown in the profile plot in Figure 5.21.
The mean and standard deviation of the S&I measure was resorted to and the $F$-test tested the significance of the difference among the arts subjects between the experimental and control groups at $p < .05$. The dependent variable was the S&I posttest and the covariate was the S&I pretest. Table 5.33 presents the $F$-ratio and significance level of the analyses of covariance for the S&I submeasure of the TCSW.

**Figure 5.21:** Estimated Marginal Means of O&I Posttest for Science Subjects
Table 5.33

*ANCOVA Comparisons of Posttest S&I Scores with Pretest S&I Scores as Covariates on Experimental and Control Groups for Arts Subjects (N = 68)*

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F-value</th>
<th>Sig</th>
<th>Partial Eta Sq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>41228.873</td>
<td>2</td>
<td>20614.437</td>
<td>174.161</td>
<td>.000</td>
<td>.843</td>
</tr>
<tr>
<td>Intercept</td>
<td>195.926</td>
<td>1</td>
<td>195.926</td>
<td>1.655</td>
<td>.203</td>
<td>.025</td>
</tr>
<tr>
<td>S&amp;I Pretest</td>
<td>23158.441</td>
<td>1</td>
<td>23158.441</td>
<td>195.655</td>
<td>.000</td>
<td>.751</td>
</tr>
<tr>
<td>Exp – Con</td>
<td>10946.995</td>
<td>1</td>
<td>10946.995</td>
<td>92.486</td>
<td>.000</td>
<td>.587</td>
</tr>
<tr>
<td>Error</td>
<td>7693.656</td>
<td>65</td>
<td>118.364</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>993396.000</td>
<td>68</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>48922.529</td>
<td>67</td>
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</tr>
</tbody>
</table>

Computed using alpha = .05; R Squared = .843 (Adjusted R Squared = .838)
Sig - Significance; Exp – Con (Experimental, n = 36 – Control, n = 32)

There was a significant difference in post training S&I scores for the arts subjects between the experimental and control groups when the pretest S&I scores were partialled out, $F (1,150) = 92.49, p < .05$. Creativity training through the KTM had a large effect size (.59). The better S&I posttest means ($M = 133.22, SD = 18.56$) indicated that the experimental group had gained significantly in the S&I from the KTM treatment compared to the control group ($M = 100.56, SD = 24.62$) and this gain is presented in the profile plot in Figure 5.22.
Based on the mean and standard deviation of the O&I measure, the $F$-test was applied to test the significance of the difference among the arts subjects in the experimental and control groups at $p < .05$. The dependent variable was the O&I posttest and the covariate was the O&I pretest. Table 5.34 presents the $F$-ratio and significance level of the analyses of covariance for the O&I submeasure of the TCSW.

Figure 5.22: Estimated Marginal Means of S&I Posttest for Arts Subjects
Table 5.34

*ANCOVA Comparisons of Posttest O&I Scores with Pretest O&I Scores as Covariates on Experimental and Control Groups for Arts Subjects (N = 68)*

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F-value</th>
<th>Sig</th>
<th>Partial Eta Sq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>23048.660</td>
<td>2</td>
<td>11524.330</td>
<td>209.994</td>
<td>.000</td>
<td>.866</td>
</tr>
<tr>
<td>Intercept</td>
<td>657.857</td>
<td>1</td>
<td>657.857</td>
<td>11.987</td>
<td>.001</td>
<td>.156</td>
</tr>
<tr>
<td>O&amp;I Pretest</td>
<td>13874.476</td>
<td>1</td>
<td>13874.476</td>
<td>252.818</td>
<td>.000</td>
<td>.795</td>
</tr>
<tr>
<td>Exp – Con</td>
<td>4992.538</td>
<td>1</td>
<td>4992.538</td>
<td>90.973</td>
<td>.000</td>
<td>.583</td>
</tr>
<tr>
<td>Error</td>
<td>3567.149</td>
<td>65</td>
<td>54.879</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
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<td>68</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
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<td>67</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Computed using alpha = .05; R Squared = .866 (Adjusted R Squared = .862)

Sig - Significance; Exp – Con (Experimental, n = 36 – Control, n = 32)

There was a significant difference in post training O&I scores for the arts subjects between the experimental and control groups when the pretest O&I scores were partialled out, $F(1,150) = 90.97, p < .05$. Creativity training through the KTM resulted in an effect size (.58) that could be considered large. The higher O&I posttest means ($M = 135.08, SD = 15.19$) signalled that the experimental group had gained significantly in the O&I from the KTM treatment compared to the control group ($M = 111.81, SD = 17.39$) and this gain is depicted in the profile plot in Figure 5.23.
5.2.5 Results for Research Question Five

The fifth research question is “Are there any significant differences in the gains between the experimental and control groups as measured by the UMIW (pretest & delayed posttest) scores?” The question focused on determining the gains among the subjects in the experimental ($n = 81$) and control ($n = 72$) groups, in the UMIW measure after creativity training.

Computations to make an assessment on the gains of the Using Modality and Imagery in Writing (UMIW) for the experimental group was done and it revealed that the mean score obtained was positive ($M = 2.51$, $SD = 2.18$). However, for the control group, the mean score was negative ($M = -0.03$, $SD =$)
1.31). From the mean scores it can be seen that the experimental subjects had outperformed the control subjects. To determine if the mean scores were significant, independent-samples $t$-test was used. The $t$-test comparison of the gain scores indicated that the experimental group had significantly higher gains than the control group ($t = 8.86, p < .05$).

Then the assumption of homogeneity of slopes was tested using a scatterplot before applying ANCOVA to test the effect of training on UMIW delayed posttest scores. Figure 5.24 shows the scatter plot for experimental and control groups with the pretest UMIW scores as covariate on the X-axis and the UMIW delayed posttest as dependent variable on the Y-axis.

![Figure 5.24: Scatterplot Testing the Homogeneity-of-groups Assumption for UMIW Scores](image)
The scatter plot showed that the slopes were homogeneous and there were no interactions between the covariate (UMIW pretest) and the factors (experimental and control groups). Hence, ANCOVA was carried out to test the effect of the KTM treatment with the pretest scores as covariates.

ANCOVA was applied to analyse the UMIW delayed posttest scores with the UMIW baseline pretest scores as covariates to control for initial group differences. ANCOVA adjusted the UMIW delayed posttest means for the subjects in the experimental and control groups. The experimental group obtained a mean of 11.06 ($SD = 3.24$) while the control group had a mean of 6.50 ($SD = 2.53$). Subjects in the experimental group had performed better than the subjects in the control group in the UMIW measure after the effect of pretest scores was removed. This suggested that the creative thinking abilities of adolescent subjects in the experimental group could be retained through the KTM treatment after a period of two weeks.

Based on the mean and standard deviation of the UMIW measure, the $F$-test was used to test the significance of the difference among the subjects between the experimental and control groups at $p < .05$. The dependent variable was the UMIW posttest and the covariate was the UMIW pretest. Table 5.35 presents the $F$-ratio and significance level of the analyses of covariance for the UMIW.
Table 5.35

*ANCOVA Comparisons of Delayed Posttest UMIW Scores with Pretest UMIW Scores as Covariates on Experimental and Control Groups for the Whole Sample (N = 153)*

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F-value</th>
<th>Sig</th>
<th>Partial Eta Sq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>1587.905</td>
<td>2</td>
<td>793.952</td>
<td>238.190</td>
<td>.000</td>
<td>.761</td>
</tr>
<tr>
<td>Intercept</td>
<td>36.924</td>
<td>1</td>
<td>36.924</td>
<td>11.077</td>
<td>.001</td>
<td>.069</td>
</tr>
<tr>
<td>UMIW Pretest</td>
<td>794.701</td>
<td>1</td>
<td>794.701</td>
<td>238.415</td>
<td>.000</td>
<td>.614</td>
</tr>
<tr>
<td>Exp – Con</td>
<td>227.033</td>
<td>1</td>
<td>227.033</td>
<td>68.111</td>
<td>.000</td>
<td>.312</td>
</tr>
<tr>
<td>Error</td>
<td>499.991</td>
<td>150</td>
<td>3.333</td>
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<td></td>
<td></td>
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<tr>
<td>Total</td>
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<td>153</td>
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</tr>
<tr>
<td>Corrected Total</td>
<td>2087.895</td>
<td>152</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Computed using alpha = .05; R Squared = .761 (Adjusted R Squared = .757)
Sig - Significance; Exp – Con (Experimental, n = 81 – Control, n = 72)

There was a significant difference in post training UMIW scores for the subjects between the experimental and control groups when the pretest UMIW scores were partialled out, $F (1,150) = 68.11, p < .05$. Creativity training through the KTM had an effect size (.31) which could be considered large. The higher UMIW delayed posttest means ($M = 11.06, SD = 3.24$) indicated that the experimental group had gained significantly in the UMIW from the KTM treatment compared to the control group ($M = 6.50, SD = 2.53$) and this gain is depicted in the profile plot in Figure 5.25.
The KTM treatment had proven to be effective in enabling the subjects in the experimental group retain the creative thinking skills learned even after a lapse of two weeks as was reflected in the use of different types of modality (visual, auditory, kinesthetic, olfactory, gustatory, cutaneous and organic) and different types of imagery (direct, personal, fantasy and symbolic) in their written compositions.

In order to further confirm the effectiveness of the KTM treatment on the dependent variable of the UMIW measure, Pearson product-moment correlation was used. The purpose was to determine if there were any significant relationships between the delayed posttest score of the UMIW and treatment. The correlation between TREATMENT (used as a dummy variable and denoted

---

Figure 5.25: Estimated Marginal Means of UMIW Delayed Posttest on Experimentals and Controls for the Whole Sample
by 1 for presence of treatment and 0 for no treatment) and the UMIW delayed posttest score was found to be positive, \( r (151) = .62, p < .01 \), as shown in Table 5.36.

Table 5.36
Correlation Matrix: Correlations between Treatment and Dependent Variables of UMIW \((N = 153)\)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>UMIW Delayed Posttest</td>
<td>Pearson Correlation</td>
</tr>
<tr>
<td></td>
<td>Sig (2-tailed)</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level

The results indicated that the experimental and control groups were similar on the UMIW measure before the commencement of creativity training through the KTM. The r-value obtained for the UMIW (.62) could be considered high (> .50), (Cohen, 1988, cited in Hittner & Daniels, 2002).

5.2.6 Summary of Gain Scores for Research Questions One - Five

A summary of the gain scores of the subjects in the experimental and control groups based on research questions one through five is given below in Table 5.37. From the data it can be seen that for the overall sample, the experimental group had performed much better in the S&I \((M = 16.10, SD = 11.50)\) and O&I \((M = 18.72, SD = 8.40)\) compared to the control group in the S&I \((M = -7.76, SD = 8.16)\) and O&I \((M = 3.59, SD = 7.21)\) measures.
| ANCOVA Comparisons of TCSW and UMIW Scores of Experimentals and Controls |
| | Experimental Group (n = 81) | Control Group (n = 72) | ANCOVA $F$ (1, 150) |
| | Pretest | Posttest | Gains | Pretest | Posttest | Gains | Pretest | Posttest | Gains |
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Overall | 117.59 | 17.36 | 133.69 | 17.42 | 16.10 | 11.50 | 114.01 | 21.70 | 106.25 | 22.80 | -7.76 | 8.16 | 226.14* |
| O & I | 117.90 | 13.03 | 136.62 | 14.16 | 18.72 | 8.40 | 111.17 | 15.22 | 114.76 | 16.07 | 3.59 | 7.21 | 145.55* |
| UMIW | 8.54 | 2.36 | 11.06 | 3.24 | 2.52 | 2.18 | 6.53 | 2.48 | 6.50 | 2.53 | -0.03 | 1.31 | 68.11* |
| High-Creative | | | | | | | | | | | | | | |
| S & I | 117.93 | 17.36 | 133.69 | 17.42 | 16.10 | 11.50 | 114.01 | 21.70 | 106.25 | 22.80 | -7.76 | 8.16 | 226.14* |
| O & I | 117.90 | 13.03 | 136.62 | 14.16 | 18.72 | 8.40 | 111.17 | 15.22 | 114.76 | 16.07 | 3.59 | 7.21 | 145.55* |
| Low-Creative | | | | | | | | | | | | | | |
| S & I | 106.86 | 12.64 | 123.23 | 15.33 | 16.37 | 12.31 | 99.78 | 14.76 | 93.00 | 16.47 | -6.78 | 7.84 | 96.75* |
| O & I | 110.63 | 11.03 | 126.65 | 9.68 | 16.02 | 7.59 | 100.33 | 10.23 | 102.89 | 10.62 | 2.56 | 7.31 | 92.99* |
| Male | | | | | | | | | | | | | | |
| S & I | 117.64 | 18.28 | 132.86 | 18.21 | 15.22 | 12.48 | 120.39 | 23.77 | 111.22 | 25.47 | -9.17 | 7.50 | 105.18* |
| O & I | 119.84 | 13.07 | 134.93 | 15.51 | 15.09 | 7.79 | 113.58 | 14.41 | 111.97 | 15.44 | -1.61 | 4.64 | 118.21* |
| Female | | | | | | | | | | | | | | |
| S & I | 117.54 | 16.44 | 134.68 | 16.64 | 17.14 | 10.27 | 107.64 | 17.51 | 101.28 | 18.84 | -6.36 | 8.65 | 115.07* |
| O & I | 115.59 | 12.79 | 138.62 | 12.26 | 23.03 | 7.03 | 108.75 | 15.83 | 117.56 | 16.41 | 8.81 | 3.31 | 100.07* |
| Science | | | | | | | | | | | | | | |
| O & I | 119.07 | 11.20 | 137.84 | 13.32 | 18.77 | 9.02 | 112.10 | 13.34 | 117.13 | 14.73 | 5.02 | 6.82 | 60.46* |
| Arts | | | | | | | | | | | | | | |
| S & I | 117.64 | 18.25 | 133.22 | 18.56 | 15.58 | 12.63 | 110.38 | 21.76 | 100.56 | 24.62 | -9.82 | 8.45 | 92.49* |
| O & I | 116.44 | 15.06 | 135.08 | 15.19 | 18.64 | 7.69 | 110.00 | 17.45 | 111.81 | 17.39 | 1.81 | 7.39 | 90.97* |

* - Sig at $p < .05$
The $F$-ratios showed that the Khatena Training Method (KTM) treatment significantly enhanced the verbal originality scores of the experimental group compared to the control group.

The data in Table 5.37 also show the performance of the sub-groups of the high creative, low creative, male, female, science, and arts, subjects in the experimental and control groups. The experimental subjects had significantly higher gains over their counterparts in the control group. This showed that all sub-groups in the experimental group had gained significantly as a result of the KTM treatment.

On the whole the subjects in the experimental and control groups had done better in the O&I measure compared to the S&I measure. The same was also true for the sub-groups (high creative, female, science, and arts, subjects) with the exception of the low creative and male subjects from the experimental group who had performed slightly better in the S&I measure compared to the O&I measure. Reasons for this pattern of performance where the O&I was a better measure of creativity for the subjects in this study are discussed later (in Chapter Six, 6.3).

The data in Table 5.37 also show the performance of the overall sample in the Using Modality and Imagery in Writing (UMIW) measure. The experimental group had performed much better in the UMIW ($M = 2.52, SD = 2.18$) compared to the control group ($M = -0.03, SD = 1.31$). The $F$-ratio indicated that the experimental group had gained significantly ($p < .05$) from the Khatena Training Method (KTM) treatment. Thus, the KTM could also result in the retention of verbal originality gains for the experimental group trained in creativity thinking skills.
5.3 Results and Interpretations

The results and interpretations for the five research questions of this study are discussed under the following headings, namely, effectiveness of training as measured by the TCSW posttest scores, and effectiveness of training as measured by the UMIW delayed posttest scores.

5.3.1 Effectiveness of Training as Measured by the TCSW Posttest Scores

The purpose of the research questions one through four was to determine if there were any gains between the subjects in the experimental and control groups after creativity training. The purpose was also to investigate if there were gains for the high creative, low creative, male, female, science, and arts, subjects in the experimental group as compared to the control group.

ANCOVA (Tables 5.20 - 5.21, 5.23 - 5.34, 5.37) was used with the S&I and O&I posttest scores as dependent variables and the S&I and O&I pretest scores as covariates. Significant differences were found in post training scores between the experimental and control groups when pretest scores were partialled out. This suggested that initial pretest scores were significant covariates. This was because when initial differences were adjusted, effects of training remained significant. Thus, it could be concluded that the KTM was effective in enhancing the creative thinking abilities of the subjects in this study irrespective of their initial creative level. ANCOVA had provided evidence to support the effectiveness of the KTM via improvement in verbal originality of the subjects. The overall effect sizes for the S&I (.60) and for the O&I (.49) could be considered large and a testament to the effectiveness of the KTM treatment.
Based on the adjusted posttest mean scores (the differences are shown in parentheses for the S&I and O&I measures), it can be seen that gains were made by the following categories of subjects in the experimental group:

1. Experimental subjects gained more in the S&I ($M = 133.69, SD = 17.42$) and O&I ($M = 136.62, SD = 14.16$) compared to the control subjects in the S&I ($M = 106.25, SD = 22.80$) and O&I ($M = 114.76, SD = 16.07$) measures.

2. High creative experimental subjects gained more in the S&I ($M = 145.53, SD = 10.89$) and O&I ($M = 147.89, SD = 8.99$) compared to the high creative control subjects in the S&I ($M = 119.50, SD = 20.54$) and O&I ($M = 126.64, SD = 10.99$) measures.

3. Low creative experimental subjects gained more in the S&I ($M = 123.23, SD = 15.33$) and O&I ($M = 126.65, SD = 9.68$) compared to the low creative control subjects in the S&I ($M = 93.00, SD = 16.47$) and O&I ($M = 102.89, SD = 10.62$) measures.

4. Male experimental subjects gained more in the S&I ($M = 132.86, SD = 18.21$) and O&I ($M = 134.93, SD = 15.51$) compared to the male control subjects in the S&I ($M = 111.22, SD = 25.47$) and O&I ($M = 111.97, SD = 15.44$) measures.

5. Female experimental subjects gained more in the S&I ($M = 134.68, SD = 16.64$) and O&I ($M = 138.62, SD = 12.26$) compared to the female control subjects in the S&I ($M = 101.28, SD = 18.84$) and O&I ($M = 117.56, SD = 16.41$) measures.

6. Science experimental subjects gained more in the S&I ($M = 134.07, SD = 16.66$) and O&I ($M = 137.84, SD = 13.32$) compared to the science control
subjects in the S&I \((M = 110.80, SD = 20.41)\) and O&I \((M = 117.13, SD = 14.73)\) measures.

7. Arts experimental subjects gained more in the S&I \((M = 133.22, SD = 18.56)\) and O&I \((M = 135.08, SD = 15.19)\) compared to the arts control subjects in the S&I \((M = 100.56, SD = 24.62)\) and O&I \((M = 111.81, SD = 17.39)\) measures.

The difference in gains of the various categories of subjects between the experimental and control groups seems to have widened after the provision of creativity training through the KTM intervention. Overall, the experimental group had gained over the control group. The highest score belonged to the high creative experimental subjects in the S&I and O&I measures and the lowest score was obtained by the low creative experimental subjects in the S&I and O&I measures. Based on the posttest gains made by the above mentioned categories of subjects (overall experimental group, high & low creative experimental subjects, male & female experimental subjects, science & arts experimental subjects) it could be determined whether they were of above or below average creativity and this is discussed below.

According to the TCSW Norms-Technical Manual (Khatena & Torrance, 1998b), the mean standard score for each of the norm-referenced measures of the S&I and the O&I is 100 and the standard deviation is 20. “Thus a score of one standard deviation above the mean would be a standard score of 120, and one standard deviation below the mean would be a standard score of 80” (Khatena & Torrance, 1998b, p. 63). According to Torrance and Ball (1984), a score of 120 is one standard deviation above the mean and is better than 84% of the norm group. On the contrary, a score of 80 is one standard deviation below the mean and is better than 16% of the norm group. Thus, a score over 120 can
be considered as above average and a score below 80 can be termed as below average.

In keeping with what Khatena and Torrance (1998b) and Torrance and Ball (1984) had said about determining above and below average creativity, the adjusted posttest mean scores obtained by the overall experimental group for the S&I \( (M = 133.69, \text{SD} = 17.42) \) measure and the O&I \( (M = 136.62, \text{SD} = 14.16) \) measure in this study could be acknowledged as impressive. For each of the posttest measures, the experimental subjects had scores that were more than 1 ½ standard deviations above the mean and hence could be considered as more than above average in creative ability. The posttest mean scores obtained by the subjects were even better than the highest mean scores recorded for American samples of more or less similar age. For the S&I measure, the American adolescents \( (N = 29) \) aged 16 years had a mean score of 112.00 and for the O&I measure the American adolescents \( (N = 77) \) aged 16 to 19 years had a mean score of 104.00 (Khatena & Torrance, 1998b). However, it must be borne in mind that the subjects in this study were tested after training in creativity strategies, whereas the American students were only tested in creative thinking potential.

The high creative and the low creative experimental subjects had gained over the high creative and low creative control subjects. The adjusted posttest mean scores obtained by the high creative experimental subjects for the S&I \( (M = 145.53, \text{SD} = 10.89) \) and O&I \( (M = 147.89, \text{SD} = 8.99) \) measures could be acknowledged as very good (slightly more than 2 standard deviations above the mean). The adjusted posttest mean scores obtained by the low creative experimental subjects for the S&I \( (M = 123.23, \text{SD} = 15.33) \) and O&I \( (M = \)
The posttest mean scores obtained by the high creative experimental subjects in this study were comparable with the American norms for the gifted and talent children. For the S&I measure, the American adolescents \((N = 47)\) aged 16 to 18 years had a mean score of 152.00 (Khatena & Torrance, 1998b). For the O&I measure, the American adolescents \((N = 31)\) aged 16 to 17 years had a mean score of 136.00 (Khatena & Torrance, 1998b) and this was lower than that obtained by the high creative experimental subjects (147.89) in this study. Perhaps the high creative experimental subjects of this study could be termed as talented in creative ability as a result of creativity training through the KTM treatment. This is because it has been said that “if a person is highly original relative to Onomatopoeia and Images, that person must obtain a standard score of at least 140 or two standard deviations above a mean of 100” (Khatena & Torrance, 1998b, p. 63).

The male and female experimental subjects performed better than the male and female control subjects. The adjusted posttest mean scores obtained by the male experimental subjects for the S&I \((M = 132.86, SD = 18.21)\) and O&I \((M = 134.93, SD = 15.51)\) measures could be acknowledged as impressive (slightly more than 1½ standard deviations above the mean). The adjusted posttest mean scores obtained by the female experimental subjects for the S&I \((M = 134.68, SD = 16.64)\) and O&I \((M = 138.62, SD = 12.26)\) measures were even better than that obtained by the male experimental subjects. The male and female experimental subjects were above average in creative ability.

The adjusted posttest mean scores obtained by the male and female subjects were even better than the mean scores recorded for American children.
who served as norm groups. For the S&I measure, the American sample (8 – 18 years) of males \((N = 1430)\) and of females \((N = 1466)\) had obtained mean scores of 99.00 and 100.00 respectively (Khatena & Torrance, 1998b). For the O&I measure, the American sample (9 – 19 years) of males \((N = 621)\) and of females \((N = 684)\) had obtained mean scores of 101.00 and 91.00 respectively (Khatena & Torrance, 1998b). This tells us that our students have creative potential that can be enhanced through creativity training programmes such as the KTM.

The science and arts subjects in the experimental group had gained over the science and arts subjects in the control group. The adjusted posttest mean scores obtained by the science experimental subjects for the S&I \((M = 134.07, SD = 16.66)\) and O&I \((M = 137.84, SD = 13.32)\) measures and by the arts experimental subjects for the S&I \((M = 133.22, SD = 18.56)\) and O&I \((M = 135.08, SD = 15.19)\) measures could be acknowledged as good for the science and arts (slightly more than 1½ standard deviations above the mean) subjects in this study. They could be considered as more than above average in creative ability. However, American norms for science and arts subjects were not available for comparisons to be made.

In summary, based on the differences in adjusted posttest mean scores for the experimental and control groups as well as for the high creative, low creative, male, female, science and arts, subjects in the experimental and control groups, it could be said that the experimental subjects performed much better than the control subjects. This could be due to the effectiveness of the KTM treatment that enhanced the creative thinking abilities of the experimental subjects. The KTM treatment had also made a greater positive impact on the following groups of subjects: low creative experimental subjects in both the S&I and O&I measures, female experimental subjects in the S&I measure, male
experimental subjects in the O&I measure, and arts experimental subjects in the 
S&I and O&I measures. It has been demonstrated by the KTM treatment that it 
could impact students’ divergent thinking abilities in verbal originality in a 
greater manner for a number of categories of subjects as reported above.

5.3.2 Effectiveness of Training as Measured by the UMIW Delayed Posttest 
Scores

The purpose of the fifth research question was to determine the gains by 
the subjects in the experimental group, via the Using Modality and Imagery in 
Writing (UMIW) measure after creativity training. Improvement in the scores of 
the UMIW after creativity training was used as a yardstick to further assess the 
effectiveness of the KTM treatment.

ANCOVA (Tables 5.35, 5.37) was used with the UMIW delayed posttest 
scores as dependent variable and the UMIW pretest scores as covariates. 
Significant differences were found in delayed post training scores between the 
experimental and control groups when pretest scores were partialled out.

Based on the adjusted posttest mean scores, the performance of the 
experimental group ($M = 11.06$, $SD = 3.24$) was compared to the control group 
($M = 6.50$, $SD = 2.53$). The experimental subjects gained more than the control 
subjects in the UMIW measure with a 4.56 mean difference. The effect size data 
from the UMIW (.31) that could be considered large indicated the successful 
educational transfer effects as a result of the KTM treatment.

The KTM treatment had effectively enabled the experimental subjects to 
retain the creative thinking skills learned even after a period of two weeks as 
was reflected in the use of different types of modality (visual, auditory, 
kinesthetic, olfactory, gustatory, cutaneous, and organic) and different types of 
imagery (direct, personal, fantasy, and symbolic) in their written compositions.
On the contrary, the written compositions of the subjects in the control group showed sense and sensibility but not sensitivity to the use of sense modality and creative imagery.
Discussion, Conclusions and Recommendations

6.0 Introduction

The first objective of this study was to investigate the effectiveness of the Khatena Training Method (KTM) treatment on the experimental and control groups as assessed by the Thinking Creatively with Sounds and Words (TCSW) test battery. The second objective of this study was to determine the effectiveness of the KTM on the high creative, low creative, male, female, science, and arts subjects between the experimental and control groups as assessed by the TCSW test battery. The third objective was to determine if there were educational transfer effects as a result of the KTM on the experimental and control groups as assessed by the Using Modality and Imagery in Writing (UMIW) checklist.

In Chapter Five, the statistical procedures for data analyses, results, and interpretations were reported. This chapter presents a summary of procedures, a summary of findings, as well as discussion and conclusions as they relate to this study. This is followed by an exploration of the implications for educational practice. Finally, limitations of the study and recommendations for further research are presented.

6.1 Summary of Procedures

Permission to use the Khatena Training Method (KTM), the Thinking Creatively with Sounds and Words (TCSW) test battery and the sub-measure of Something About Myself (SAM) from the Khatena Torrance Creative Perception Inventory (KTCPI) was obtained before this study was carried out. Permission was also sought from the Education Planning and Research Division
of the Ministry of Education, the State Education Department in Selangor, and the schools concerned before pilot study and the study proper were conducted.

Initially all the Form Four students \( N = 257 \) from a typical secondary school in the state of Selangor were administered the creative inventory of SAM. The subjects were then differentiated as high creatives (above the 75\(^{th}\) percentile or upper quartile) and low creatives (below the 25\(^{th}\) percentile or lower quartile) according to their performance in SAM. Thus after the administration of SAM, 161 subjects were selected for the study proper. The high and low creative subjects, both male and female, from the science academic stream were more or less evenly distributed (stratified random sampling) to the experimental or control group. The same procedure was employed for the high and low creative subjects, both male and female, from the arts academic stream. For data analyses, the subjects’ SAM raw scores were converted to standard scores using the conversion tables in the KTCPI Instruction Manual (Khatena & Torrance, 1998a).

Subjects in the experimental group received creativity training through the KTM and subjects in the control group did not receive any form of training. This study employed the randomized groups, pretest-posttest design to investigate the effectiveness of creativity training through the KTM treatment. Altogether five research questions were formulated.

The creativity testing instruments administered were firstly, the TCSW. The sub-measures of the TCSW, namely, Forms 1A of Sounds and Images (S&I) and Onomatopoeia and Images (O&I) were used as pretests and Forms 1B of S&I and O&I were used as posttests. The TCSW was used to investigate the effectiveness of the KTM treatment on the creative thinking abilities of the subjects. For data analysis, the subjects’ TCSW raw scores were converted to
standard scores by using the conversion tables in the TCSW Norms-Technical Manual (Khatena & Torrance, 1998b). Secondly, the UMIW was used as pretest and delayed posttest. The UMIW was used to determine if the KTM treatment could be retained and reflected in the subjects’ written compositions after a period of two weeks. For data analyses, the subjects’ UMIW raw scores were used.

The KTM treatment focused on four creative thinking strategies, namely, Breaking Away from the Obvious and Commonplace, Synthesis - Restructuring - Destructuring, Transposition, and Analogy-Imagery. The subjects in the experimental group were given the KTM treatment over two days or 480 minutes. The training procedures used were brainstorming and synectics.

Creativity training through the KTM and creativity testing through SAM, TCSW and UMIW were carried out over seven days. After that, the data of only 153 subjects were subjected to analyses as 8 out of the 161 students missed one or more of the training and/or testing sessions. For data analyses, descriptive statistics (frequency, mean, standard deviation) and inferential statistics (independent sample t-test, analysis of covariance, Pearson product-moment correlation coefficient) were used. The level of significance for all analyses was set at .05. Statistical comparisons of scores were made using the Statistical Package for Social Sciences (SPSS), Version 11.0 for Windows.

Pilot tests were carried out before the study proper. For the pilot study, a typical secondary school in the district of Petaling was chosen and a total of 78 Form Four students, both males and females from the science and arts academic streams were involved. To determine the criterion validity of SAM, the Pearson correlation coefficients between SAM and the other two instruments of TCSW (Form 1B of S&I & Form 1A of O&I) and UMIW were examined and found to
be significant \((p < .01)\). To establish interscorer reliabilities of the TCSW (Form 1B of S&I & Form 1A of O&I) and UMIW as well as test-retest reliabilities of the UMIW, the same subjects were used. Pearson correlation coefficients were computed and found to be significant \((p < .01)\) for the TCSW and UMIW.

### 6.2 Summary of Findings

ANCOVA was used in this study to determine if there were any significance in the variance of the criterion scores after differences in the covariates had been corrected. Results from ANCOVA analysis showed that after initial differences in creativity scores had been adjusted, the Khatena Training Method (KTM) treatment remained significant in enhancing the creativity of the subjects. Significant training effects on both the testing measures of Sound and Images (S&I) and Onomatopoeia and Images (O&I) were obtained. The summary of the main findings for the five research questions in this study are as follows:

- Experimental subjects performed better than the control subjects in the TCSW posttest scores of S&I and O&I;
- High creative experimental subjects performed better than the high creative control subjects in the TCSW posttest scores of S&I and O&I;
- Low creative experimental subjects performed better than the low creative control subjects in the TCSW posttest scores of S&I and O&I;
- Male experimental subjects performed better than the male control subjects in the TCSW posttest scores of S&I and O&I;
- Female experimental subjects performed better than the female control subjects in the TCSW posttest scores of S&I and O&I;
- Science experimental subjects performed better than the science control subjects
in the TCSW posttest scores of S&I and O&I;

Arts experimental subjects performed better than the arts control subjects in the TCSW posttest scores of S&I and O&I;

Experimental subjects performed better than the control subjects in the UMIW delayed posttest scores.

The KTM had a greater positive impact on some groups of subjects such as the:

- Low creative experimental subjects in both the S&I and O&I;
- Female experimental subjects in the S&I;
- Male experimental subjects in the O&I;
- Arts experimental subjects in the S&I and O&I.

6.3 Discussion and Conclusions

It is important to bear in mind, before conclusions can be drawn from this study, that the findings are restricted by limitations (listed further down in this Chapter as well as in Chapter Two, 2.9). Besides, the generalizations from this study are exclusive to comparable samples only and further investigations are warranted before judgements and applications can be made.

To date, only one formal empirical study (Chia, 1997) was undertaken in the area of enhancement of creativity in the Malaysian context. However, Chia’s study involved teacher trainees and not students. This study focused on gathering empirical data on the effectiveness of the Khatena Training Method (KTM) in enhancing the creative thinking abilities of Form Four students in a typical secondary school in the state of Selangor. This study could be viewed as a preliminary effort that could stimulate interest in conducting further studies in the area of creativity training of students.
In this study, the subjects in the overall experimental group who were given creativity training via the KTM, performed better than the control group with an adjusted posttest mean score difference of 27.44 for Sounds and Images (S&I) and 21.86 for Onomatopoeia and Images (O&I). These findings concur with the results of some earlier studies that utilized the KTM. In the study by Khatena and Barbour (1972) that used 72 college majors, creativity training was given through the KTM strategies after which the subjects were tested with the S&I measure. The experimental subjects gained from training compared to the control subjects with a mean score difference of 30.00 which is comparable to that obtained in this study for the S&I measure. In a study by Khatena and Parnes (1974) that used only the O&I measure with adults (N = 138), the experimental subjects performed better than the control subjects by a mean difference of 13.23. However, this mean difference is much less than the mean difference obtained for the O&I in this study. The findings of this study suggest that the performance of the adolescent students is comparable to American students in the S&I measure and better than the American students in the O&I measure.

The findings of this study also concur with the findings of other studies (Blissett, 1994; Khatena, 1971b, 1971c, 1972d, 1973a, 1975b, 1977; Khatena & Dickerson, 1973) where experimental subjects gained from the KTM treatment. Some other studies (Chia, 1997; Clapham & Schuster, 1992; Furze, Tyler, & McReynolds, 1984; Golub & Hahn, 1983; Hooda & Jarial, 1986; Kurtzberg & Reale, 1999; Saxon et al., 2003) with a pretest-posttest design like this study that focused on creativity training but used other training programmes give indirect support to the findings of this study. In those studies, creativity training was
successful in enhancing the creativity level of the subjects in the experimental group.

This study also determined the effectiveness of creativity training on the high creative and low creative subjects. The high creative and the low creative subjects in the experimental group performed better than the high creative and low creative subjects in the control group, based on their adjusted posttest scores. However, the KTM treatment had a greater positive impact for the low creative experimental subjects in the S&I and O&I measures. This was because the mean difference (30.23) between the low creative experimental subjects and the low creative control subjects was higher when compared to the mean difference (26.03) between the high creative experimental subjects and the high creative control subjects in the S&I measure. A similar pattern was obtained for the O&I measure where the mean differences were 23.76 and 21.25 respectively.

The better performance of the low creative experimental subjects with a mean score difference of 4.20 for the S&I and 2.51 for the O&I was an unexpected finding as the usual norm was for the high creative experimental subjects to have gained more as was the case in the study by Jampole et al. (1994). However, a study by Khatena (1973a) that utilized the KTM treatment found that the high and low creative experimental subjects did not differ significantly in their scores after training. In this study the differences in mean scores between the high creative experimental and control subjects and between the low creative experimental and control subjects were not too great especially for the O&I measure. Hence the high creative and low creative subjects could do better with more exposure to creativity training in sounds and images as well as in onomatopoeia and images.
In this study the performance of the high creative experimental subjects was found to be comparable to American students of more or less similar age (Khatena & Torrance, 1998b) or better than their American counterparts (Masten, Khatena & Morse, 1986). In the study undertaken by Masten et al. (1986) on the verbal originality of gifted or creative adolescents, the TCSW was administered. The subjects obtained mean standard scores of 78.00 on the S&I measure and 62.00 on the O&I measure. Their mean scores were much less than the mean scores obtained by the subjects in this study despite being termed “gifted” adolescents. Perhaps this was because they were not exposed to creativity training as the study investigated the effects of repeated presentation of sound stimuli on verbal originality.

The better performance of the high and low creative experimental subjects over the high and low creative control subjects in this study revealed that SAM, used to differentiate the high and low creatives, was a good predictor of creative ability. Niu and Sternberg (2002) have informed us that a couple of researchers (Khatena & Raina, 1977; Palaniappan, 1996), “believed that if a person rated herself or himself highly in traits related to creativity, she or he would be more likely to think and behave creatively than would an average person” (cited in Niu & Sternberg, 2002, p. 276).

The male and female experimental subjects in this study performed better than the male and female control subjects based on their adjusted posttest scores. However, the KTM had a greater positive impact for the female experimental subjects in the S&I measure and for the male experimental subjects in the O&I measure. This was because the mean difference (33.40) between the female experimental and female control subjects was higher when compared to the mean difference (21.64) between the male experimental and
male control subjects in the S&I measure. Whereas it was the reverse for the O&I measure where the mean differences were 21.06 and 22.96 respectively.

The greater positive impact of the KTM for the female experimental subjects in the S&I measure and for the male experimental subjects in the O&I measure concurs with the findings for male and female students reported in the Norms-Technical Manual (Khatena & Torrance, 1998b). In the manual, the females (N = 1466) performed better with a mean score of 100.00 compared to 99.00 for males (N = 1430) in the S&I measure. The ages of the sample were from 8 to 18 years. In the O&I measure, the males (N = 32) performed better with a mean score of 103.00 compared to 98.00 for females (N = 45). The ages of the sample were from 16 to 19. The findings of this study suggest that the creative thinking abilities of our male and female students can be enhanced with creativity training. However, our male students may need more exposure to sounds and images while our female students can do with more training in onomatopoeia and images. The exposure of male students to sounds and images should be given more attention, considering their greater mean score (11.76) difference compared to that of 1.90 for onomatopoeia and images.

A comparison of the findings in this study with other research studies in the local context was not possible as the only study on creativity training (Chia, 1997) did not compare male and female students. However, a study undertaken by Khatena and Dickerson (1973) that looked into the enhancement of creative thinking abilities of 56 male and female children through the KTM treatment, found that males and females benefitted from it. The testing instrument used in their study was the Torrance Tests of Creative Thinking (TTCT). The findings of the study have shown that creativity training via the KTM can give positive results irrespective of the testing instruments used.
Some local studies (Chan, 1986; Palaniappan, 1994; Yong, 1986) that only tested students in creative thinking skills found that generally males were more creatively inclined. However, the findings of this study revealed that the creative thinking abilities of both male and female students could be enhanced through creativity training utilizing the KTM.

In this study, the science and arts experimental subjects performed better than the science and arts control subjects based on their adjusted posttest scores. However, the KTM had a greater positive impact on the arts experimental subjects in the S&I and O&I measures. This was because the mean difference (32.66) between the arts experimental and arts control subjects was higher when compared to the mean difference (23.27) between the science experimental and science control subjects in the S&I measure. A similar pattern was obtained for the O&I measure where the mean differences were 23.27 and 20.71 respectively.

No studies could be found that utilized the KTM for science and arts subjects to make a comparison. However, some general studies (Hartley & Greggs, 1997; Lloyd-Bostoc, 1979; Webster & Walker, 1981) found that arts students outperformed science students in divergent thinking tasks. The results of these studies give indirect support to the findings of this study as the KTM strategies are based on divergent thinking activities. Cheung et al. (2003) have informed us that according to the bio-cognitive and social learning theories, students of arts, humanities, and social sciences would have higher creativity than students of natural science and technology. This is because the educational setting of the former encourages more primary process cognitions especially in relation to the right brain that is linked to creativity. The explanation given by Cheung et al. (2003) indirectly supports the better performance of the arts
students in this study. Thus the science students may need further training in creative thinking skills to improve their scores in the S&I and O&I measures. The exposure of science students to sounds and images can be given more attention, considering their greater mean score (9.39) difference compared to that of 2.56 for onomatopoeia and images.

The following are some general comments for the S&I and O&I sub-measures of the TCSW that were utilized in this study. For the subjects in the experimental group, the effect size for the S&I measure ranged from the lowest of .56 (low creatives) to the highest of .64 (high creatives) and for the O&I measure, the lowest effect size was .42 (science subjects) while the highest was .63 (high creatives). The high effect sizes of .64 for the S&I and .63 for the O&I though impressive were smaller than the effect size of .82 obtained for creativity training via the KTM in the meta-analytic study by Ma (2006) which covered twelve creativity training programmes.

Based on the adjusted posttest results of the S&I and O&I measures, there was a pattern of performance whereby the experimental as well as the control subjects generally scored better in the O&I measure compared to the S&I measure. A reason for this unusual finding, of all the subjects performing better in the O&I measure compared to the S&I measure can perhaps be explained by the discovery made by Khatena and Fisher (1974) in their longitudinal study that lasted for four years. They discovered that age is a factor to consider in the responses of the O&I measure, as original responses tend to increase from age ten. However, no such discovery was made for the S&I measure. This may be a reason why the Form Four subjects (N = 153) in this study (average age = 16 years, 4 months) performed much better overall in the O&I compared to the S&I measure.
In an earlier study by Khatena (1971b) that involved 116 college students, it was discovered that the experimental subjects who had received creativity training not only performed better than the control subjects but they had also performed better in the O&I measure compared to the S&I measure. Thus, the O&I may be a more suitable measure for adolescents and adults than the S&I measure.

Another possible reason for the better overall performance of the subjects in the O&I can be that the O&I is different from the S&I though both are auditory measures. In the S&I measure, the stimuli are sounds and in the O&I measure, onomatopoeic words that “have the potency to evoke the production of original responses by both their meaning and music” (Khatena & Torrance, 1998b, p. 44). The onomatopoeic words that are based on intellectual (different layers of meaning) and emotional elements and their interaction may have caused the creative process to function more effectively (Feldhusen & Clinkenbeard, 1986) compared to the S&I measure for the subjects in this study. Khatena (1992) has said that the creative process works best when the intellect and emotions are involved and since the O&I measure stirs the intellect and the emotions better than the S&I measure, the subjects in this study from both the experimental and control groups performed better in the O&I measure. Besides, students are usually quite familiar with the meaning of onomatopoeic words and when challenged, familiarity coupled with the KTM treatment may have prompted them to consider the familiar onomatopoeic words in strange ways and to think of more and better original responses. Those high creative male or female subjects from the science or arts academic streams who performed better than their counterparts may have already had the edge over the others in the O&I measure and creativity training through the KTM further challenged them.
The S&I on the contrary is an auditory measure of sounds and the meaning is left to the imagination and as such “considerable power is needed to break away from the usual sequence of thought into an altogether different pattern, often requiring the power of synthesis” (Khatena, 2000, p. 50). To have a mental representation of a sound and to consider several dimensions of that mental representation is a thought pattern which may have been more difficult for many of the subjects. Thus, the subjects’ ability to perform on this measure may have been limited by their level of thinking. Besides, students in schools are normally not asked to listen to sounds to give verbal responses. Hence they may have found the strange and unusual sounds and especially the combination of sounds a more daunting experience to translate into familiar but original responses despite the KTM treatment. However, those who managed to perform well in the S&I measure can perhaps be considered as capable of higher abstraction and flexibility of thought.

The overall better performance of the subjects in the O&I over the S&I measure could have been predicted from their pretest scores which were used to determine comparability of groups before creativity training. The incomparability of some of the groups in the O&I measure such as the low creative, male, female, and science, subjects had already suggested that these subjects found it easier to think and provide more divergent and original responses on the O&I measure and hence the disparity in scores. The KTM treatment had only further enhanced their creative thinking ability in the O&I measure. This finding suggests that Form Four students may be sorely in need of more training to enhance their creative thinking skills in the S&I measure that focuses on sounds and images.
In this study, apart from investigating the effectiveness of the KTM on the subjects, the study also intended to determine if educational transfer effects were possible through the KTM. Two out of the four KTM strategies taught, namely, Transposition (use of sense modality) and Analogy-Imagery (use of creative imagery) were tested in the subjects’ writings via the UMIW (pretest & delayed posttest) measure. Successful transfer effects of these two creative strategies in the experimental subjects’ written compositions tell us that training in creative thinking skills can be transferred to creative writing as was observed by Torrance (1962) and Khatena (2000). It also depicts real-life creativity (Amabile, 1996; Niu & Sternberg, 2002) in the classroom where students are routinely asked to write descriptive compositions during language lessons.

Another explanation for the successful transfer effects as a result of the KTM treatment is that “within the framework of divergent thinking, knowledge can be viewed as flexible and transferable from a previously learned schema to a new and different task” (Carr & Borkowski, 1987, cited in Russo, 2004). Since the KTM strategies were generally based on divergent thinking aspects of the overall conceptual system of creativity (Parkhurst, 1999; Sternberg, 1985), the subjects in this study were able to utilize the creative skills learned in a creative manner even after a lapse of time. The finding of this study regarding positive educational transfer effects concurs with the views of Carr and Borkowski (1987) as well as the findings of Roskams and Fisher (2006) and reassures Diakidoy and Spanoudis (2002) who said that it is questionable for divergent thinking tests “to predict creative potential that is, subsequently, expected to manifest itself in the context of school and in connection with school subjects” (Daikidoy & Spanoudis, 2002, p. 56).
General studies on creative imagery and sense modality have been carried out by researchers (Bellarosa & Khatena, 1979; Khatena, 1972b, 1972d, 1972e, 1973c, 1976b, 1976c, 1977, 1978a; Khatena & Parks, 1987; Sajjadi-Bafghi & Khatena, 1985) but not as a result of the KTM treatment. These researchers analyzed the different types of imagery and modality used from the subjects’ responses on the TCSW. Other researchers (Jampole et al., 1991; Jampole et al., 1994; Long & Hiebert, 1985) assessed the different types of imagery and modality in students’ compositions but also not as a result of the KTM treatment. Since no studies have been undertaken in the United States, Malaysia or elsewhere to determine if creativity strategies learned through the KTM can be retained by the subjects after a period of two weeks as assessed by their written compositions, no comparison can be made. However, this finding which can be considered as an original contribution of this study has shown that educational transfer effects are possible through creativity training with the utilization of the KTM treatment.

This study used the KTM treatment that successfully enhanced the creative thinking abilities of Form Four students. This suggests that the KTM is a viable creativity training programme for students. Mansfield et al. (1978) evaluated creativity training programmes and according to their evaluation the two outstanding programmes were the Creative Problem Solving (CPS) and the KTM. When Ma (2006) categorized the different creativity training programmes in 15 categories, the KTM was one of the categories. The findings of this study have justified the evaluation of Mansfield et al. (1978) and the categorization of Ma (2006) regarding popular and sound creativity training programmes.

In this study, creativity training through the KTM had a greater positive impact on the experimental subjects in the S&I measure (Effect size = .60)
compared to the O&I measure (Effect size = .49). However, the effect sizes were less than the average effect sizes of 0.77 and 0.78 based on meta-analytic studies of creativity training methods by Ma (2006) and Scott et al. (2004a) respectively. The effect size (0.82) obtained by the KTM in Ma’s (2006) study was much higher than the effect sizes obtained for the S&I and O&I via the KTM in this study.

In the meta-analytic study by Scott et al. (2004a), 156 training programmes were appraised and “some types of training, specifically idea production and cognitive training, proved particularly effective” (Scott et al., 2004a, p. 149). The KTM used in this study was based on divergent thinking strategies and was supported by the Creative Imagination Imagery model (Khatena, 1979) which takes into consideration both cognitive and affective factors. Hence the KTM can be considered an effective training programme according to the appraisal by Scott et al. (2004a). The conclusions of these meta-analytic studies and other meta-analytic reviews (Kim, 2008a; Meador et al., 1999; Pyryt, 1999; Reis & Renzulli, 1999) as well as general studies (Chen et al., 2005; Cheung et al., 2006; Cunningham & MacGregor, 2008; Freund & Holling, 2008; Yuan & Zhou, 2008; Zampetakis et al., 2008; Zhou & Shalley, 2003) on creativity training that focused on creative process outcomes have given us assurance of the positive influence of training programmes on creativity enhancement. However, we are reminded by another meta-analytic study (Bertrand, 2005) that not one individual programme showed significantly better results than the other. This perhaps is because creativity is a complex phenomenon that involves various factors (Prabhu et al., 2008). This tells us that training programmes other than the KTM can also enhance students’ creativity.
but it will be better if they can be empirically verified in the local school context before being accepted.

The KTM treatment for this study was based on four creative thinking strategies, namely, Breaking Away from the Obvious and Commonplace (BAOC), Synthesis-Destructuring-Restructuring (S-D-R), Transposition (TR), and Analogy-Imagery (A-I), designed to enhance originality of thought. According to Roskos-Ewoldsen, Black, and Maccown (2008), “Originality is a joint product of statistical rarity and appropriate cleverness” (p. 34). The KTM strategies for this study were similar to those mentioned in Ma’s (2006) meta-analytic study. In Ma’s study, the KTM that was evaluated was based on five studies and consisted of creativity thinking strategies such as “breaking away from the obvious and commonplace, transposition, analogy, restructuring, and synthesis” (p. 439).

In this study, creativity training through the KTM strategies was supported by the Creative Imagination Imagery (CII) model (Khatena, 1979) which is a synthesis of the models of Wallas (1926), Guilford (1967), and Vargiu (1977). The CII is a theoretical process model and the creative process is the only aspect of creativity that is malleable to training (Kobe, 2001) unlike the other facets of creativity such as the creative person, creative product, and creative press or environment. The success of the KTM treatment in enhancing the creativity of the subjects in the experimental group regardless of their innate abilities gives credence to the CII model as a viable creativity process model.

The Thinking Creatively with Sounds and Words (TCSW) test battery with its sub-measures of Sounds and Images (S&I) and Onomatopoeia and Images (O&I) was used as the main dependent variable in this study. The S&I and O&I are divergent thinking tests. Though divergent thinking tests are not
perfect measures, they are popularly used to quantify the creative process and thereby can be dependent on to provide useful estimates of a person’s potential for creative thinking (Plucker & Renzulli, 1999; Runco, 1991; Scott et al., 2004a). The TCSW which was designed to measure verbal originality of thought (Cooper, 1991; Khatena & Torrance, 1998b; Ma, 2006) could be deemed a suitable dependent variable in this study as it has complemented the KTM well. Besides, the study has provided further support for the construct validity of the TCSW as a convenient evaluation tool in applied research. Though understanding and implementing the KTM strategies in the school context is not difficult, scoring, interpretation, and explanation of the responses on the TCSW instrument is best left to those who have knowledge and practice. Creativity tests are usually designed by psychologists for professional use (Khatena, 2000).

The KTM treatment and the TCSW test battery utilized in this study focussed on the dimension of originality and they have provided evidence of the significant gains in the subjects’ verbal originality skills. The dimension of originality regarded as a key element in creativity (Dollinger, 2003) was the sole creative thinking ability of interest in this study. Some researchers (Feldhusen & Clinkenbeard, 1986; Kurtzberg & Reale, 1999; Roskos-Ewoldsen et al., 2008) have encouraged the use of originality as a single dependent variable. Furthermore, Rose and Lin (1984) in their meta-analytic study of creativity training found large effects for the variable of originality.

The success of creativity intervention in this study has proven that creativity training through the KTM can play a useful role in promoting the development of uncommon, extraordinary, and novel ideas in adolescents. The effect size data from the TCSW has indicated improvements in creative thinking
abilities of the subjects in the experimental group and of the high creative, low creative, male, female, science, and arts subjects in the experimental group.

A couple of studies (Tan, 1992; Yong, 1985) in the local context that looked into the variable of originality as was the case in this study but not as a result of creativity training found that our Form Four students were capable of original thought. A local experiment (Chia, 1997) on creativity training that used originality as a variable found that teacher trainees were capable of original thought. But the mean score of the teacher trainees in the experimental group was only 106.21 compared to the mean score of the Form Four subjects in this study that was 133.69 for the S&I measure and 136.62 for the O&I measure. This suggests that our adolescent students can exhibit more originality of thought than adults as a result of creativity training irrespective of the type of creativity training or instrument used.

The KTM can be considered an effective training programme because it did enhance the creative thinking skills of Form Four students who are adolescents by stimulating their creative imagination to make optimum use of the intellect and emotion in a synergistic manner. It has been said that the most successful approaches to teaching creativity were those that took into consideration both the intellect or cognitive factor and emotion or affective factor (Cross, 2001; Murock, 2005; Torrance, 1972). This is because the generation of creative ideas and responses act as emotional (Torrance& Goff, 1989) and cognitive stimulants (Messaris, 2001). Thus, adolescence may be the right time for the resurgence of creativity (McCabe, 1991; Smith & Carlsson, 1985) for it is a period of high emotion and vivid imagination. It may also be a good time to foster creative thinking skills (Dacey, 1989b; Gruber, 1980;
Torrance, 1962) as the adolescents will be more prepared to take risks and try out new ideas.

In this study, the creativity training procedures (Davis, 1983; Torrance & Hall, 1980) utilized in order to increase the occurrence of divergent thinking among the adolescent subjects were mainly the rational procedures of brainstorming and synectics that involves the use of analogies and metaphors. These procedures are popular and teachable (Ambrose, 1996; Gordon, 1961; LeBoeuf, 1986; Osborn, 1957) and usually used during creativity training (Bull et al., 1995; Cropley, 1992; Smith, 1998) as they give opportunities for the use of creative imagination imagery and for the incubation of ideas (Khatena, 2000). It appears that the creativity training procedures employed in this study helped the subjects to think in diverse ways to produce original responses. However, the experimental subjects in this study may need more training in synectics, especially “making the strange familiar”. This view is based on their performance in the Sounds and Images (S&I) measure which was not as impressive as their performance in the Onomatopoeia and Images (O&I) measure. Despite the KTM treatment, the subjects found the S&I measure a more difficult experience to translate the strange sound stimuli into novel but familiar responses.

In this study, it seems that by utilizing the operational definitions of creativity and originality (Khatena & Torrance, 1998), creative imagination (Khatena, 1984), creativity training (Khatena, 1978a, 1979, 1992, 2000), and creativity testing (Khatena & Torrance, 1976, 1998), the likelihood of obtaining a significant degree of improvement in the creative abilities and skills of the experimental group as a result of the KTM treatment is high. Besides, it also
appears that retaining the creative abilities and skills learned after a lapse of two weeks is possible through the KTM.

The design of this evaluative study with respect to the sample size, use of control group, stratified random assignment of subjects, and use of transfer tasks can be considered of high quality (Scott et al., 2004a). This is because it has met pertinent prerequisites for internal validity. Besides, the effects of training evidenced substantial external validity with the KTM treatment proving beneficial in the school setting (outside a content-based curriculum) for high creative, low creative, male, and female adolescents in the science and arts streams. Furthermore, creativity scores of the experimental subjects including high creatives, low creatives, males, and females were comparable to the norm scores of American students of similar age. Thus, it can be said that the subjects of this study are a typical representation of the general population.

In summary, the present study makes conceptual and practical contributions to the creativity literature. Conceptually, it focuses attention on a creativity training programme, namely, the Khatena Training Method that has received little attention in the past. Results have indicated that the KTM is a viable creativity training method that can be used successfully to train adolescents to enhance their creative thinking skills in the specific strategies in which they are trained. Practically, this study provides implications for the enhancement of creativity in the educational context. It is hoped that the findings of this study will stimulate additional research in the area of creativity training of students as it can benefit not only students but also teachers, educators, psychologists and other interested parties. It is also hoped that the findings of this empirical study on the effectiveness of creativity training in the school context will add to the pool of documented literature on this subject and
enhance our understanding of creativity training of Malaysian secondary school students.

6.4 Implications for Educational Practice

Findings of this empirical study that focused on creativity training have practical implications for educational practice.

This study provided empirical evidence in support of the Khatena Training Method (KTM) that had effectively enhanced the creative thinking abilities of Form Four students in a typical secondary school in the state of Selangor within a short period. The implication from this successful experiment that underscores the value of creativity training is that if Form Four students in similar typical schools in Malaysia are exposed to the KTM treatment they can also gain from it immensely. Although this study is the first documented record of a local research that examined the viability of a creativity training programme on the creative thinking abilities of students, one clear finding that has emerged is that our students have creative potential in verbal originality that can be further enhanced. Just as other empirical studies (Ansburg & Dominowski, 2000; Balloche, 1994; Blissett, 1994; Cunningham & MacGregor, 2008; Freund & Holling, 2008; Khatena & Barbour, 1972; Khatena & Dickerson, 1973; Khatena & Parnes, 1974; Kurtzberg & Reale, 1999; Lalemi, 1991; Lee, 2005; Zampetakis et al., 2008) on creativity training of students, this study has demonstrated that creativity could be improved by an empirically tested creativity training programme such as the KTM. Educationists and interested parties need to take cognizance of this especially since it has been said that school grades and tests are not good predictors of creative potential (Kim,
Thus, it will be wise to give students opportunities to develop their creative abilities and skills.

The KTM can be acknowledged as an appropriate creativity training programme that can induce gains in the performance of adolescents. At the secondary school level, adolescence seems to be an appropriate time for creativity training as suggested by some researchers (Dacey, 1989b; Gruber, 1980; McCabe, 1991; Pickard, 1990; Smith & Carlsson, 1985; Torrance, 1962) and verified in this study. This is because youths from 16 to 18 years in age are imaginative and high on emotional energy. Thus, it is important to provide a favourable environment during the adolescence period to encourage the development of creative thought and skills. Subject teachers who teach Form Four and Form Five students, can give them more opportunities to think creatively by designing and implementing creative activities in their daily lessons. It will be beneficial for teachers to include the KTM strategies in their repertoire of teaching skills for diversified teaching methods can enhance creativity skills (Afolabi, Dionne & Lewis, 2003; Freund & Holling, 2008).

The main finding of this study that subjects in the experimental group who were exposed to the KTM treatment gained from it, suggests the need for planning and implementing creativity training interventions using the KTM or other empirically tested methods in isolation or infused in the curriculum. Such intervention programmes can support and strengthen the development of students’ creative thinking abilities and skills. It must be remembered that creative thinking is both an innate ability and a skill (Khatena, 2000; Rose & Lin, 1984; Torrance & Safter, 1999). Innate abilities can be greatly stimulated and nourished and skills can be further developed through proper training methods. For the past 30 years, educators and psychologists have developed
methods, strategies, techniques, and instructional materials to facilitate the formal development of creativity among students (Fleith, 1999; Khatena, 1992, 2000). However, it seems strange that our educational authorities such as the curriculum planning unit have not ventured to take advantage of what is available in the area of creativity training so that our students can be properly trained in creative thinking skills before they leave school.

Creative thinking has not been neglected in our school curricula (Mukherjee & Sarjit Singh, 1983) and teachers have been doing what they can to encourage creative thinking among students. Educators too have emphasized the importance of promoting favourable conditions for the development of students’ creativity. However, in our school system priority is given to the development of logical thinking or left-brained thinking that emphasizes knowledge, recall, and reproduction (Chia, 1997; Joseph, 1998; Zarrin, 2003). High intelligence and the attainment of excellent grades are also focused on. But it has been pointed out that “in evaluations of the reasons for accomplishment and failure, creativity appears to have replaced intelligence as the focus of interest” (Smith & Carlsson, 1990, quoted in Parkhurst, 1999, pp. 1-2). Perhaps the time has come to promote right-brained thinking and foster creative thinking abilities and skills in a formal and systematic manner through empirically tested creativity training programmes. However, this will require educational planners to initiate changes in the school teaching and learning system. In today’s world with emphasis on evidence-based practices, it is good to know the research bases for creativity training programmes that can be successfully used in schools. The KTM has been proven to be based on evidence and as such can be assumed to benefit students.
Creativity is one of the important assets of the human mind and a vital aspect of human intellectual performance (Freund & Holling, 2008; Huang, 2005; Williams, 2002) and the success of the KTM treatment in this study had shown us that creativity could be enhanced. Thus, by promoting creativity training in schools we will also be promoting “a higher order of intellectual processing, influenced by biological, psychological, sociological, conceptual knowledge and general problem-solving knowledge internal to the creator” (Alexander, Parsons & Nash, 1996, quoted in Huang, 2005 p. 53). As educators the privilege is ours to not only unlock but to fan the flame of creativity that is bubbling in every child. All normal children inherit the capacity to create (Gardner, 1993; Horible, 2001; Schacter et al., 2006) and if they are given the right assistance and attention, they can continue to be creative in their adult years. Thus, students who are well grounded in creative thinking skills may be well on their way to realizing their full creative potential in later years that can benefit them and society. Human beings are always faced with change and the tremendous value in approaching creativity as a life skill cannot be denied. This is because creative ideas and solutions can improve any area of human enterprise (Scope, 1998; Strenberg & Dess, 2001). We were reminded long ago that, “To give a fair chance to potential creativity is a matter of life and death for any society. This is all-important because the outstanding creative ability of a fairly small percentage of the population is mankind’s ultimate capital asset” (Toynbee, 1967, quoted in Taylor, 1984, p. 106). It is never too late for our educational authorities to heed Toynbee’s advice. They need to be farsighted and take appropriate measures to enhance the creative thinking abilities and skills of our students.
It was said earlier that exposing our students to creativity training could benefit them greatly. In this regard it is important for teachers and educators to learn how to discover unrecognized or untapped talent and to implement creativity strategies that can help to promote the development and expression of students’ creative abilities. However, before that they have to understand more about the abstract and complex concept of creativity as it was revealed by earlier studies (Chia, 1997; Joseph, 1998; Palaniappan, 2005; Zarrin, 2003) that our teachers and educators need to learn more of the many aspects of creativity. Some of the areas that they can be exposed to are theories, models, definitions, facets, dimensions, measurements, procedures, approaches, methods, strategies, and techniques of creativity. Since creativity is a multifaceted phenomenon, a holistic perspective to its understanding is recommended.

In this study, though the KTM treatment benefited the high creative and the low creative subjects in the experimental group, it made a greater positive impact on the low creatives in the S&I and O&I measures. This finding confirms the fact that everyone has creative potential that can be enhanced greatly. It also implies that creativity training programmes can benefit all, irrespective of the fact that they have high or low creative ability. School authorities and teachers must realize that when creative thinking abilities of students are enhanced, it can help to establish a healthy creative learning environment for all. An environment that arouses students’ curiosity and excites their imagination as well as challenges them to think divergently and productively should be a goal of education.

In this study, both the male and female subjects in the experimental group gained from the KTM treatment. This tells us that males and females can have their creative potential enhanced if they are given creativity training. It also
implies that in coeducational schools, intervention programmes to foster creative thinking abilities should be implemented uniformly to benefit both males and females. The KTM treatment also exposed their strengths and weaknesses such as the males performed better in the O&I measure compared to the females who did better in the S&I measure. Clearly, males may need more exposure to sound stimuli and females may need more training in onomatopoeic words in order to generate more original images as responses.

In this study, creativity training through the KTM benefited both the science and arts subjects in the experimental group. This finding suggests that students in the science and arts academic streams are not superior to each other where creativity is concerned. However, since the KTM had a greater impact for the arts experimentals in the S&I and O&I measures, this indicates that the science students need more exposure to sound stimuli and onomatopoeic words in order to increase their verbal originality scores. In general the creative potential of both the science and arts students can be further enhanced so that creativity can be a solid part of their educational experience. It has been said that people with creative minds can contribute to original thought in their area of specialization (Khatena, 2000) and we have been reminded that all the outstanding achievements in the sciences and arts are the result of creative thoughts (Fiest & Gorman, 1998; Kaufman, 2002). Thus, students in different academic streams if provided with proper assistance and guidance in the area of creativity may make future contributions in their specific talent domains be it in the realm of science or arts.

The KTM treatment for this study was based on four creativity strategies, namely, Breaking Away from the Obvious and Commonplace (BAOC), Synthesis-Destructuring-Restructuring (S-D-R), Transposition (TR),
and Analogy-Imagery (A-I). (These strategies were explained in Chapter two and the actual activities carried out in the classroom during the experiment together with instructions are in Appendix A). The KTM activities based on verbal and figural tasks encourage active participation and make learning challenging and fun for both the high and low ability students because they can progress at their own pace and intellectual ability. It has been said that generally, “students find training in creativity strategies to be enjoyable and it does improve students’ abilities to use specific strategies taught” (Hunsaker, 2005, p. 292). Thus, a creative approach to teaching and learning by teachers can remove the boredom (Chiang & Yager, 1993; Plucker & McIntia, 1996) that students as passive learners normally face when they have to cramp in their minds facts and figures in order to pass examinations. The KTM strategies and activities that are based on creative thinking skills can be manipulated and made applicable to suit a variety of subject matter contents. What is important is that students “… need to learn how to think rather than to learn the products of other people’s thinking” (Torrance & Safter, 1986, p. 6) and this should be the aim of education, to stretch students’ minds beyond their current thinking (Keller-Mathers & Murdock, 2002; Mellou, 1996).

Researchers (Feldhusen & Clinkenbeard, 1986; Khatena, 2000; Perkins, 1984) have said that training in the art of creative thinking can produce long-term transferable effects and thereby help mould a creative person. The possibility of transfer effects through creativity training has been proven in this study. The KTM treatment was successful in helping the subjects to retain the creativity skills learned as reflected in their written compositions. At the end of the KTM treatment, the subjects were asked to take a delayed posttest after two weeks with the aim of assessing if the KTM strategies learned could be
sustained over a period of time. The success of the delayed posttest implied that the KTM was a creativity training programme that could also result in positive educational transfer effects. This was because the KTM helped students retain the creative skills learned and to apply them in other areas of learning such as in composition writing which was richer in the use of sense modality and creative imagery (delayed posttest compared to the pretest).

Use of analogies and metaphors can help in fostering creative thinking besides reinforcing language skills (Callahan & Renzulli, 1977; Tsujimoto, 1993). Language teachers often lament the fact that their students’ compositions are devoid of metaphorical expressions and figurative language that can make prose writing more interesting. Thus, creativity training through the KTM strategies can help students in the area of creative writing. This finding of the study confirms the observations made by Torrance (1962) and Bigler (1980). Torrance said that training in the skills of creative thinking usually transfer to creative writing and to Bigler, creative writing enriches a language developing fluency, flexibility, elaboration, and originality of thought. This is because language and thought are intimately related.

Empirical studies on creativity training and testing of students have been carried out especially in the USA since the 1950’s. However, in Malaysia this study is the first effort that has shown that our students have the creative potential that can be enhanced further by creativity training programmes such as the KTM. The KTM has also shown us that our students’ creativity, irrespective of whether they have high or low creative ability, are males or females, and come from the science or arts streams, can be improved significantly. Since the KTM treatment has proven to be efficacious in the experiment carried out, it is hoped that more Form Four secondary school students can be exposed to it so
that they too can gain from it by having their creative thinking abilities enhanced. However, teachers and educators have to be convinced first of the effectiveness of the KTM treatment. Chia (1997) has also shown us that the Creative Problem Solving (CPS) method can be successfully used to further enhance the creative thinking abilities of teacher trainees. Our education ministry needs to take a serious view of the fact that the creative thinking abilities and skills of teachers and students can be improved greatly with empirically tested creativity training programmes.

Training in creative thinking has become a mandated part of the school curriculum for children in many parts of the world (Weisberg, 1993) because creativity is important at both the individual and societal levels (Freund & Holling, 2008; Williams, 2002). Schools have come to realize that with a balanced emphasis on intellectual and creative abilities, the education system can avoid turning out intellectually inclined giants but creativity stunted dwarfs. It has been said that those who are intelligent according to IQ tests are not necessarily creative (Gan, 1998; Kim, 2008a; Sen & Hagtvet, 1993). However, those who are creative must also have above average intelligence because intelligence enables creativity (Khatena, 2000; Silvia, 2008; Sligh et al., 2005). This can be a reason to explain why students with high levels of intelligence and high levels of creativity are those who seem to be performing best in schools (McCabe, 1991). In the local context, Yong (1985, 1993) found that significant but low correlation exists between creativity and intelligent scores of Form Four students. This implies that our secondary school students may not be performing at their optimum creative thinking capacity. The findings of Yong’s studies and this study suggest that educational authorities in charge of planning school experiences should consider a more holistic and pragmatic approach in
secondary education with equal emphasis on the acquisition of knowledge and the development of creative thinking skills.

Excellence in education should be our goal and to achieve this we may need to revamp our school curriculum so that it promotes the robust and holistic development of intelligence as well as creativity in students. In this way, by the time secondary school students enter institutions of higher learning they may be able to put their intelligence and creativity to better use for their own sake and for the betterment of the country.

6.5 Limitations of the Study

This empirical study must be viewed in the light of a number of limitations that need to be taken into consideration so that the results can be interpreted appropriately. However, given the limitations stated below, the results of this study have demonstrated that creativity training through the Khatena Training Method can improve the creative thinking abilities of Form Four students.

Firstly, the findings of this study were obtained from the analyses of the data of Form Four subjects from a typical secondary school in the state of Selangor. A typical secondary school was defined as an urban grade A, ordinary national secondary school or Sekolah Menengah Kebangsaan Biasa (SMK Biasa) in the district of Petaling. Thus, the results of this study cannot be generalized for populations of other schools that do not come under the category of a typical secondary school as defined above.

Secondly, while an assessment of creativity and an investigation into the possibility of enhancing the creative thinking abilities of students in Malaysia are desirable, this study limited the sample population to only 161 Form Four
students initially due to the use of extreme scores and later to 153 due to experimental mortality. Thus, the limited size of the study sample may affect the general applicability of the findings when a comparison is made. Besides, a small sample may have special localized characteristics not common in the population it is supposed to represent. Though stratified random sampling was employed to form the experimental and control groups, the results of this study cannot be generalized for populations of all ages or classes.

Thirdly, the creativity test battery, namely, Thinking Creatively with Sounds and Words (TCSW) and its sub-measures, to determine creative level but not as a result of creativity training, was used only once with female undergraduates in the local context (Gan, 1998). It has not been used with students. Since no studies of creativity training of students using the TCSW other than this study are available, no comparisons can be made. Besides, the TCSW that was used by Gan (1998) with female undergraduates was the adult version. However, in this study, the children’s version that is also suitable for adolescents was used for the first time. The TCSW was scored based on the norms and scoring procedures derived from studies of American students. The TCSW is a popular testing measure that has been successfully used mainly in the USA. However, if there were Malaysian norms for children on the TCSW, the findings of this study could have been interpreted with greater accuracy.

Fourthly, in this study creativity was defined as verbal originality and it was measured by using the TCSW test-battery which is a measure of verbal originality. However, creativity can have other components or dimensions and for conclusions to be drawn about other specific components of creative abilities such as fluency, flexibility, and elaboration, the test battery has to be enlarged to include other appropriate measures. Thus, the results of this study should only
be compared with other studies that also used similar definitions and measures of creativity.

Fifthly, the TCSW was used mainly to explore the viability of the four creative thinking strategies in the Khatena Training Method (KTM) treatment, namely, Breaking Away from the Obvious and Commonplace, Synthesis-Destructuring-Restructuring, Transposition, and Analogy-Imagery. Thus, a complete assessment of the creative thinking abilities and skills of students is therefore impossible with just the TCSW test battery.

In view of the discussion above, the findings of this study should be interpreted with caution taking into consideration its inherent limitations as well as its scope and assumptions (discussed in Chapter Two, 2.9).

6.6 Recommendations for Further Research

This study determined the effects of the Khatena Training Method (KTM) treatment upon the creative thinking abilities of Form Four students in a typical secondary school. Since this study represents a first effort of training students in creative thinking skills, continued research efforts are recommended. We need to understand more fully the effects of creativity training at the school level.

Firstly, the researcher hopes that other creativity enthusiasts will pursue empirical studies on creativity training especially in the school context. They can replicate this experiment on modified or extended lines. Most studies including this study have demonstrated the effectiveness of brief training programmes by measuring creativity within a short time of the experiment. However, the effectiveness of such programmes over a longer time especially outside of the experimental or classroom setting have not been given due
attention. Large-scale study replications and long-term experiments could be more “revealing” in attempting to gain further insights into the psychological construct of creativity.

Secondly, other creativity training programmes, apart from the KTM used in this study, can be adopted, adapted, developed, and evaluated to assess the viability of such programmes in the school context. The Creative Problem Solving (CPS) method that was used by Chia (1997) to train teacher trainees has not been used with students yet. Though the CPS is more time consuming than the KTM and focuses on both the divergent and convergent thinking components, it can be tested with students if schools are willing to cooperate. According to Mansfield et al. (1978), apart from the KTM and the CPS, other successful creativity training programmes suitable for children and adolescents that are also equally if not more time consuming than the CPS are the Productive Thinking Program, the Purdue Creative Thinking Program, and the Myers-Torrance Ideabooks. By assessing the suitability and viability of more creativity training programmes, there can be a pool of knowledge regarding creativity training programmes that can be used with confidence to enhance the creative thinking abilities of Malaysian students.

Thirdly, replications of this study or studies using other creativity training and testing methods can be carried out with samples of secondary school students from Form Four classes as was the case in this study or with other Forms in urban areas to test the suitability of the KTM or other training programmes. Studies can also be undertaken in rural areas so as to enable a comparison of the performance between subjects from the urban and rural areas. Such studies may give a more holistic picture of the impact of creativity training programmes in the educational context in this country.
Fourthly, larger and more diverse student samples can be used and more demographic variables can be investigated to gather more data of the creative thinking abilities and skills of our student population. Some of the demographic variables that can be studied as control variables are educational levels, socio-economic status, different age ranges and ethnic origins. This may enhance the rigour and generalizability of findings. Using the demographic variable of age can be challenging. This is because it can have a positive effect due to cognitive development or negative effect due to the decline in imagination (Dacey & Lennon, 1998). Creativity can peak or recede at certain ages (Dacey, 1989b; Simonton, 1994).

Fifthly, follow-up studies using testing measures other than the Something About Myself (SAM) inventory to differentiate the high and low creatives, the Thinking Creatively with Sounds and Words (TCSW) test battery to assess creativity gains, and Using Modality and Imagery in Writing (UMIW) checklist to assess students’ writings can be utilized. In this way there will be a pool of empirically tested measures that interested parties can utilize when needed. The TCSW and UMIW are verbal measures of originality but figural measures can also be used. According to some researchers (Cropley, 1997; Dacey & Lennon, 1998) both verbal and figural measures can tap characteristics of creativity such as originality. A more comprehensive set of compatible creativity measures can also be adopted. Assessment of creativity by resorting to multiple measures in order to tap various dimensions of creativity has been recommended (Fishkin & Johnson, 1998). This can increase the efficiency of statistical analysis as well as the consistency, adequacy and generalizability of the findings and assertions based on the findings to a greater extent.
Sixthly, in this study the KTM was used over two days (4 hours each day or 480 minutes). The duration of time (480 minutes) has proven that the KTM is a suitable training programme that can enhance the creative thinking abilities of the subjects concerned. However, future studies can experiment with shorter duration of time (200, 240, 300, 360, or 400 minutes) as was the case in some studies or experiments with longer duration of time (more than 480 minutes) to ascertain if the impact is similar or greater. A creativity training programme which can be conducted in a shorter duration of time but with better results will be more appealing to those who are interested in enhancing students’ creative thinking abilities but do not have the luxury of time.

Seventhly, this study utilized an experimental method (pretest-posttest, randomized groups design). However, in future studies, the use of a mixed design incorporating observational methodology by way of a complement may help to provide fine-grained idiographic narratives of creativity training while at the same time establish a broader understanding of the impact of creativity training programmes on students (Garaigordobil, 2006). In this way the generality of the findings may be more valid.

Eighthly, with continued research efforts in the area of creativity training, further knowledge can be generated regarding students’ creative abilities and ways to enhance them. Besides, if research indicates a maximization of creative potential as a result of appropriate creative methods and strategies, a basis for universal rather than scattered access to appropriate learning experiences can be generated.

Finally, this experimental study has demonstrated that creative thinking abilities of students especially that of verbal originality can be enhanced. Perhaps this study should be replicated with adults too such as teachers. This is
because in Gan’s (1998) study, low mean scores for verbal originality was obtained by the adult (Malaysian undergraduates) sample and she suggested further studies to investigate whether training in creative thinking can enhance the creative thinking abilities of adults. If we want an educational system that places greater emphasis on creativity then we should enhance the creativity of not only our students but also our teachers. Clearly due to the paucity of research in the area of creativity training more effort is needed by concerned researchers. It is hoped that this experimental study will spark the creativity of researchers to consider conceptualizing and designing investigations in order to answer unanswered questions and to stimulate further discussion on creativity training.

6.7 Conclusion

This experimental study is the second study on the impact of creativity training in the local educational context. However, it is the first study that involved secondary school students. This study investigated the effectiveness of the Khatena Training Method (KTM) on the creativity of Form Four students in a typical secondary school in the state of Selangor.

Amabile (1983b) has said that “if proper facilities are provided, creativity springs out during the process of development” (cited in Sen & Hagtvet, 1993, p. 497). This empirical investigation confirms Amabile’s view as the results have demonstrated that the KTM treatment can impact students’ divergent thinking abilities in verbal originality irrespective of whether they are from different ability level (high creative & low creative), gender category (male & female) or academic stream (science & arts). The results have also shown that the KTM treatment can enable students to retain the creative skills learned as reflected in their written compositions. The KTM is a viable
creativity training programme for adolescents that can enhance their creativity thinking abilities and make educational transfer effects possible. Thus, it is hoped that this study provides useful information and insights to educational planners, administrators, and teachers who are in a position to further nurture the creative potential of students.

It is also hoped that this study will add to the pool of documented literature on creativity training of students and stimulate more research in this area so as to enable further understanding of the complex concept of creativity and the variables that affect its development in the local context.
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**Appendix A**

CREATIVITY TRAINING PROGRAMME
(KHATENA TRAINING METHOD - KTM)

The strategies for the KTM have been adopted and adapted from Khatena’s books (Khatena, 1978c, 1992, 2000). The 4 identified strategies are Breaking Away from the Obvious and Commonplace (BAOC), Synthesis-Destructuring-Restructuring (S-D-R), Transposition (TR) and Analogy-Imagery (A-I).

Apart from the identified strategies, the subjects in the experimental group will also be given the opportunity of experiencing general divergent thinking skills as a warm-up activity.

The activities planned for the training will emphasize both verbal and figural activities as well as individual, paired and group activities in a pleasant and fun atmosphere.

The training programme will be conducted by the researcher who will use mainly the English language. The National language (Bahasa Melayu) will be used to give instructions and explanations when necessary. The instructions for the activities in Bahasa Melayu are indicated in italics. For the written verbal responses, the subjects will be free to use English or Bahasa Melayu.

The KTM treatment will be conducted over 2 days (4 hours each day or 240 minutes) and utilize 480 minutes. Other researchers had used 200, 240, 300, 360 or 400 minutes for the KTM treatment. All the experimental studies showed significant results.

GENERAL DIVERGENT THINKING ACTIVITIES

1. According to Khatena (2000), divergent thinking which was identified by Guilford as one of the inherited mental operations, can lead to many alternative solutions to problems or creative production.
2. Before getting the subjects to participate in activities, they will be told of the importance of creativity and divergent thinking skills. They will also be told short stories of people like Thomas Edison, Alexander Bell and Albert Einstein who used their imagination to contribute ideas and solutions for the progress and advancement of the world.
3. **Activity 1** (Verbal) – The following are activities based on “instances”, “similarities” or “alternate uses”. For each activity, the subjects will be given 2 minutes to write down their responses on the blank papers provided. They will be encouraged to be fluent, flexible and original in their thinking by stretching their imagination. Each activity will be followed by class discussion. Subjects who come up with creative responses will be praised.
   1. Name all the “round” things you can think of.
   2. Name all the things you can think of that can make a “noise”.
   3. List the various ways a “cat” and a “mouse” are alike.
   4. List the various ways a “radio” and a “telephone” are alike.
   5. Give alternative uses for a “paper-clip” or “paper-clips”.
   6. Give alternative uses for a “newspaper” or “newspapers”.

Aktiviti 1 (Lisan)
Aktiviti berikut adalah aktiviti berdasarkan kepada “instances”, “persamaan”, atau kegunaan-kegunaan “alternatif”.
Anda diberi dua minit untuk menulis respons anda di atas kertas kosong yang disediakan. Anda digalakkan menggunakan bahasa yang lancar, lewes dan asli
dengan mengembangkan imaginasi anda.
1. Namakan semua benda yang “bulat” yang dapat anda fikirkan.
2. Namakan semua benda yang menghasilkan “bunyi bising” yang dapat anda fikirkan.
3. Senaraikan persamaan-persamaan antara “kucing” dan “tikus”.
4. Senaraikan persamaan-persamaan di antara “radio” dan “telefon”.
5. Berikan kegunaan alternative bagi “klip” atau “klip-klip kertas”.
6. Berikan kegunaan alternative “surat khabar” atau “surat-surat kabar”.

KTM - STRATEGY 1
Breaking Away from the Obvious and Commonplace (BAOC)

1. Khatena (1992, 2000) informs us that if we want to be creative, we have to break away from inhibitory experiences and to do this we need to make a conscious effort to apply the thinking strategy of BAOC which is sometimes known as breaking away from perceptual set. This strategy will be illustrated by presenting/demonstrating to the subjects with a figural stimulus “square” followed by 2 drawings or figural analogies (i.e. a window and a clock). The subjects will be told that if the square is used to make the drawings, they would be doing things the same as always. Other common drawings may be a blackboard, book, door or flag. However, if they drew a large enough circle around the square to make a bubble with the square as a highlight, they would be using creative imagination to get away from older habits of thought (Refer to Fig. 6.2 in Khatena, 2000, p. 101).

2. Activity 2 (Figural) - Using the “rectangle”, a figural stimulus, each subject will be given a worksheet containing 2 rows of 4 rectangles each and encouraged to draw interesting and unusual pictures using the rectangles. If the subjects move away from drawing objects like windows or doors, which are dependent on angular construction, they will be praised for their efforts (Refer to Fig. 6.3, in Khatena, 2000, p. 102).

Aktiviti 2 (Berajah)
Dengan menggunakan rajah empat segi, rangsangan berbentuk rajah, setiap respondan akan diberikan kertas edaran mengandungi 2 baris rajah empat segi dan digalakkan melukiskan gambar-gambar yang menarik dan luar biasa dengan menggunakan rajah empat segi tersebut. Sekiranya respondan dapat keluar daripada melukis benda-benda yang biasa seperti pintu, tingkap, yang bergantung kepada konstuk sudut, mereka akan dipuji atas usaha tersebut.

3. Activity 3 (Figural) - The second exercise involves semi-circles as the figural stimulus for the production of creative drawings or analogies and images. As an example, the trainer will indicate how a semi-circle can represent a “cave entrance”, and how if the line is extended in either direction, it can represent a “sunset” (Refer to Fig. 6.4 in Khatena, 2000, p. 102)

Worksheets will then be supplied to each subject. Each worksheet will contain 3 rows of 3 semi-circles. The subjects will then be given the following instructions:

Here are 3 rows of 3 semi-circles each. What I want you to do is to use them to make unusual and interesting pictures (Refer to Fig. 6.5 in Khatena, 2000, p. 103). Look at each semi-circle in turn, close your eyes and think of an object it suggests to you (i.e. image). When you are ready, open your eyes and draw a picture of the image using this shape as an important part of it. You may add details or colour to
give the image more meaning. In this way, the simple image or picture you have drawn will become complex.

The trainer will observe the extent to which the subjects make pictures that are not just semi-circular. Where necessary, the subjects will be guided to break away from the semi-circular set and produce uncommon drawings. The more creative subjects may even break away from the instructional set of drawing single pictures by combining the semi-circles. If this happens, the subjects will be praised for their effort.

Aktiviti 3 (Berajah)
Latihan kedua ini melibatkan rajah separuh bulatan sebagai rangsangan untuk menghasilkan lukisan yang kreatif atau analogy dan gambaran. Sebagai contoh, jurulatih akan membayangkan rajah separuh bulatan itu sebagai “pintu gua” dan sekitanya garis itu dipanjangkan ia akan menjadi gambar “matahari jatuh”.

Kertas edaran akan dibekalkan kepada responden. Tiap-tiap kertas edaran tersebut mengandungi 3 baris gambar separuh bulatan. Respondan akan diberikan arahan seperti berikut:

Apa yang saya mahu anda lakukan ialah gunakan gambar separuh bulatan itu untuk jadi gambar-gambar yan menarik dan luar biasa. Lihat kepada tiap-tiap satu separuh bulatan tersebut, tutup mata dan bayangkan objek yang dapat and lihat. Apabila anda sudah bersedia, buka mata dan lukis gambar tersebut. Gunakan bentuk separuh bulatan sebagai sebahagian daripadanya. Anda boleh tambah dengan maklumat yang terperinci atau warnakan gambar tersebut supaya lebih bermakna. Dengan cara ini gambar yang mudah yang anda lukis itu akan menjadi lebih kompleks.

4. Activity 4 (Verbal or Figural) - The subjects will be given onomatopoeic stimulus words such as “bang” and “thud”, with instructions to be imaginative in responding to it. The following instructions will be given:

Let us take the words “bang” and “thud” which are words with strong sound quality. What I want you to do is to use your imagination and think of images that are not often thought of by people when they hear the words and sounds. Close your eyes and use your creative imagination. Picture in your mind’s eye what you think each word, followed by the sound is. The first word is “bang”. Now listen to the sound (the classroom door will be shut with a bang). You may write or draw the image that comes to your mind in the paper provided. The second word is “thud”. Now listen to the sound (a heavy object will be dropped on the floor). You may now write or draw the image that comes to your mind in the paper in front of you.

If the subjects produce verbal responses or analogies such as “a gun being used” or “something falling” for “bang” and “thud” respectively, their responses will be regarded as commonplace, whereas analogies like “the brain exploding” (for bang) and “an angel’s sudden appearance on earth” (for thud) are imaginative and show creative strength. The subjects will be praised for their imaginative responses.

Aktiviti 4 (Lisan atau Berajah)
Mari kita ambil perkataan “bang” dan “thud” yang merupakan untuk bunyi yang kuat. Apa yang saya mahu anda lakukan ialah gunakan imaginasi anda dan fikirkan

Sekiranya, untuk bunyi “bang” apa yang digambarkan difikirkan mereka merupakan “letupan senapang” atau untuk “thud” merupakan “ada benda yang jatuh”, ini merupakan perkara biasa Tetapi sekiranya, gambaran yang diberikan ialah seperti “otak meletup” untuk “bang” dan “ada melakai yang lalu di dunia ini” untuk “thud”, ini merupakan idea-idea yang kreatif dan menunjukkan keupayaan untuk berfikir secara kreatif. Respondan diuji atas imaginasi mereka.

5. **Activity 5** (Verbal or Figural) – Various recorded sounds (taken from “Sounds and Music of Preschool” by Haji Abu Hassan Ali of Malaysia, 2000) will be played. The sounds are from 4 categories, namely, movement of animals, sounds in the environment, sounds made by people and sounds made by animals. The subjects will be encouraged to listen to the common, everyday sounds and come up with unusual responses in verbal or figural form.

**Aktiviti 5 (Lisan atau Berajah)**

**KTM - STRATEGY 2**
**Synthesis-Destructuring-Restructuring (S-D-R)**

1. According to Khatena (1984, 1992, 2000) the thinking strategy of S-D-R is an important creative process. Bits of information are first assembled or synthesized to establish some kind of order or identity, the same as a child selects various pieces of a tinker toy and builds an object. The time comes when a change of form is needed. To do this, the previously established object needs to be broken up or destructured and reassembled or restructured to produce another form of the information, much as a child dismantles the earlier object made to reduce it to its parts for recombination into another possibly more interesting and unusual object.

2. **Activity 6** (Figural) - The trainer will first demonstrate how 3 geometrical shapes (semi-circle, triangle, and rectangle), 10 apiece (5 big and 5 small brightly coloured cut-outs for manipulation) can be combined or synthesized to make a picture of, for instance, a girl holding a balloon. The white board in the classroom will be used for this purpose. A large piece of white paper will be placed on the board and held by magnets. Then the cut-outs which will have blue tack behind them will be stuck on the white paper to form the picture of a girl holding a balloon (Fig. 6.6). Then the
pieces will be pulled apart and structured into another picture, perhaps an airplane (Fig. 6.7). The airplane will then be broken down into its parts and a new scene or picture will be created by combining them with other available shapes like a scene of two children on a see-saw (Fig. 6.8). (For Figures 6.6, 6.7 & 6.8, refer to Khatena, 2000, pp. 106 – 108). After the demonstration, the subjects will be asked to carry out the activity in groups. The 81 subjects in the experimental group will be divided into 16 groups with about 5 subjects in a group. Each group will be given the 3 geometrical shapes (semi-circle, triangle, and rectangle), 10 apiece (5 big and 5 small brightly coloured cut-outs for manipulation). Each group will also be given a large, white “mahjong paper” to place the cut-out pieces on in order to make a picture. They will be reminded to think of unique and unusual pictures that can depict people, animals, objects or scenes. If the subjects display combinations of ideas such as people and animals together, they will be praised. To further encourage the use of imagination, the subjects will be asked to talk about the characters and scenes. Then they will be asked to destroy the pictures created by pulling the pieces apart and reconstructing another picture, perhaps even more unusual.

Aktiviti 6 (Berajah)

3. Activity 7 (Verbal) - The S-D-R process can also be used with words to stimulate expression of creative imagination. The trainer will first demonstrate how this can be done. A circle will be drawn and in it a number of words will be placed such as ruby, pearls, eyes, teeth, love, beauty, joy, snow, sun, moon, lips, cheek, spring, winter, lily. Then at least 2 words from the word pool will be picked and combined with other words to make interesting or unusual sentences. More than 2 words can be picked out from the word pool as desired (Refer to Fig. 6.9, in Khatena, 2000, p. 109) to form suitable and unique sentences.

1. The sun turned her lips to ruby red.
2. His smile had the beauty of pearls.
3. The lily under a blanket of snow waited for the sun to stir its roots.

Then creative imagination can be used to combine the sentences produced into an interesting short story. For example, “Jennifer was on her way to her grandmother’s house when she noticed a beautiful lily as white as snow, gently swaying in the wind. She stopped to admire it. Somebody greeted her and when she turned she saw her neighbour’s son wearing a broad smile. His smile had the beauty of pearls as his teeth were white and shiny. They talked for some time before she resumed her journey. Soon the sun came up and turned her lips to ruby red. By the time she reached her grandmother’s house, she was tired and hungry. She stayed with her grandmother for two weeks. It was the beginning of winter when she started her journey back home. When she walked past the spot where she had noticed the lily before, she smiled for she knew that the lily under the blanket of snow was waiting for the sun to stir its roots” (story was concocted by the trainer). The subjects will be asked to write their own creative short stories by picking words from the same word pool.

Aktiviti 7 (Lisan)


1. Matahari merubah birirnya menjadi batu delima merah.
2. Senyumnya seindah mutiara
3. Bunga lili di bawah seliut thalji menunggu matalhari untuk mengerakkan akarnya.


4. Activity 8 (Verbal) - The subjects will be given a worksheet with 2 circles drawn and with different sets of words placed in them (Refer to Fig. 6.10 in Khatena, 2000, p. 109). The first circle will have words such as waves, wind, heart, finger, head, air, spaceship, train, dream, angel, fairy, witch, house, empty. The second circle will have words such as angry, fire, leaves, peanuts, animal, ghost, superman, rope, chains, insect, bubble, moan, dance. The activity will involve the selection of words from both pools in order to make interesting sentences. Then they will be encouraged
to combine the sentences into an imaginative story. This activity can be done individually, in pairs or in groups. Some of the stories will be read out to the others.

Aktiviti 8 (Lisan)

KTM STRATEGY 3
Transposition (TR)

1. To Khatena, the thinking strategy of TR can be “taught in terms of the transference of an existing structural or functional relationship of a phenomenon from one mode of expression to another” (Khatena, 1992).

2. Activity 9 (Figural) - To demonstrate the activity, the trainer will present 2 circles, one being larger than the other. Simple instances of transposition will be made in terms of space, music, algebra and linguistics (Refer to Fig. 9.5 in Khatena, 1992, p. 345). The subjects then will be given a worksheet with other shapes (one being larger than the other) such as a cone, a diamond and an hour glass. They will be asked to use their creative imagination and transpose or transfer the shapes to other things in the environment.

Aktiviti 9 (Berbentuk rajah)
Sebagai demonstrasi, jurulatih akan menunjukkan 2 bulatan, satu lebih besar. Satu contoh transposisi akan dibina dari segi ruang, muzik, algebra dan linguistic. Respondan akan diberi kertas kerja yang memuatkan bentuk lain (satu lebih besar dari yang lain) seperti kone, berlian dan glas jam. Mereka diminta untuk menggunakan imagnasi mereka untuk menukarkan bentuk itu kepada bentuk-bentuk lain dalam persekitaran.

3. Activity 10 (Verbal) - The trainer will explain that verbal stimulus, for example, the word “thunderstorm” is an auditory or heard stimulus. If we can transpose what is heard to another sense modality such as sight (flower stalks seeing their flowers ripped away) and taste (grape-drenched palate) we show imaginative strength. For this activity, 6 sounds will be written on the white board such as crank, flop, jangle, murmur, stutter, thud. The meanings of the sounds will be explained. The subjects will be asked to stretch their imagination and transpose the sounds into another sense modality such as sight, taste, touch or smell. Hopefully they will come up with responses such as an ant walking on the icing of a cake (murmur) and a frog with an insect stuck on its tongue (stutter).
Aktiviti 10 (Lisan)
Jurulatih akan menerangkan bahawa rangsangan lisan misalnya perkataan “rebut taufan” merupakan rangsangan mendengar. Sekiranya kita menukarkan rangsangan tersebut kepada rangsangan melihat (tangkai bunga melihat bunganya dikoyak) dan rangsangan rasa (mulut yang dipenuh anggur) kita menunjukkan keupayaan imaginasi kita. Untuk aktiviti ini, 6 perkataan bunyi akan ditulis dipapan tulis seperti crank, flop, jangle, murmur, stutter, thud. Makna perkataan – perkataan itu akan dijelaskan. Responden akan diminta menggunakan imaginasi mereka untuk menugah bentuk perkataan tersebut kepada bentuk untuk lihat, rasa, sentuk dan bau. Diharapkan mereka dapat mengeluarkan idea seperti “semut berjalan di atas kek icing (murmur) dan katak yang lidah terlekat serangga (stutter).

KTM STRATEGY 4
Analogy-Imagery (A-I)

1. Khatena (1984), MacCormac (1986) and Wheeler (1987) tell us that the thinking strategy of A-I has been the subject of a lot of discussion and research from the 1970’s. A major function of A-I strategy is to discover likeness in dissimilar things and to come up with meanings that go beyond the objects of comparison. Creative analogies can be presented as personal, direct, symbolic or fantasy images or mental pictures. Often analogies with complex patterns tend to be more challenging and provocative. For example, “Mary sings like a featherless crow on a winter’s day” is more complex and interesting than, “Mary sings like a crow”.

2. Activity 11 (Verbal) - Subjects will be told that in making analogies we can use figures of speech such as simile (John is as fat as an elephant), metaphor (Jimmy has a heart of stone), personification (Time marches on) and allusion (He is the Shakespeare of our class). For this activity, the subjects will be encouraged to come up with some figures of speech that touch on simile, metaphor, personification and allusion.

Aktiviti 11 (Lisan)
Respondan diberitahu bahawa analogy boleh digunakan sebagai untuk perbandingan (John gemuk seperti gajah), metafora (Ahmad berhati batu), personifikasi (Masa terus berlalu) dan ilusi (Dia adalah Shakespeare bagi kelas kami). Utuk aktiviti ini, responden digalakkan menghasilkan kata perbandingan (figures of speech) seperti analogy, metafora, personifikasi dan ilusi.

3. Activity 12 (Verbal or Figural) - For this activity, a short passage (prose) rich with analogy and imagery will be presented. The subjects will be asked to read and experience the creative handling of the words by the author.

Night World

The night world is very different from that of the day. Things that hide from the light are all awake when the sun goes down. Spiders and scorpions as big as the palm and fingers of a man and rats as large as the foot of a man prowl about or take advantageous positions where they expect their prey to pass. Lizards and cockroaches of all sizes, from that of one’s finger to one’s finger nail move about outside or inside homes in search of food in dust-bins, cupboards and drawers. They are always alert for their enemies and scurry away as fast as they can when they sense someone or something approaching. But if they come
within reach of the big spiders, they are pounced upon in an instant and they soon give up their hopeless struggle (Adapted from Belt, 1954, in Khatena, 2000, p. 116).

After reading the above passage, the subjects will be given instructions, “Close your eyes and experience as many of these images as you can. Now image yourself in this night world as an owl perched on the branch of a tree. What else can you see happening? When you are ready open your eyes and write or draw your experience. Enhance what you have written or drawn by using interesting and appropriate analogies.”

Aktiviti 12 (Lisan dan rajah)
Untuk latihan ini, satu petikan pendek “Night World” akan diberikan Petikan ini mengandungi analogy dan imagery. Respondan diminta membaca dan membayangkan apa yang hendak disampaikan oleh penulis.

4. Activity 13 (Verbal or Figural) - For this activity, another short passage (poetry) rich in analogy and imagery will be presented. The subjects will be asked to read and experience the creative handling of the words by the author.

**Cries of Children**
What nursery rhymes for the children who sit in rows blistering their fingers?
What fairy tales for the young ones whose fate is sealed with hate?
What play toys for the innocent souls whose pathetic voice curse adults?
Only anthems echoing from hell.
Only tales of horror from their cell.
Only needle and thread their wares to sell.
Doomed to a life of adulthood,
they glimpsed not childhood.
Mindless, emotional junkies,
wishing they were frolicking monkeys.
(Concocted by the trainer)

After reading the above poem, the subjects will be given instructions, “Close your eyes and experience as many of these images as you can. Now image yourself as one of the children. What are your feelings towards the adults who have put you in that situation? When you are ready open your eyes and write or draw your experience. Enhance what you have written or drawn by using interesting and appropriate analogies.”

Aktiviti 13 (Lisan dan rajah)
Untuk aktiviti ini satu petikan yang lain dalam bentuk puisi diberikan. Petikan ini penuh dengan analogy dan imaginasi. Responden diminta membaca puisi ini, membayangkan dan cuba alami imaginasi penulis yang dimuatkan di dalam puisi “Cries of Children” itu.

Setelah membaca puisi di atas, responden akan diberi arahan: “Tutup mata anda dan cuba bayangkan apa yang hendak disampaikan. Bayangkan diri anda sebagai seorang kanak-kanak yang tergamar di dalam puisi tersebut. Apakah perasaan anda terdapat orang yang telah meletakkan anda di dalam situasi
tersebut? Apabila anda sudah bersedia, buka mata anda dan tuliskan atau lukiskan apa yang dapat anda fikirkan atau gambarkan. Jelaskan apa yang dapat anda gambarkan itu dalam bentuk analogi.”

5. According to Best-Mangard (1952), (cited in Khatena, 2000) there are 7 fundamental generic motifs which are basic to design. They are the spiral, circle, half-circle, two half-circles, wavy line, zig-zag and straight line (see Fig. 7.1). By combining and rearranging 2 or more of these motifs, attractive designs can be produced. These motifs especially the spiral, represent all possible shapes in nature that can be observed in plant-life, animal-life and in all other aspects of the universe.

6. N. Khatena (Khatena & Khatena, 1990) tells us how the 7 motifs can be combined to form complex artistic representations of things in nature. The motifs assume dynamic movement and meaning in their metaphorical presentation. (Refer to Figures 7.2, 7.3 and 7.4 in Khatena’s book (Khatena, 2000, pp. 121 – 125).

7. **Activity 14 (Figural)** – The subjects will be told about the 7 fundamental motifs that are common in nature especially the “spiral” motif that serves as the generic or ideal source of all motifs. The seven motifs will be drawn on the white board. The subjects will then be asked to imagine that they are artists and use their creative imagination to draw a detailed image or picture using as many of the 7 generic motifs.

**Aktiviti 14 (Bentuk rajah)**
Respondan akan diberitahu tentang 7 motif alam semulajadi yang asas terutama motif “spiral” yang boleh dianggap sebagai motif generic yang ideal. Tujuh motif itu akan dilukis di papan putih. Respondan diminta membayangkan bahawa mereka adalah pelukis dan gunakan imaginasi mereka untuk melukis secara terperinci dengan menggunakan sebanyak mungkin 7 motif generic tersebut.
<table>
<thead>
<tr>
<th><strong>SOMETHING ABOUT MYSELF</strong></th>
<th><strong>PERIHAL DIRI SAYA</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INSTRUCTIONS:</strong></td>
<td><strong>ARAHAN:</strong></td>
</tr>
<tr>
<td>A list of statements is given to you below. All you have to do is read them carefully and decide if they describe you or not. If a statement describes you, show this by shading the circle marked ‘A’ on your answer sheet. If a statement does not describe you, shade the circle marked ‘B’</td>
<td>Anda dihendaki membaca pernyataan-pernyataan dibawah ini dengan cermat dan tentukan samada ianya menerangkan hal perihal anda atau tidak. Jika pernyataan tersebut menerangkan perihal anda, lorekkan 'A' dan jika tidak lorekkan 'B' dalam kertas jawapan anda</td>
</tr>
<tr>
<td>1. I like adding to an idea</td>
<td>1. Saya suka menambah sesuatu kepada idea</td>
</tr>
<tr>
<td>2. I have many talents</td>
<td>2. Saya berbakat dalam pelbagai bidang</td>
</tr>
<tr>
<td>3. I like making guesses but will make new ones if they are wrong</td>
<td>3. Saya suka meneka dan akan buat tekaan baru jika tekaan lama didapati salah</td>
</tr>
<tr>
<td>4. I am imaginative</td>
<td>4. Saya adalah seorang yang berimagination</td>
</tr>
<tr>
<td>5. Others think I am different</td>
<td>5. Orang lain menganggap saya berlainan</td>
</tr>
<tr>
<td>6. I have composed a new dance or song</td>
<td>6. Saya pernah menggubal sebuah tarian atau lagu baru</td>
</tr>
<tr>
<td>7. I have done art or craft work of one kind or another</td>
<td>7. Saya pernah melukis atau membuat satu jenis kraft-tangan</td>
</tr>
<tr>
<td>8. My products were shown to others or won prizes</td>
<td>8. Hasil ciptaan saya pernah dipamerkan atau menangi hadiah</td>
</tr>
<tr>
<td>9. I like pulling a thing apart and putting it together to make something new</td>
<td>9. Saya suka menanggalkan sesuatu dan menyusunnya semula untuk membentuk sesuatu yang baru</td>
</tr>
<tr>
<td>10. I have tried to find out if my guesses are right or wrong</td>
<td>10. Saya pernah cuba menentukan samada tekaan saya itu betul atau tidak</td>
</tr>
<tr>
<td>11. When I have a problem, I try to think of new ideas</td>
<td>11. Bila saya menghadapi sesuatu masalah, saya cuba memikirkan idea-idea baru untuk menyelesaikannya</td>
</tr>
<tr>
<td>12. I have been the main actor or star in a play</td>
<td>12. Saya pernah menjadi pelakon utama dalam satu drama</td>
</tr>
<tr>
<td>13. I am surely as talented as others</td>
<td>13. Saya memang berbakat seperti orang lain</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>15. I get so interested in what I do that I do not notice other things going on</td>
<td>15. Saya tertarik dengan apa yang saya buat sehingga saya tidak mengetahui apa yang berlaku di sekeliling</td>
</tr>
<tr>
<td>16. I have brought about important changes in rules or ways things are done</td>
<td>16. Saya telah membawa perubahan yang penting dalam peraturan atau cara sesuatu itu dijalankan</td>
</tr>
<tr>
<td>17. I know what others say is not always right</td>
<td>17. Saya tahu apa yang dicakap oleh orang lain itu tidak selalu nyata benar</td>
</tr>
<tr>
<td>18. To help others understand an idea, I relate it to what can be seen, touched or heard</td>
<td>18. Untuk memudahkan orang lain memahami sesuatu idea, saya mengaitkannya dengan apa yang boleh dilihat, disentuh atau didengar</td>
</tr>
<tr>
<td>19. I let my thinking and feeling work together when I am trying to make something</td>
<td>19. Saya melibatkan pemikiran dan perasaan saya menolong semasa saya cuba membuat sesuatu</td>
</tr>
<tr>
<td>20. I can always find a way to do things</td>
<td>20. Saya sentiasa dapat cari jalan untuk membuat sesuatu</td>
</tr>
<tr>
<td>21. I can make new things</td>
<td>21 Saya boleh membuat perkara/benda baru</td>
</tr>
<tr>
<td>22. I know what makes a problem and can define it</td>
<td>22. Saya dapat mengesan punca sesuatu masalah dan menerangkannya</td>
</tr>
<tr>
<td>23. I dance, sing or play music in new ways</td>
<td>23. Saya boleh menari, menyanyi atau main muzik dengan cara yang baru</td>
</tr>
<tr>
<td>24. I have planned lighting for a play or musical</td>
<td>24. Saya pernah merancang susunan lampu-lampu untuk sesuatu drama atau konsert</td>
</tr>
<tr>
<td>25. I can combine things or ideas to make something new</td>
<td>25. Saya boleh menggabungkan idea untuk mereka sesuatu yang baru</td>
</tr>
<tr>
<td>26. I can work for a long time without getting tired</td>
<td>26. Saya boleh kerja lama tanpa letih</td>
</tr>
<tr>
<td>27. To be able to laugh or see the funny side of things helps me to cope with everyday problems</td>
<td>27. Saya dapat menempuh masalah sehari-hari dengan melihatnya dari kaca mata yang lucu</td>
</tr>
<tr>
<td>28. I enjoy beautiful things</td>
<td>28. Saya suka benda-benda yang cantik</td>
</tr>
<tr>
<td>29. I like to try new ways of cooking and describe them</td>
<td>29. Saya suka mencuba cara-cara yang baru semasa memasak dan kemudian menerangkannya</td>
</tr>
<tr>
<td>30. I see answers to problems suddenly</td>
<td>30. Saya mendapat jawapan kepada sesuatu masalah dengan tiba-tiba</td>
</tr>
<tr>
<td>31. I have written a story or poem on my own</td>
<td>31. Saya pernah menulis sebuah cerita atau sajak</td>
</tr>
<tr>
<td>32. I can work towards far off goals</td>
<td>32. Saya boleh berusaha untuk mencapai matlamat yang lebih tinggi</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-------------------------------------------------------------------</td>
</tr>
<tr>
<td>33. My friends must be true</td>
<td>33. Kawan-kawan saya mestilah jujur</td>
</tr>
<tr>
<td>34. The unknown thrills me</td>
<td>34. Sesuatu yang tidak diketahui mencabar dan menarik minat saya</td>
</tr>
<tr>
<td>35. I find fault in others to help them improve</td>
<td>35. Saya melihat kelemahan orang lain dengan tujuan membaiki dan memajukan mereka</td>
</tr>
<tr>
<td>36. I am never tired of asking questions</td>
<td>36. Saya sentiasa suka menyoal</td>
</tr>
<tr>
<td>37. I am very interested in and consider the ideas of others</td>
<td>37. Saya suka menimbang idea-idea orang lain</td>
</tr>
<tr>
<td>38. I think for myself though I may not be always right</td>
<td>38. Saya berfikir untuk diri sendiri walaupun saya tidak selalunya betul</td>
</tr>
<tr>
<td>39. I prefer to work on my own</td>
<td>39. Saya lebih suka bekerja sendiri</td>
</tr>
<tr>
<td>40. I wait for enough information before judging</td>
<td>40. Saya menunggu sehingga menerima maklumat yang cukup sebelum membuat sesuatu keputusan</td>
</tr>
<tr>
<td>41. I know the answer to something though no one else knows</td>
<td>41. Saya tahu jawapan kepada sesuatu walaupun lain tidak</td>
</tr>
<tr>
<td>42. I am playful and like a child when I try to make things</td>
<td>42. Apabila saya sedang membuat sesuatu, saya berperangai seperti kanak-kanak dan suka bermain-main</td>
</tr>
<tr>
<td>43. I do not like doing things in the ways others require</td>
<td>43. Saya tidak suka membuat sesuatu mengikut apa yang dikehendaki oleh orang lain</td>
</tr>
<tr>
<td>44. I begin doing things and continue because of my own interest</td>
<td>44. Saya boleh mula sesuatu kerja dan terus membuatnya kerana saya berminat</td>
</tr>
<tr>
<td>45. I like trying to do what others call difficult</td>
<td>45. Saya suka mencuba kerja yang orang lain menganggapnya susah</td>
</tr>
<tr>
<td>46. My desire to do better makes me work harder</td>
<td>46. Keinginan saya untuk membuat sesuatu dengan lebih baik, menyebabkan saya bekerja dengan lebih kuat lagi</td>
</tr>
<tr>
<td>47. I have found a new formula or way to do things</td>
<td>47. Saya telah menemui satu formula atau cara yang baru untuk membuat sesuatu</td>
</tr>
<tr>
<td>48. I can organize</td>
<td>48. Saya boleh merancang</td>
</tr>
<tr>
<td>49. I have made a scenery for a play or musical</td>
<td>49. Saya pernah merekabentuk pemandangan untuk sesuatu drama atau konsert</td>
</tr>
<tr>
<td>50. I am willing to change my judgement when new information turns up</td>
<td>50. Saya sedia mengubah keputusan saya apabila saya terima maklumat baru</td>
</tr>
</tbody>
</table>
THINKING CREATIVELY with SOUNDS and WORDS

by E. Paul Torrance, Joe Khatana, and Bert F. Cummington

Sounds & Images

Onomatopoeia & Images

DIRECTIONS MANUAL and SCORING GUIDE
FORMS IA AND IB

Published by Scholastic Testing Service, Inc.
Examples of Creative Responses

The following are samples of creative responses to each stimulus sound in Sounds and Images, Form IA. They are intended to be examples only.

Sound 1 (Thunder)
- A team of dinosaurs pushing a mountain
- God speaking
- Heart pumping blood
- Sailing in the ocean bottom
- Tearing of cloth in an echo chamber

Sound 3 (Reverberating Spring in Echo Chamber)
- Arrival of death
- Birds from another planet
- Nerve impulses
- Seeds of watermelon hitting foil
- Storm building up

Sound 2 (Audio Generator Sweeps)
- Bird trying to get off the ground
- Brain washing
- Clown Singing
- Complaining before God
- The beginning of a temper tantrum

Sound 4 (Abstract Sounds in Grand Piano)
- Lecture given in modern music
- Men spitting in a spittoon in quick succession
- Religious ceremony
- Lunar light drops

Note: The concept of “creative strength” is an important one and the examiner should attempt to master the idea well. Possibly the best way to accomplish this is to study the originality weights assigned to responses in the scoring guide, noting the differences between examples of zero-credit (not original) and responses showing creative strength. It may also prove helpful to think of responses showing no creative strength as requiring little intellectual energy; in other words, little energy is necessary to give obvious, common, and learned responses. In contrast, more intellectual energy is necessary to give responses that go beyond what is learned, practiced, habitual, and away from the obvious and commonplace. Hence, these latter types of responses are thought of as “showing creative strength.”
Examples of Creative Responses

The following are samples of creative responses to each stimulus sound in *Sounds and Images, Form IB*. They are intended to be examples only.

<table>
<thead>
<tr>
<th>Sound 1 (Surf Sound)</th>
<th>Sound 3 (Sustaining-Pedal Piano Effects)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside of human heart</td>
<td>Fight between lizards</td>
</tr>
<tr>
<td>Illusive thought</td>
<td>Dreaming</td>
</tr>
<tr>
<td>Surge of strength</td>
<td>Conflicts between God and Satan</td>
</tr>
<tr>
<td>Tranquility in abstract conflict</td>
<td>Sign language</td>
</tr>
<tr>
<td>Whale scratching its back</td>
<td>Emotional expression</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sound 2 (Electronically Processed Cymbal Roll)</th>
<th>Sound 4 (Blend of Assorted Abstract Sounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angels in a tunnel</td>
<td>House in hell</td>
</tr>
<tr>
<td>Cow with stomach trouble</td>
<td>Biological functioning</td>
</tr>
<tr>
<td>Death approaching</td>
<td>Someone’s thoughts while robbing a bank</td>
</tr>
<tr>
<td>Emptiness</td>
<td>Ocean exploration</td>
</tr>
<tr>
<td>Seasickness</td>
<td></td>
</tr>
</tbody>
</table>
Examples of Creative Responses

The following are samples of creative responses to each stimulus sound in *Onomatopoeia and Images, Form IA*. They are intended to be examples only.

**Onomatopoeic Effect 1 (Crackle)**
- A crow’s love call
- Rope stretched taut
- Wrinkles breaking across his smooth forehead
- Biting celery
- Scratching electricity out of a cardigan

**Onomatopoeic Effect 2 (Buzz)**
- Forming of an idea
- Tingling piano in low range
- Cooperation
- Imagination soaring
- A fool

**Onomatopoeic Effect 3 (Boom)**
- Swelling
- The birth of an idea
- Organ
- Discovery
- A nickname

**Onomatopoeic Effect 4 (Moan)**
- A kite in the wind
- Doubt
- Purgatory
- Air escaping through a bit of tubing
- The death of a yawn

**Onomatopoeic Effect 5 (Growl)**
- Enzyme reaction to dirt
- Misunderstanding
- Truck unloading garbage
- Frustrated ghost
- The echo of inhumanity
Examples of Creative Responses

The following are samples of creative responses to each stimulus sound in *Onomatopoeia and Images, Form IB*. They are intended to be examples only.

**Onomatopoeic Effect 1 (Ouch)**
- Bad argument
- Harrassed housewife
- Sympathy
- Touching extremely cold surface
- Trumpet blast

**Onomatopoeic Effect 2 (Groan)**
- The voice of boredom
- Universal agony
- Garbage disposal
- Brakes when you do not hold them tight
- Flowers seeing their fellows plucked away

**Onomatopoeic Effect 3 (Jingle)**
- Futile activity
- Icicles in the wind
- The silvery sunlit waves
- Shivering false teeth
- Spangled banner in the wind

**Onomatopoeic Effect 4 (Zoom)**
- Echo between clouds
- Woman in a sale
- Snake pattern
- On the crest of a wave
- Falling in love

**Onomatopoeic Effect 5 (Fizzy)**
- Happiness
- A magic spell
- Air in spring
- Snake in hot water
- A new teenage dance
Using Modality and Imagery in Writing (UMIW) – Checklist for Pretest and Delayed Posttest (writing component)

Student’s ID NO: __________________________

Tick (✓) each of the 10 items only once if applicable.

Modality (visual, auditory, kinesthetic, olfactory, gustatory, cutaneous, organic)
1. 0 point ( ) no modality used
2. 1 point ( ) single modality used
3. 2 points ( ) combination of 2 modalities used
4. 3 points ( ) combination of 3 modalities used
5. 4 points ( ) combination of 4 or more modalities used

Maximum score (10 points)

Obtained score ______ points

Imagery (direct, personal, fantasy, symbolic)
6. 0 point ( ) no analogy used
7. 1 point ( ) direct analogy used
8. 2 points ( ) personal analogy used
9. 3 points ( ) fantasy analogy used
10. 4 points ( ) symbolic analogy used

Maximum score (10 points)

Obtained score ______ points

Overall total score based of 20 points ______
2015 Bearcat Court  
Pensacola, FL 32507  
Tel: 1-850-492-5275  

February 12, 2006  

Elizabeth Joseph  
47 Jalan Pamah  
Section 8/1D  
40000 Shah Alam  
Selangor  
Malaysia  

Dear Elizabeth,  

You have my permission to use all my creative training materials referred to as the Khatena Training Method or KTM obtained by you from several sources for your Thesis titled *Khatena Training Method: Testing its Effectiveness on the Creativity of Form Four Students in a School in Selangor* to satisfy requirements for your Ph. D. degree at the University of Malaya.  

Let me know if you need any further help in this regard.  

Sincerely yours,  

Joe Khatena Ph. D.  
Professor Emeritus  
Mississippi State University
BAHAGIAN PERANCANGAN DAN PENYELIDIKAN DASAR PENDIDIKAN
KEHENTERIAN PELAJARAN MALAYSIA
ARAS 1-4, BLOK E-8
KOMPLEKS KERAJAAN PARCEL E
PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN
62604 PUTRAJAYA.

Ruj. Kami : KP(BPPDP)603/5/JLD.0 5(93)
Tarikh : 17 Mei 2007

Pn. Elizabeth Jaya A/P M Joseph
47, Jalan Pamah Seksyen B/1D
40000 Shah Alam
Selangor

Tuan/Puan,

Kelulusan Untuk Menjalankan Kajian Di Sekolah, Institut Perguruan, Tabatan Pelajaran Negeri Dan Bahagian-Bahagian Di Bawah Kementerian Pelajaran Malaysia

Adalah saya dengan hormatnya diarah memaklumkan bahawa permohonan tuan/puan untuk menjalankan kajian bertajuk :

" Effectiveness Of Khatena Training Method On The Creativity Of Selected Form Four Malaysian Students " diluluskan.

2. Kelulusan ini adalah berdasarkan kepada cadangan penyelidikan dan instrumen kajian yang tuan/puan kemukakan ke Bahagian ini, Kebenaran bagi menggunakan sampel kajian perlu diperolehi dari Ketua Bahagian/Pengarah Pelajaran Negeri yang berkenaan.

3. Sila tuan/puan kemukakan ke Bahagian ini senaskah laporan akhir kajian setelah selesa kelak. Tuan/Puan juga diingatkan supaya mendapat kebenaran terlebih dahulu daripada Bahagian ini sekiranya sebahagian atau sepenuhnya dapatan kajian tersebut hendak dibentangkan di mana-mana forum atau seminar atau diumumkan kepada media massa.

Sekian untuk makluman dan tindakan tuan/puan selanjutnya. Terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,

[Signature]

(DR. NAIMAH BINTI ISHAK)
Ketua Penolong-Pengarah
Unit Penyelidikan Dasar
Bahagian Perancangan dan Penyelidikan Dasar Pendidikan
Kementerian Pelajaran Malaysia
Rujukan Tuan :
Rujukan Kami : JPNS/SPS/PPN/A25090/06/25/ JLD 30 ( 52 )
Tarikh : 29-MEI-07

ELIZABETH JAYA A/P M JSEPHE
47 JALAN PAMAH SEKSYEN 8/1D
40000 SHAH ALAM,
SELANGOR DARUL EHSAN

Tuan,

KEBENARAN MENJALANKAN PENYELIDIKAN/KAJIAN DI SEKOLAH-SEKOLAH DI NEGERI SELANGOR

"EFFECTIVENESS OF KHATENA TRAINING METHOD ON THE CREATIVITY OF SELECTED FORM FOUR MALAYSIA STUDENTS."

Dengan segala hormatnya perkara di atas dirujuki.

2. Jabatan ini tiada halangan untuk pihak tuan / puan menjalankan kajian/penyelidikan tersebut di sekolah-sekolah dalam Negeri Selangor seperti yang dinyatakan dalam surat permohonan.

3. Pihak tuan/puan diingkarkan agar mendapat persetujuan daripada Pengetua / Guru Besar supaya beliau dapat bekerjasama dan seterusnya memastikan bahawa penyelidikan dijalankan hanya bertujuan seperti yang dipohon. Kajian / Penyelidikan yang dijalankan juga tidak mengganggu perjalanan sekolah serta tiada sebarang unsur paksan.

4. Tuan/Puan juga diminta menghantar senaskah hasil kajian ke Unit Perhubungan & Pendaftaran Jabatan Pelajaran Selangor sebal selesai penyelidikan / kajian.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

"KEJUJURAN DAN KETEKUNAN"

Saya yang menurut perintah,

(A.RAHIM BIN MOHD MISLANI)
Penolong Pendaftar Sekolah Dan Guru,
Jabatan Pelajaran Selangor.
b.p. Ketua Pendaftar Sekolah Dan Guru,
Kementerian Pelajaran Malaysia.
UM.P/PTD(IT)/644/1
24 September 2007

Puan Elizabeth Jaya a/p Joseph
No. 47, Jalan Parma, Seksyen 8/1D
40000 Shah Alam
Selangor Darul Ehsan

Puan,

KEPUTUSAN MESYUARAT JAWATANKUASA PENYEMAK/VETTING
CADANGAN PENYELIDIKAN

Izinkan saya merujuk kepada perkara di atas.


"EFFECTIVENESS OF KHATENA-TRAINING METHOD ON THE
CREATIVITY OF FORM FOUR STUDENTS IN A SELECTED SCHOOL"

Sehubungan dengan itu, puan dibenarkan untuk meneruskan penyelidikan puan.

Semoga berjaya.

Yap benar,

PROFESOR DR. SIOW HENG LOKE
Timbalan Dekan (Ijazah Tinggi)
Fakulti Pendidikan

s.k. Dekan, Fakulti Pendidikan
Prof. Dr. Akbar Hussin (Penyemak)
Dr. Lihanna Borhan (Penyemak)
Prof. Madya Dr. Ananda Kumar a/l Palaniappan (Penyelia)
آينستينوت أمين الدين باقي

INSTITUT AMINUDDIN BAKI
KEMENTERIAN PENDIDIKAN MALAYSIA
dengan ini mengesahkan bahawa
ELIZABETH JAYA D/O M. JOSEPH
K.P. 0-91595
setelah menyempurnakan syarat-syarat kursus
dianugerahkan
SIJIL KURSUS LATIHAN PAKAR KREATIVITI DALAM PENGURUSAN
yang telah diadakan pada
06 OGOS 1990 HINGGA 16 NOVEMBER 1990

Pangkat: CEMERLANG

PENGARAH

KETUA PENGARAH PENDIDIKAN MALAYSIA
Tarikh: 16 NOVEMBER 1990