

CREATIVE THINKING AND PROBLEM-SOLVING ABILITIES: THEIR
RELATIONSHIP WITH PSYCHOLOGICAL TRAITS AMONG 10th-GRADE
STUDENTS IN OMAN

By

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DEDICATION

In the widest sense of the term, this completed work is dedicated to my beloved parents, who always give me their unconditional love. This dissertation is also dedicated to my compassionate, precious, and great wife, Fadhila. My darling children, Omar, Rawa, and Mulham; they made me who I should be.

TABLE OF CONTENTS

	PAGE
DEDICATION.....	ii
ACKNOWLEDGMENTS.....	iii
TABLE OF CONTENTS.....	iv
LIST OF TABLES.....	xii
LIST OF FIGURES.....	xiv
GLOSSARY OF ABBREVIATIONS	xv
ABSTRAK.....	xvi
ABSTRACT.....	xviii

CHAPTER ONE – INTRODUCTION

1.0	Introduction.....	1
1.1	Background of the Study.....	5
1.2	Problem Statement.....	9
1.3	Research Objectives	12
1.4	Research Questions.....	13
1.5	Significance of the Study.....	14
1.6	Rationale.....	15
1.7	Limitations of the Study.....	17
1.8	Operational Definitions.....	17

CHAPTER TWO – LITERATURE REVIEW

2.0	Introduction.....	22
2.1	Main Concepts.....	23
2.1.1	Creative Thinking Views and Concepts.....	23
2.1.2	Importance of Creative Thinking.....	27
2.1.3	Problem-solving	29
2.1.4	Problem-solving Processing.....	33
2.1.5	Assessment of Creative Thinking and Problem-solving.....	36
2.1.6	Intrinsic Motivation	38
2.1.7	Intrinsic Motivation and Creativity.....	45
2.1.8	Curiosity	49
2.1.9	Curiosity and Creativity.....	53
2.1.10	Self-image.....	58
2.1.11	Self-image and Creativity.....	63
2.2	Conceptual Framework.....	67
2.2.1	Personality Approach to Studying Creativity.....	68
2.2.2	Theoretical Framework.....	73
	2.2.2a Self-determination Theory.....	73
	2.2.2b Amabile’s Intrinsic Motivation Theory.....	75
2.3	Research Model.....	78
2.4	Summary.....	79

CHAPTER THREE - METHODOLOGY

3.0	Introduction.....	81
3.1	Re-statement of Problem.....	81
3.2	Research Design.....	81
3.3	Research Variables.....	83
3.4	Population and Sample.....	83
	3.4.1 Population.....	83
	3.4.2 Sample.....	84
3.5	Instrumentation.....	85
	3.5.1 Work Preference Inventory (WPI).....	85
	3.5.2 Multidimensional Curiosity Inventory (MCI).....	87
	3.5.3 Offer Self-image Questionnaire (OSIQ-R).....	88
	3.5.4 Torrance Test of Creative Thinking (Verbal Form-A).....	90
	3.5.5 Problem-solving Test.....	91
3.6	Factor Analysis.....	93
3.7	Validity and Reliability.....	95
3.8	Data Collecting Procedures.....	98
3.9	Data Scoring.....	99
3.10	Data analysis.....	100
3.11	Summary.....	103

CHAPTER FOUR – FINDINGS

4.0	Introduction.....	104
4.1	Descriptive Analysis.....	106
4.1.1	Descriptive Analysis for Dichotomous Variables.....	106
4.1.2	Descriptive Analysis for Independent and Dependent Variables...	108
4.2	Bivariate Correlation.....	110
4.2.1	Correlation between Psychological Traits and Creative Thinking Abilities.....	111
4.2.1a	Correlation between Intrinsic Motivation and Creative Thinking Abilities (H_{01a}) Fluency, (H_{01b}) Originality, and (H_{1c}) Total score of TTCT.....	111
4.2.1b	Correlation between Curiosity and Creative Thinking Abilities (H_{2a}) Fluency, (H_{02b}) Originality, and (H_{02c}) Total Score of TTCT.....	111
4.2.1c	Correlation between Self-image and Creative Thinking Abilities (H_{03a}) Fluency, (H_{03b}) Originality, and (H_{03c}) Total score of TTCT.....	112
4.2.2	Correlation between psychological traits and Problem-solving Abilities.....	113
4.2.2a	Correlation between Intrinsic Motivation and Abilities of Problem-solving (H_{04a}) Novelty, (H_{04b}) Appropriateness, and (H_{04c}) Total Score of PST.....	113
4.2.2b	Correlation between Curiosity and Abilities of Problem-solving (H_{05a}) Novelty, (H_{05b}) Appropriateness, and (H_{05c}) Total Score of PST.....	114
4.2.2c	Correlation between Self-image and Abilities of Problem-solving (H_{06a}) Novelty, (H_{06b}) Appropriateness, and (H_{06c}) Total Score of PST.....	115
4.3	Multivariate Analysis.....	115

4.3.1	Demographic Variables and Creative Thinking Abilities.....	115
4.3.2	Demographic Variables and Problem-Solving Abilities.....	120
4.4	Multiple Regressions.....	124
4.4.1	Prediction of Combination's Predictors (a) Intrinsic Motivation, (b) Curiosity, (c) Self-image, (d) Gender, and (e) School Type on Total score of TTCT.....	125
4.4.2	Contribution of the Predictors (a) Intrinsic Motivation, (b) Curiosity, and (c) Self-image on Prediction of Total Score of TTCT When Gender and School Type are controlled.....	129
4.4.3	Prediction of Combination's Predictors (a) Intrinsic Motivation, (b) Curiosity, (c) Self-image, (d) Gender, and (e) School Type on Total Score of PST.....	130
4.4.4	Contribution of the Predictors (a) Intrinsic Motivation, (b) Curiosity, and (c) Self-Image on Prediction of Total Score of PST when Gender and School Type are controlled.....	133
4.5	Summary.....	135

CHAPTER FIVE – DISCUSSION

5.0	General Overview.....	137
5.1	Discussion.....	138
5.1.1	Correlation between Psychological Traits and Creative Thinking and Problem- solving Abilities.....	138
5.1.1a	Correlation between Intrinsic Motivation and Creative Thinking Abilities.....	138
5.1.1b	Correlation between Curiosity and Creative Thinking Abilities.....	140

5.1.1c	Correlation between Self-image and Creative Thinking Abilities.....	141
5.1.1d	Correlation between Intrinsic Motivation and Problem-Solving Abilities.....	142
5.1.1e	Correlation between Curiosity and Problem-solving Abilities.....	143
5.1.1f	Correlation between Self-image and Problem-solving Abilities.....	144
5.1.2	Demographic Variables and Creative Thinking and problem-solving Abilities.....	145
5.1.2a	Gender and Creative Thinking Abilities.....	145
5.1.2b	School Type and Creative Thinking Abilities.....	146
5.1.2c	Gender and Problem-solving Abilities.....	147
5.1.2d	School Type and Problem-solving Abilities.....	149
5.1.3	Prediction of Intrinsic Motivation, Curiosity, Self-image, Gender, and School Type on Total Score of TTCT.....	150
5.1.3a	Prediction of Intrinsic Motivation on Total Score of TTCT.....	150
5.1.3b	Prediction of Curiosity on Total Score of TTCT.....	151
5.1.3c	Prediction of Gender on Total Score of TTCT.....	152
5.1.3d	Prediction of Self-image on Total Score of TTCT.....	153
5.1.3e	Prediction of School Type on Total Score of TTCT.....	154
5.1.4	Prediction of Intrinsic Motivation, Curiosity, Self Image, Gender, and School Type on Total Score of PST.....	154
5.1.4a	Prediction of Intrinsic Motivation on Total Score of PST	154
5.1.4b	Prediction of Curiosity on Total Score of PST.....	155

5.1.4c	Prediction of Gender on Total Score of PST.....	156
5.1.4d	Prediction of Self-image on Total Score of PST.....	157
5.1.4e	Prediction of School Type on Total Score of PST.....	157
5.1.5	Prediction of Combination Factors: Intrinsic motivation, Curiosity, and Self-image on Total Score of TTC.....	158
5.1.6	Prediction of Combination Factors: Intrinsic Motivation, Curiosity, and Self-image on total Score of PST.....	159
5.2	Implications of the Study.....	160
5.2.1	Implications for Policy Makers.....	160
5.2.2	Implications for Teachers.....	162
5.3	Generalizations and Limitations of the Study.....	164
5.4	Suggestions for Future Research.....	165
5.5	Conclusion.....	166
REFERENCES	168

APPENDICES	189
Appendix A Work Preference Inventory.....	190
Appendix B Multidimensional Curiosity Inventory.....	192
Appendix C Offer Self-Image Questionnaire.....	194
Appendix D Problem-solving Test.....	196
Appendix E Torrance Test of Creative Thinking (TTCT) Form A.....	205
Appendix F Arabic Version of Work Preference Inventory.....	216
Appendix G Arabic Version of Multidimensional Curiosity Inventory.....	218
Appendix H Arabic version of Self-image Questionnaire.....	221
Appendix I Arabic Version of Problem-solving Test.....	223
Appendix J Arabic Version of Torrance Test of Creative Thinking.....	230
Appendix K Permission for Using Work Preference Inventory.....	240
Appendix L Permission for Using Self- image Questionnaire.....	241
Appendix M Permission for Using Multidimensional Curiosity Inventory.....	242
Appendix N Approval Letter from Ministry of Education in Oman for Collecting Data	243
Appendix O Approval Letter from One of General Directorates in Oman for Collecting Data from Some Schools.....	244

LIST OF TABLES

		Page
Table 3.1	Item Distribution among MCI's Subscales.....	87
Table 3.2	Item Distribution among OSIQ-R's Subscales.....	89
Table 3.3	Scale for Judging Originality in the Torrance Test of Creative Thinking.....	91
Table 3.4	Scale for Judging Novelty in Problem-solving Test.....	92
Table 3.5	Scale for Judging Appropriateness in Problem-solving Test.....	93
Table 3.6	Total Variance Explained By OSIQ-R Factors.....	94
Table 3.7	Coefficient Reliability for WPI, MCI, and OSIQ.....	96
Table 3.8	Judges Reliability Coefficients on the Subscales of TTCT and PST.....	97
Table 3.9	The Statistical Analysis for the Research Hypotheses.....	102
Table 4.1	Distribution of the Subjects into Demographic Variables.....	107
Table 4.2	Distribution of Gender According to Districts and School Type....	108
Table 4.3	Descriptive Statistics for the Independent and Dependent Variables.....	109
Table 4.4	Correlation Coefficients between Psychological Traits and Creative Thinking Abilities.....	110
Table 4.5	Correlation Coefficients between Psychological Traits and Problem-solving Abilities.....	113
Table 4.6	Correlation Coefficients of the Dependent Variables.....	116
Table 4.7	Between-subjects Factors.....	116
Table 4.8	Multivariate Tests for Differences in Fluency and Originality Based on Gender, School Type and Interaction between Gender and School Type.....	117

Table 4.9	Levene's Test of Equality of Error Variances for Fluency and Originality Based on Gender, School Type, and Interaction between Gender and School Type.....	117
Table 4.10	Tests of Between-subjects Effects of Fluency and Originality Based on Gender, School Type, and Interaction between Gender and School type.....	118
Table 4.11	Means and Standard Deviation of Fluency and Originality Based on Gender and School Type.....	119
Table 4.12	Parameter Estimates of Fluency and Originality Based on Gender, School Type, and Interaction between Gender and School Type.....	119
Table 4.13	Multivariate Tests of Novelty and Appropriateness Based on Gender, School Type and the Interaction between Gender and School Type.....	121
Table 4.14	Levene's Test of Equality of Error Variances Matrices for Novelty and Appropriateness.....	121
Table 4.15	Means and Standard Deviation of the Demographic Variables on Novelty and Appropriateness.....	122
Table 4.16	Test of Between-subject Effects for Novelty and Appropriateness	123
Table 4.17	Parameter Estimates for Novelty and Appropriateness.....	123
Table 4.18	ANOVA for Combination Predicted Variables on Total Score of TTCT.....	127
Table 4.19	Model Summary of the Variability in TTCT Based on the Predictors.....	128
Table 4.20	Coefficients of the Predicted Variables on Total Score of TTCT...	128
Table 4.21	ANOVA for Two Combinations of Predictors on Total Score of TTCT.....	129
Table 4.22	Model Summary for the Two Combinations of Predictors on TTCT.....	129
Table 4.23	Coefficients for the Two Combinations of Predictors on total Total Score of TTCT.....	130

Table 4.24	ANOVA for Combination Predicted Variables on Total Score of PST.....	132
Table 4.25	Model Summary of the Variability in TTCT Based on the Predictors.....	132
Table 4.26	Coefficients for the Two Combinations of Predictors on Total Score of PST.....	133
Table 4.27	ANOVA for Two Combinations of Predictors on Total Score of PST.....	133
Table 4.28	Model Summary for the Two Combinations of Predictors on PST	134
Table 4.29	Coefficients for the Two Combinations of Predictors on Total Score of PST.....	135
Table 4.30	The Results of the Tested Hypotheses.....	135

LIST OF FIGURES

		Page
Figure 2.1	Self-determination Theory.....	75
Figure 2.2	Amabile's Theory of Intrinsic Motivation.....	77
Figure 2.3	Proposed Research Model.....	79
Figure 3.1	Sample of the Study.....	85
Figure 4.1	The Scatter Plots between Predictors and TTCT.....	126
Figure 4.2	The Scatter Plots of Residual around Regression Line for Predictor Variables with Total Score of TTCT.....	127
Figure 4.3	Scatter Plots between Predictors and Total Score of PST.....	131
Figure 4.4	Scatter Plots of Residual around Regression Line for Predictor Variables with Total Score of PST.....	131

GLOSSARY OF ABBREVIATIONS

CT: Creative Thinking

PS: Problem-solving

IM: Intrinsic Motivation

EM: Extrinsic Motivation

CU: Curiosity

SI: Self-image

ST: School Type

WPI: Work Preference Inventory

OSIQ-R: Offer Self-image Questionnaire Revised

MCI: Multidimensional Curiosity Inventory

TTCT: Torrance Test of Creative Thinking

PST: Problem-solving Test

**KEUPAYAAN BERFIKIR KREATIF DAN PENYELESAIAN MASALAH:
HUBUNGANNYA DENGAN TRAIT PSIKOLOGI DALAM KALANGAN MURID
GRED 10 DI OMAN**

ABSTRAK

Dewasa ini, banyak tumpuan diberikan terhadap pendekatan personaliti dalam pengajian kreativiti. Kajian terdahulu menunjukkan bahawa terdapatnya perkaitan yang positif di antara beberapa trait dan kreatif yang berpotensi. Kajian yang dijalankan kini lebih tertumpu kepada kajian sama ada trait psikologi terpilih (motivasi intrinsik, sifat ingin tahu dan imej sendiri) berkaitan dengan keupayaan pemikiran kreatif kreatif (*fluency dan originality*) seperti yang terdapat dalam ujian pemikiran kreatif Torrance (TTCT) dan dua keupayaan menyelesaikan masalah (*novelty dan appropriateness*). Reka bentuk korelasi (correlation design) dalam kumpulan digunakan dalam kajian ini.

Pengkaji menggunakan lima instrumen dalam kajian ini, antaranya inventori pilihan kerja untuk menilai motivasi intrinsik, inventori *curiosity* pelbagai dimensi, soal selidik imej sendiri Offer, ujian TTCT dan ujian penyelesaian masalah yang dibina oleh pengkaji. Dalam ujian penyelesaian masalah, tiga masalah sebenar dalam bentuk terbuka dalam bahasa Arab, Pengajian Sosial dan Sains diberikan kepada sampel.

Kajian ini dijalankan dalam kalangan murid gred 10 di Oman. Populasi kajian ialah murid gred 10 di dua wilayah di Sultanate Oman. Bilangan sampel ialah 367 orang murid lelaki dan perempuan yang dipilih secara persampelan kluster daripada lapan buah sekolah(empat sekolah Bandar dan empat sekolah luar bandar). Dua buah kelas dipilih secara random daripada setiap sekolah.

Pemboleh ubah demografi dalam kajian ini ialah kawasan bandar dan luar bandar. Korelasi Pearson r , analisis multivariate (MANOVA), dan multiple regression digunakan untuk menganalisis respons murid.

Dapatan kajian ini menunjukkan pemboleh ubah bebas (motivasi intrinsik, *curiosity*, dan imej sendiri) mempunyai hubungan yang positif dengan keupayaan pemikiran kreatif (*fluency dan originality*) dan keupayaan menyelesaikan masalah (*novelty dan appropriateness*). Perbezaan yang signifikan juga didapati di antara sekolah bandar dan luar bandar dalam keupayaan berfikir kreatif dan keupayaan menyelesaikan masalah. Perbezaan yang signifikan juga didapati di antara murid lelaki dengan murid perempuan dalam keupayaan berfikir kreatif tetapi tidak dalam keupayaan menyelesaikan masalah. Faktor motivasi intrinsik, *curiosity* dan jantina meramal secara signifikan jumlah skor TTCT dan PST murid tetapi imej sendiri dan jenis sekolah tidak sedemikian. Selain itu motivasi intrinsik, *curiosity* dan imej sendiri dapat meramal secara signifikan jumlah skor TTCT dan PST bagi jantina dan jenis sekolah.

Berdasarkan model yang digunakan dalam kajian ini yang berasaskan teori, dapatan kajian ini menyokong peranan penting trait psikologi terpilih murid dalam menentukan potensi kreativiti mereka. Justeru kajian ini menyokong agar pembuat dasar di kementerian Pelajaran Oman mengubah kaedah mereka bagi meningkatkan kreativiti dalam kalangan murid dengan memberikan lebih perhatian terhadap trait psikologi terpilih murid. Adalah diharapkan bahawa kajian ini menjadi titik permulaan bagi perjalanan sukar dalam memahami dan mengembangkan kreativiti dalam kalangan murid di Oman.

**CREATIVE THINKING AND PROBLEM-SOLVING ABILITIES: THEIR
RELATIONSHIP WITH PSYCHOLOGICAL TRAITS AMONG 10th-GRADE
STUDENTS IN OMAN**

ABSTRACT

Recently, much attention has been focused on the personality approach of studying creativity. Previous studies have shown a positive association between some of traits and creative potential. The current study sought to investigate the relationship between psychological traits: intrinsic motivation (IM), curiosity (CU), and self-image (SI), and creative thinking abilities: fluency and originality as stated in the Torrance test of creative thinking (TTCT) and two abilities of creative production on problem-solving test: novelty and appropriateness. The within-groups design was used to study the correlation.

The investigator employed five assessment tools, namely, work preference inventory for assessing intrinsic motivation, multidimensional curiosity inventory, the Offer self-image questionnaire, the TTCT, and a problem-solving test developed by the researcher. In the problem-solving test, three real and open-ended problems within the content areas of Arabic, Social Studies, and Science were provided to the subjects.

This study was conducted among 10th-grade students in Sultanate of Oman. The population is the total number of 10th-grade students in two districts. The sample size was 367 male/female students selected by clustering sampling from eight schools (four urban and four rural). Two classes are randomly selected from each school. Pearson r correlation, multivariate analysis of variance (MANOVA), and multiple regression were used to analyse students' responses.

The study showed that independent variables: intrinsic motivation, curiosity, and self-image were related positively with creative thinking abilities: fluency and originality, and problem-solving abilities: novelty and appropriateness. Significant differences were found between rural and urban schools in creative thinking and problem-solving abilities. Significant differences were obtained between male and female in creative thinking abilities but not in problem-solving abilities. Factors of intrinsic motivation, curiosity, and gender significantly predicted the total score of TTCT and PST, but self image and school type were not. On the other hand, intrinsic motivation, curiosity, and self-image were significantly added to the prediction of total score of TTCT and PST over the gender and school type.

Based on the model used in this study which derived from the theoretical standpoints, the results have supported the important role of students' psychological traits in their creative potential. Therefore, the study recommends that the policy makers in the ministry of Education in Oman review their methodology in enhancing creativity among students by giving more attention to the students' psychological traits. The implications of this study hope to be a starting point of the arduous journey in understanding and developing creativity among students in Oman.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

Evolution is the mainstream trend in all aspects of life. In the education domain, energetic educational systems have to reform regularly their policies to adapt to accelerated offshoot changes. Development of students' thinking is the most effective way to prepare them to face changes and challenges in their society. In line with the perception of the importance of creativity, the years after the middle of the last century have witnessed the creativity development within educational systems. Academic creativity is a concept that is used widely. It is a way of thinking about learning and of producing information about school subject problems, and it needs encouraging to develop students' abilities to learn and investigate (Torrance & Kathy, 1990).

Psychologists have articulated that research in problem-solving illuminate broad issues in the study of creative thinking, because solving problems based on the creative thinking potential. Indeed, ambiguous and mysterious problems need novel and breakthrough solutions, and these solutions are the main contribution we make by pursuing such creative projects (Fatt, 2000).

The forces of mental processes are not enough to generate novel solutions for a problem. In fact, there are many contextual factors. This fact led Stein (1969) to state that there are four (P) forces in studying creativity: process, product, person, and place "environment". As a result of this long-term view, psychologists have conducted creativity studies using various approaches such as the cognitive, personality, pragmatic, psychodynamic, psychometric, experiment, and confluence (Sternberg & Lubart, 1999).

In their serious attempts at studying the cornerstone issue of where creativity comes from, psychologists have identified that individual traits are a vital element in understanding creative behaviour. The personality approach influences creative production by way of impact on cognitive styles and skills. Furthermore, creativity demands a proper conjunction between personalities, cognitive skills, and situational conditions; cognitive abilities are affected by personality influences. Therefore, school students are ideal subjects to study creativity from the personality viewpoint (James & Asmus, 2001). In 1993, Eysenck reinforced the view that creativity is a personality variable, not an ability.

Studies that relate creativity with personality traits have progressed dramatically. Recently, psychologists such as Eysenck (1993), and Jonathan, Runco, and Limm (2006) have preferred to study the correlation of the constellation of integrated dispositions with creative behaviour. Certainly, creative thinking is not easy work; instead, it demands perseverance, struggle, and persistence. Therefore, a person's thinking alone is not adequate to produce novel and appropriate ideas without giving attention to motivation, interest, and self-confidence to pursue the ideas that a person considers important (Selby, Shaw, & Houtz, 2005). This study was conducted to investigate creative abilities and creative production in problem-solving in relation to three psychological traits: intrinsic motivation, curiosity, and self-image. These psychological traits are vital in making people engage in and accomplish tasks with interest and enthusiasm (Ryan & Deci, 2000; Thomas, 2000; Vaicunas, 1998).

Personality interests, as seen, need autonomy of control conditions. Autonomy is a core characteristic of the creative personality as demonstrated in empirical research (e.g., Barron & Harrington, 1981; Mumford & Gustafson, 1988; Wink, 1991). Similarly, Sheldon (1995) assumed that self-determined people were able to resist

controlling situations and intrapersonal forces; he asserted that to achieve potential creativity we must develop a strong autonomy (i.e., divergent thinkers usually show strong intrinsic desire to be creative). This intrinsic desire works with people who have high self-esteem to seriously affect creative production (Amabile, Hennessey, & Grossman, 1986). On the other hand, one serious difference between routine problem-solving and ambiguous problem-solving is that the latter copes with new situations requiring internal motivation and dispositional characteristics to fulfill new achievements (Mumford, Costanza, Threlfall, & Palmon, 1993).

Intrinsic motivation is a drive, which comes from the inner individual by means of internal reinforcement instead of other external motives. It is an essential condition of creative acts, as articulated by authors such as Amabile (1990), Csikszentmihalyi (1990), Deci and Ryan (1992/2008), Gardner (1993a), and Sternberg and Lubart (1995). Intrinsic motivation is conducive to creative thinking because it is related to task satisfaction and enjoyment. Regardless of control conditions, this virtue relies on an individual's perseverance and pursuit of the task engaged. It flourishes in supportive conditions of autonomy, and when a person feels independent.

Curiosity is a trait that drives a person to ask and learn about unknown things. It is conceptualized as a positive emotional-motivational system associated with the recognition, pursuit, and self-regulation of novelty and challenge (Kashdan, Rose, & Fincham, 2004). Curiosity is an inner interest that encourages the person to obtain missing knowledge (Brown, 1971; Lahey, 2007; Vaicunas, 1998; Vegal, 1986). As a consequence of their studies, Hensley and Columnist (2004), Tamdong (2006), and Torrance and Kathy (1990) viewed curiosity as a psychological trait that impacts positively on creative abilities. Self-image is a whole internal mental picture about a person of himself or herself. The importance of self-image as a major determinant of

human behaviour has long been recognized by Allport (1971), Maslow (1967) and Mead (1934, as cited in Leahy, 1985). Bailey (2003) considered self-image as a subconscious, inner perception of how persons see themselves, what they like, and what they can achieve. Franken (2007, p. 384) stated that "self-image plays a motivational role; beliefs about the self have been found to be a powerful source of motivation". Positive self-image is a drive that engages in a task because it leads individuals towards challenge, risk-taking and confidence; these are inner elements that influence achievement (Mumford, Baughman, Supinski, & Maher, 1996). The creative person has a positive self-image, because the person who has a positive image has the ability to think divergently, take risks, challenge and think out of the box; and these are characteristics of the creative person (Yau, 1991).

Incontestably, a considerable amount of students' inner traits are affected by elements of the learning environment such as instruction, curriculum, activities, and evaluation (Abbeduto, 2002; Hensley & Columnist, 2004; Torrance & Kathy, 1990). Such studies found that psychological traits are differentiated among the different types of schools (learning environment). These traits are intrinsic motivation (Gottfried, James, & Allen, 1998; Xinyi, 2003); curiosity (Day & Langevin, 1974; Engelhard & Monsaas, 1988); and self-image (Delores & Robert, 1995; Goldsmith, Flynn, & Kim, 2000). This study was conducted in two schools from different environments in Oman, one rural and one urban. The levels of students' possession of psychological traits were differentiated with regard to gender, as indicated in previous studies. The traits were intrinsic motivation (David & Witryol, 1990; Wiest, Wong, Cervantes, Craik & Kreil, 2001); curiosity (Engelhard & Monsaas, 1988); and self-image (Delores & Robert, 1995; Goldsmith et al., 2000). Therefore, this study was conducted in these areas among boys and girls.

1.1 Background of the Study

Oman relies heavily on dwindling oil and gas revenues. A large quota of this revenue is devoted to accomplishing infrastructure targets and constructing alternative economic resources. Oman adopts practical plans, which focus on diversification, industrialization, and privatization. Therefore, to achieve these long-term national objectives, Oman concentrates on developing the quality of human resources. The Omani Government recognizes the fact that reform of educational policies is the most effective way of pursuing these objectives (Ministry of Education, 2002a).

In effect, the official education system in Oman began in 1970, under the rule of Sultan Qaboos who started a modern renaissance. Oman implemented national development programs within a series of successive five-year plans. The first four plans were aimed at increasing the number of schools and students (Ministry of Education, 2006b). In subsequent plans, the situation changed entirely. Oman's government conducted the *Oman Vision 2020* conference in order to evaluate the country's 25 year performance, and to formulate a future for the Omani economy in 2020. Human resource development is at the core of strategies formulated to realize the vision of Oman's economy. There was a consensus that comprehensive educational reform was the first step in achieving the desired goals of human resource development. Consequently, Oman started developing its educational policies to be consistent with the development in other sectors. The educational policy makers began the emphasis on making secondary education more consistent with the requirements of future society (Rassekh, 2004).

In 1998 the Ministry of Education developed Basic Education, which aimed to implement more objectives, one of which was employing strategies to develop skills and attitudes such as autonomous and cooperative learning, communication, critical

thinking, problem-solving, research and investigation techniques, creativity and innovation. In the course of Basic Education, the objectives have been translated into actions and implemented in schools (Ministry of Education, 2001a). The current development plan, which extends from 2006 to 2010, includes implementation of educational quality assurance. Thereupon, the objectives of the plan are concerned with nurturing the creative and the gifted (ME, 2006b).

On a more specific note, in November 2000, the Ministry embarked on a plan to develop secondary education (i.e., 10,11,12-grade students). The plans for improving secondary education began with a consultation study which consisted of reviewing the general objectives, and consequently developing new general objectives. Consultants developed 12 objectives, one of which was to enable students to acquire the basic skills in creative thinking, problem-solving, independent learning, innovation and communication. The consultants suggested a model of curricula construction at the secondary stage, and they suggested that the model should be founded on some basic skills that must be taught in the curricula. The skills identified were: Critical and creative thinking, problem-solving, technical knowledge, innovation, life skills and understanding of personality values (Ministry of Education, 2001b).

To promote secondary education in Oman, the Sultanate hosted an international conference in December 2002 under the auspices of UNESCO. The final report of the conference recommended that to improve secondary education, there must be a balance between knowledge and cognitive skills with behavioral and living skills including problem-solving, creative thinking, and critical thinking (Ministry of Education, 2002b). Furthermore, the paper presented by Alkiyumi (2002a) emphasized efforts to develop creative abilities among secondary students to face changes in life, and prompt students to think divergently and solve learning and work problems. In taking up the

recommendations of the conference, the Ministry declared that the new secondary curricula should foster critical and creative thinking and problem-solving capacity among students, as well as application to real-life situations by providing opportunities for practical experiences (Rassekh, 2004).

The Ministry of Education, in order to develop creative abilities and creative problem-solving among students, has focused its efforts on implementing some creative teaching methods. Therefore, it initiated several workshops to identify those methods. Moreover, the Omani curricula consist of activities oriented towards enhancing creative abilities and problem-solving. Additionally, the Ministry's policy-makers arranged a set of training workshops for teachers to develop their skills in developing creative thinking among students; (a) workshop for developing creative thinking in Mathematics and Science among students in the First Cycle of Basic Education, March 2003; (b) workshop for developing high-order thinking (e.g., creative thinking) skills using brainstorming and strategy of what I Know, what I Want to learn, and what I did learn (KWL), April 2007; and (c) workshop for enhancing creative abilities, August 2007.

In addition, many educational specialists participated in the following overseas courses and conferences; (a) meeting of creative Gulf Cooperation Council (GCC) policy-makers, in October 2001, in the United Arab Emirates; (b) *scientific conference for the gifted and creative*, in August 2006, in the Kingdom of Saudi Arabia; (c) training course to develop thinking skills as creative thinking at the preparatory and secondary levels in the fields of languages, Social Studies, Mathematics, and Science, which was held in the Kingdom of Bahrain, November 2005; and (d) training course for those diagnosed creative and gifted, which was held in the Kingdom of Bahrain, 2006.

To increase the development of creative thinking abilities, especially that which are pertinent to curricula and instruction among school students, the Ministry of

Education organized two important seminars in cooperation with the De Bono Centre of Creative Thinking in Jordan. The first seminar was held from 17th to 21st Dec, 2005, with an audience of teachers, supervisors, and senior teachers. The main recommendations of this seminar were (a) creativity must be developed among students in several stages, (b) tracking of creative development in schools, (c) providing teachers with creativity books and bulletins, and (d) integration of creative potential activities in the school syllabus.

Subsequent to this seminar, the Ministry of Education set up a guided bulletin about the development of high-order thinking skills among students in the various subjects syllabi. This bulletin has published since the academic year 2006-7. The second seminar was held from 4 to 13 Dec, 2006. It included the presenting of consecutive courses on the cognitive research trust program (CORT) and decision-making skills. The suggested recommendations were (a) emphasis on creative skills integration with school syllabus, (b) cooperation with UNICEF in order to present further seminars on developing creative thinking, and (c) implementing the CORT program of creative thinking (Ministry of Education, 2005, 2006a).

The above-mentioned efforts of the Ministry of Education, including methods, workshops, and curricula activities are not sufficient to match the ambitions of its objectives to develop creative thinking among students, because the students' dispositions are the vital elements in improving their creative thinking. This study brings to the attention of policy-makers the importance of student psychological traits in creative thinking development. The study was conducted to investigate the question: Are the creative thinking and creative production in problem-solving abilities related to the students' psychological traits?

1.2 Problem Statement

Study of students' traits is a plausible approach to answering the elusive question that encounters the creativity researchers: why do students differ in their creative responses even though they share the same learning environment? Practically, traits influence students' behaviour and attitudes towards actualizing their creative potential. Moreover, it is possible to observe students' traits instead of the process (Feist, 1999). More important, traits affect the cognitive styles of students (Cropanzano, James, & Citera, 1993; Shaw & Runco, 1994; Sternberg & Lubart, 1995). Students' psychological traits enable them to control external situations (Sheldon, 1995). Moreover, personalities offer a unique and important perception of the creative production. In sum, creativity is an individual trait (Walton, 2003).

Intrinsic motivation is a salient characteristic of the creative person. Haensly and Torrance (1990) stated that the most important trait of the creative person is being in love with what one is doing. Creative performance has its origin in the motivation of the individual, not in cognitive abilities (Hayes, 1989). According to Amabile (1990), talent, personality, and cognitive abilities seem to be insufficient for creative achievement. Instead, the most important are personality motives and love. Several studies such as Amabile (1990), Deci and Ryan (1992), Patrick, Skinner, and Connel (1993), and Xiaomeng (2007) investigated the positive relationship between intrinsic motivation and creativity. In contrast, studies that by Katz (2001) revealed that intrinsic motivation is not related to creativity. Cooper and Jayatilaka (2006) revealed that intrinsic motivation did not surpass extrinsic motivation in enhancing creativity.

Curiosity is a trait that drives learners to acquire knowledge, and drives them to solve fuzzy and complex problems (Tamdong, 2006). Surprisingly, few studies have been conducted to investigate the correlation between curiosity and creative thinking

abilities. Torrance (1969) found that gifted students with curiosity scored higher on timed and untimed tests of creativity than incurious students. Maw and Maw (1970) investigated that students of high curiosity showed a significant positive lead in creativity, and vice versa. Saunders (2002) investigated the positive effect of a designed model of curiosity, called “curious design agents” on artificial creativity.

Pagano (1979) insisted that creative people have a higher self-image because they think of themselves as creative and have personal courage, standing against social constraints. Self-image and creative abilities related positively, as demonstrated in studies by Gudmund, Lunds, Ingerard and Gunilla (1989), and Viola (2003), but related negatively as revealed in studies by Evangeline (1993), and Hoff and Carlsson (2002).

Clearly, the studies conducted so far either had contradictory findings or insufficient. This study is based on three psychological traits, in scrutinizing their relationship with creative potential. Moreover, previous studies that tested the relationship between psychological traits and creativity mostly shed light on the experts or scientist, but little is known about this relationship among adolescent-non expert learners (Jravis, 2009). In addition, the vast majority of creative studies used only one test to measure creativity. Researchers have stated that any single measure is rarely sufficient by itself because it does not measure all creative abilities (e.g., Feldhusen & Goh, 1995; Torrance, 1988). The present study however, mitigated this obstacle by using two different tests that consisted of four varied criteria.

Empirical data shows that current endeavours by the Ministry of Education in Oman to concentrate on developing teachers’ instructional skills and providing the curricula with creative activities are inadequate to help students to improve their creative behaviour and productivity (Torrance & Kathy, 1990). Exploring students’ psychological traits facilitates selection of the proper instructional strategies and

curricula activities because these traits affect students' cognitive process. Whether creativity improves among them or not is due to the fact that creativity vastly differs between students (Ruscio & Amabile, 1999). Currently, studying the relationship between psychological traits and creativity is completely neglected in Oman.

Additionally, no study has been conducted in Oman to relate creative thinking with psychological traits. A few studies have been conducted to investigate the impact of instructional strategies on creativity, such as brainstorming by Alkiyumi (2002b), structural learning by Alghafri (2004), and CORT program by Almahri (2005). The findings showed that the strategies enhanced creative potential; but did not show to what extent the students' traits influenced the findings. Furthermore, despite the importance of psychological traits in the learning, particularly in creativity, unfortunately there are no programs for cultivating them among students. Instead, extrinsic motivation (e.g., rewards, grades, and praise) is used widely to stimulate the students. The curiosity of students is stifled in the primary stages by the use of traditional instructional strategies, and the focus on memorized-information as desirable learning outcomes. In Oman, most schools are not provided with psychological consultants who play crucial roles in developing students' sense of their images (Rassekh, 2004).

Although the Ministry of Education has begun since 1998 using instructional strategies and providing creative activities in the curricula for developing creative thinking among students, creative production is still unsatisfactory. This was investigated in studies by Albahrani (2002), Alghafri (2004), Alkiyumi (2002b), and Almahri (2005). In addition, the final report of evaluation on the first cycle of Education in Oman pointed out that students' attainment in innovative thinking and problem-solving not up to expectations (ME, 2006a). In Oman, it is time to study students'

creativity from other perspectives. Current study hopes to determine whether students' psychological traits are related to their creative potential, within its limitations.

1.3 Research Objectives

This study was designed to:

1. Investigate the relationship between the students' psychological traits (intrinsic motivation, curiosity, and self-image) and creative thinking abilities (fluency and originality), which are included in the Torrance Test of Creative Thinking (TTCT) and two abilities of creative production (novelty and appropriateness) in problem-solving test (PST)
2. Examine the differences in 10th-grade students' scores in creative thinking abilities (fluency and originality) in TTCT according to gender and type of school.
3. Examine the differences in 10th-grade students' scores in their abilities of creative production in problem-solving test (novelty and appropriateness) according to gender and type of school.
4. Explore whether the combination of factors (a) intrinsic motivation, (b) curiosity (c) self-image, (d) gender, and (e) school type, predict the total score of TTCT, and problem solving test.
5. Determine the contribution of the psychological traits (a) intrinsic motivation, (b) curiosity, and (c) self-image in the prediction of total scores in TTCT, and PST when controlling the effects of demographic variables: Gender and school type.

1.4 Research Questions

To achieve its objectives, the study sought to answer the following questions:

- Q1. Is there any significant association between intrinsic motivation and creative thinking abilities?
- Q2. Is there any significant association between curiosity and creative thinking abilities?
- Q3. Is there any significant association between self-image and creative thinking abilities?
- Q4. Is there any significant association between intrinsic motivation and problem-solving abilities?
- Q5. Is there any significant association between curiosity and problem solving abilities?
- Q6. Is there any significant association between self-image and problem-solving abilities?
- Q7. Are there any significant differences in the main effects of the linear combination of fluency and originality with respect to gender, school type, and the interaction between gender and school type?
- Q8. Are there any significant differences in the main effects of the linear combination of novelty and appropriateness with respect to gender, school type, and the interaction between gender and school type?
- Q9. Does the combination of five predictors (a) intrinsic motivation, (b) curiosity, (c) self-image, (d) gender, and (e) school type, predict the total score of TTCT?

- Q10. Does the combination of predictors (a) intrinsic motivation, (b) curiosity, and (c) self-image add anything to the equation of prediction in the total score of TTCT when controlling the effects of gender and school type?
- Q11. Does the combination of five predictors (a) intrinsic motivation, (b) curiosity, (c) self-image, (d) gender, and (e) school type, predict the total score of PST?
- Q12. Does the combination of predictors (a) intrinsic motivation, (b) curiosity, and (c) self-image add anything to the equation of prediction in the total score of PST when controlling the effects of gender and school type?

1.5 Significance of the Study

The results of this study will provide the Ministry of Education in Oman with current data that can aid the Ministry in making better policy decisions by recognizing that the creative potentials are enhanced by such factors. Psychological traits of the students constitute a crucial factor that must be appreciated and investigated besides instructional strategies and curricula activities. Additionally, it will help create awareness among the ministry's policy makers that improving the creative potential among students requires identifying their psychological traits, and setting practical programs to develop them through the learning process. The current study provides a proper view of creative potential latency. It measured creative abilities through a systematic test, and creative production in real problem solving test by using different criteria. Assessment methods employed in this study help to enhance our understanding of creative potential outcomes. Furthermore, it informs curricula designers that curricula activities and tasks, which require creative solutions must motivate students intrinsically and reflect their inner psychological needs. Therefore, the study identified practical

techniques to improve teachers' skills to deal with and develop students' psychological traits. In terms of personality approach, the study's findings assist in determining whether specific psychological traits are related to creative potential.

Theoretically, the findings of the study contribute to the current literature that has either contradictory results or insufficient studies in this domain. In addition, it sets basics that could help other researchers to investigate other individual psychological traits related to creative potential. Moreover, the findings and the proposed study's model established a basic background for further research in the future.

Specifically, this study is a pioneer in combining a constellation of psychological traits in motivation and self-determination domains as independent variables, and in assessing creative thinking abilities and problem-solving as dependent variables by using two different tests, comprising four different criteria. It is worth mentioning that this study is a pioneer in using the personality approach of studying creative potential among school students instead of scientists or experts.

1.6 Rationale

In recent years, plans by the Ministry of Education in Oman have concentrated on quality assurance in terms of objectives, curricula, teaching methods, evaluation, and learning outcomes to develop students' skills and abilities to match community needs and changes. This aim is clearly elaborated in the National Report on Quality Education in Oman (Ministry of Education, 2004).

The Ministry of Education states that developing creative thinking and problem-solving abilities is one of the basic educational objectives in secondary school grades in Oman. In response to the recommendations of the *Secondary Education Conference* (2002), and the 2001 secondary education consultation study, the Ministry has begun to

conduct practical procedures (ME, 2001a, 2002b). Therefore, the years after 2002 witnessed strenuous and continuous efforts to develop the creative potential among students, such as providing instructions, incorporating enriched creative activities in all subjects, and conducting different workshops for teachers and supervisors. These endeavors were oriented towards cultivating creative thinking and problem-solving abilities among students in the classrooms.

Certainly, initiating creative development methods, using evaluation tools, holding workshops on teaching creative thinking, and integrating activities in curricula are not sufficient for students to become capable of creative abilities and problem-solving. Rather, we have to understand students' personalities as crucial factors in enhancing creative abilities among them (Amabile, 1995; Sheldon, 1995; Sternberg & Lubart, 1995). In accordance with mainstream studies of creativity through combination of psychological traits, this study combines three psychological traits (intrinsic motivation, curiosity, and self-image) from the motivation and self-determination domains, to investigate their relationship with abilities of creative thinking and problem-solving.

It is reasonable to state that studying students' personalities precedes either implementing of instructional methods or conducting creative learning activities and tasks. This prerequisite is due to the fact that students' dispositions determine suitable instructional methods and creative activities. Creativity is a complex activity requiring multiple assessments to understand its outcomes precisely. In order to assess creative construction among students, the current study assesses the creative abilities (fluency and originality) of students as stated in the divergent thinking test and their creative production abilities (novelty and appropriateness) in some real life problems that still require creative solutions. This study employed two ways of judging creativity; creative

abilities were judged by teachers through a standardized scoring booklet guide, and creative production was judged by teachers who were specialists in the subjects. Hitherto, no study has been conducted to investigate the relationship of the constellation of students' motivation and self-determination with creative thinking abilities and creative production in problem-solving.

1.7 Limitations of the Study

The limitations of the study are as follows:

1. The study investigated the relationship of only three dimensions of students' psychological traits: Intrinsic motivation, curiosity, and self-image, with two dimensions of students' creative thinking abilities (fluency and originality), and two dimensions of students' problem-solving abilities (novelty and appropriateness).
2. The data was collected from two educational districts in the Sultanate of Oman: South Albatinah and North Albatinah.
3. In the work preference inventory, the intrinsic motivation items were assessed, and extrinsic motivation items were excluded.
4. The study was implemented only among students of grade 10.
5. The data was collected only from government schools, private or bilingual schools were not included.

1.8 Operational Definitions

Creativity

Creativity is a "mental process that leads to solutions, ideas, conceptualization, artistic forms, and theories of products that are unique and novel" (Reber, 1985, p.

203). In this study, the term refers to the abilities that the creative thinking process is based on, according to the TTCT, and ability of students to generate creative solutions in problem-solving tasks.

Fluency

Guilford (1967) defined fluency as “Total number of responses generated; it involves the ability to produce many ideas that belong to the specific task” (p. 138). In this study, the term refers to the number of responses generated by the students and belonging to the various activities in the TTCT verbal form (A) ranging from 0 to maximum scores.

Originality

Originality is defined as the “production of ideas that are unique or unusual; it involves synthesis or putting information about a topic back together in a new way” (Guilford, 1967, p. 138). The term in this study refers to the number of unique, unusual responses generated by the students for the various activities in the TTCT verbal form (A) ranging from zero to maximum scores.

Problem-solving

In the current study, the term refers to the student’s ability to create novel and appropriate products in the tasks under “problems” included in the problem-solving test. The problems are derived from three subjects studied by 10th-grade students (Arabic Language, Science, and Social Studies). The problems are constructed to motivate students to generate creative productions. (Weisberg, 1988, p. 148) stated that problem-solving is “The thought processes involved in producing work of acknowledged greatness in art or in science”. Guilford (1967) categorized problem-solving as creative production generated from solving-problems.

Novelty

Torrance (1988, as cited in Finke, Ward and Smith, 1992) considered novelty as infrequency of responses. (Sternberg, 1988, p. 137) defined it as “Something that is quite different from what is already known”. MacKinnon (1975, p. 82) defined novelty as “at least statistically infrequent”. In this study, the term refers to the scores that students obtained in generating new, distinct, and so far unknown products in the tasks of the problem-solving test, ranging from zero to four marks. The product is new, distinct, and so far unknown to the judges. Furthermore, it is not included within the subject content.

Appropriateness

Sternberg (1988, p. 137) defined appropriateness as “Correct in that experts agree on the produced solution”. (Barron, 1988, p. 80) considered everything after novelty go under the heading of appropriateness/fit. He viewed appropriateness of products as “their aptness, their validity, their adequacy in meeting a need, and a rather subtle additional property that may be called simply fitness, aesthetic fitness, ecological fitness, optimum from being right”. In this study, the term refers to the feasible and useful products that students provided on the tasks of the problem-solving test, ranging from zero to four marks.

Intrinsic motivation

The term of IM refers to “human motives stimulated by the inherent nature of the activity, their pleasure in mastering something new, or its natural consequences” (Deci, & Ryan, 1985a, p. 35). Intrinsic motivated behaviour is “participation by a person in an activity in the absence of a reward contingency or external control” (Lahey, 2007, p. 377). In this study, the term refers to the students' inner motives that drive them to learn,

investigate, challenge, persist, and create what they seek, enjoy, and derive satisfaction from the performance itself, instead of the external rewards.

Curiosity

Berlyne (1960, p. 45) defined curiosity as “A state of increased arousal response, promoted by a stimulus high in uncertainty and lacking in information, resulting in exploratory behaviour and the search for information”. The term in this study refers to students' internal drive, which leads them to know what is unknown, discover, seek new experiences, and expand their information in various curricula topics to satisfy their inner desire to learn.

Self-image

In this study, this term refers to the students' appreciation of their inner picture as a whole: physically, socially, and mentally, and the extent of their confidence to achieve, and overcome the obstacles. Bailey (2003) states it is “Subjective perception of oneself, including an image of one's body and impression of one's personality, capabilities, *mental abilities* [emphasis added], and so on. (p. 383)

Psychological trait

The term refers to “a characteristic or quality distinguishing a person, especially a more or less consistent pattern of behaviour that a person possessing the characteristic would be likely to display in relevant circumstances” (Williams, Schatterwhit, & Saiz, 1998, p. 18). In this study, the term refers to students' particular qualities which stem from their internal emotions instead of external reinforcements, and which reflect their interest, satisfaction, and self-determination.

10th-grade

The first grade of secondary education in the Sultanate of Oman; it covers general science and arts subjects that students have to study. According to their achievements in 10th- grade, and addition of their interests, students determine what kind of subjects they will study in 11th and 12th-grade studnets.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Understanding the role of education in contemporary societies requires identifying the most effective circumstances in the world. Nowadays, the world is characterized by rapid changes, globalization, and growing complexity in terms of economics and socio-cultural relations; in addition to extraordinary technological changes and rapid information expansion. The speed of these changes is directly reflected in education. The core aim of recent education system policies is understanding the dynamics of events and planning strategically for the next generation to deal with the future. Runco (2003, p. 318) stated that “Education is not only a ladder of opportunity, but it is also an investment in our future”.

In order to achieve their educational aims, teachers have to provide supportive environment for students' learning that encourages their motivation and independence in thinking. Educational systems ought to resist imposing information into students' minds in order to have it memorized and retrieved during examinations. In contrast, 21st-century education has to shed light on teaching students how to find knowledge, how to generate new ideas, vesting scope of student thinking, and how to criticize given information.

There is no dearth of talk in education about innovation, change, diversity, and risk-taking. Thus, creativity studies are rooted in an expanded epistemological spectrum, which enables the fulfillment of both traditional and innovative educational goals. Although, there is a set of thinking goals in various educational systems, but

schools tend only to value memory and analytical thinking; other skills, such as creative and practical skills are the least of school aims.

In particular, to verify the above mentioned objectives of education in the 21st-century, schools must encourage divergent thinking skills that enable students to deal effectively with information and solving problems inside and outside schools. As a result, we should nurture rather than ignore creative thinking (Higgins & Reeves, 2006).

2.1 Main Concepts

2.1.1 Creative Thinking Views and Concepts

People spend a significant part of their time reading novels and poems, going to see the latest blockbuster movies, visiting museums to see cultural heritages, playing games, and using electronic equipment and communication facilities. These activities, implicitly are testimony of the consequences of creative minds. The historical background of creativity, as documented in literature, indicates what Guilford in 1950 claimed in his APA presidential address that this topic deserves more attention and study, because it is certainly among the most important and pervasive of all human activities (Selby et al., 2005).

Undoubtedly, that announcement was the signal for several psychologists to study creativity. In 1967 Guilford published his outstanding book *The Nature of Human Intelligence*, which discusses indepth the divergent-convergent abilities and problem-solving, and provided the core and various abilities that make up creativity. That effort was the first serious step in studying creativity using scientific methods.

Since the concept of creativity emerged, the question of what creativity is still remains due to the absence of a condensed and unified definition. Indeed, numerous

definitions have been given to this concept by many psychologists. However, the study of creativity has infiltrated other fields (Jalan & Kleiner, 1995).

To conceptualize creativity, it is better to intuitively understand it than define it. In this case, we are bound to refer to Guilford's (1967) work. Guilford compared divergent and convergent thinking. Convergent thinking relates to linear, logical, single, and correct answers. In contrast, divergent thinking deals with multiple answers, concrete innovation rather than abstract concept, and original or unusual ideas. He categorized creativity under divergent thinking skills.

Surgical separation and human brain thinking tests have assisted the work of the generative process of ideas in the brain, which reveal that creative thinking requires coordinating and using both sides of the brain. Right-brain thinking activates intuition and insight. However, analyzing these insights must be carried out in the left brain (LeBoeuf, 1990).

Runco and Okuda (1991) emphasized that creative performance is the result of interaction between cognitive ability and metacognition strategy. They demonstrated their view when they observed that gifted students avail themselves of elements that facilitate originality, unlike non-gifted students. Later, Runco and Okuda's view was empirically supported by Davidson and Sternberg (1995, as cited in Russo, 2004).

Thus, we return to our question: what is creativity? Torrance as a distinguished researcher of creativity ultimately stated: "creativity is, in my view, something that is impossible to define in words" (Torrance, 1988, p. 44). He expressed his opinion that creativity defies precise definition, and argued that this conclusion does not bother him because creativity is almost infinite.

Wallas (1926, as cited in Shook, 1997) identified four steps in the creative process: Preparation, incubation, illumination and revision. Torrance developed a