DOMINANCE DIFFERENCES IN CREATIVITY THINKING BETWEEN ART AND SCIENCE STUDENTS: A MIXED METHOD STUDY OF CHINESE STUDENTS OF BAISE UNIVERSITY

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This Independent Study Manuscript Presented to

The Graduate School of Bangkok University

In Partial Fulfilment of the Requirements for the Degree

Master of Management (Business Innovation)

2020

This manuscript has been approved by

the Graduate school

Bangkok University

Title: Dominance Differences in Creativity Thinking between Art and Science Students: A Mixed Method of Study of Chinese Students of Baise University

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November 11, 2020

Lu, J. M.M. (Business Innovation), November 2020, Graduate School, Bangkok University.

Dominance Differences in Creativity Thinking between Art and Science Students: A Mixed Method Study of Chinese Students of Baise University (59 pp.)

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ABSTRACT

With the development and changes of the times, creativity has received more and more attention. Research creativity has become an important issue in higher education. The Art and science student show great differences in creativity in different professional fields. Therefore, it is necessary to conduct a comparative study on the creativity of Arts and Science students. This research uses the adapted scale of the Torrance Creative Thinking Test（TTCT）to investigate the creativity of arts and science students of Baise University from the perspective of real performance in fluency, originality, abstractness of titles, elaboration and resistance to premature closure. This article will carry out research from three aspects: First, review the previous research results on the creativity research of Arts and Science students. Second, through the TTCT scale and interviews Baise University students' creativity on the fluency, originality, abstractness of the title， elaboration and resistance to premature closure are investigated and analyzed. Third, the impact of Arts and Science students' creativity characteristics on business activities and professional development is explored.

The following conclusions are finally drawn: (1) The creativity performance of

Science students and Arts students of Baise University is inconsistent. (2) Arts students are significantly higher in fluency of creative thinking than Science students, while Science students are significantly higher in exquisiteness and resistance to premature closure, but not in originality and abstractness of titles significant differences. (3) Arts students tend to interact with people in terms of occupational adaptation, and science students tend to engage in precise and meticulous work types. Business activities Arts students adapt to the role of business marketers, while Science students are more suited to the roles of entrepreneurs and senior management.

Keywords: *Arts Students, Science Students, TTCT, Creativity*

ACKNOWLEDGMENT

I am very grateful to my adviser, Dr. Chulatep. From the selection of the topic of the thesis to the finalization of the thesis, every step of the instructor provides me with very detailed guidance and help. Encourage me when I am depressed, he is really a very good adviser.

At the same time, I am very grateful to my colleague Qin Zehu, an assistant researcher, who helped me complete the collection of sample data at Baise University. Allow me to finish the analysis of the thesis data on time.

I also want to thank my second co-adviser Dr. Tengfei. She encouraged me when I feel nervous and teach me the skills of writing thesis and defending.

I would like to thank my life mentor teacher, Genevieve Lim. She cares about every student very much and helps us solve many problems in life. Under her guidance, our English level has also been improved. It is good for us to write a thesis.

I would like to thank my parents. They tried their best to support me to study abroad. Although our family is not very wealthy, I still support my dream. Constantly encourage me when I am sad.

Finally, thanks to Khun Kesara for helping me adjust the paper format. Help me coordinate the time of class and defense and remind me carefully every time. She is really a very careful teacher.

Jinyu Lu

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CHAPTER 1

INTRODUCTION

1.1 Research Background

With the rapid development and change of technology and environment, creativity becomes more and more important, and it can help people cope with these development changes. In addition, it is a key component of problem solving (Mumford, Mobley, Uhlman, Reiter-Palmon and Doares, 1991; Runco, 1994, 2004; Torrance, 1971). By-products derived from creativity enable people to enjoy many things every day. Creativity can explain why original things are more valuable than copies. The 1,500 CEOs interviewed by IBM worldwide believe that innovation is the most important leadership quality (IBM, 2010). UNESCO (1988) also emphasized the importance of stimulating students 'creativity analysis. Creativity has become an important issue in higher education. Education aims not only to train people with rich knowledge, but also to train creative thinkers. A comprehensive analysis of the list of "100 Innovative Strength Universities in China" found a prominent phenomenon: Universities with obvious development advantages in science and engineering are generally ranked ahead of universities with balanced development strength in the liberal arts and sciences, and some top universities in the field of humanities and social science Even out of 20. From this point of view, it is easier to judge the strong universities of science and engineering majors to reflect the strength of innovation and development (Education Master, 2019). In the impromptu speech contest held by Baise University, the stories compiled by liberal arts students are often more detailed, complete, and exciting than science students. Arts students are relatively good at

expressing their ideas. Although Baise University has set up courses on innovation and entrepreneurship, it aims to cultivate students' creativity. However, no one has done an article about the difference in creativity between Baise University students and Arts students. I hope that through this research, I will better understand the difference between the two so as to better enhance the creativity of Baise University students.

1.2 Research Objectives

The objective of this research is to explore the differences between the two academic tracks of students—liberal arts and the engineering and science major. Both tracks have diversity of interests and different sets of competencies, skills, and fields of knowledges. Both tracks are creative in different ways. Science and engineering are very systemic and have strong logical approach in developing an intuitive way of scientific intuition of creativity, while the art track has a different imaginative way of creativity. These two types of tracks of students have two diverse kinds of creativity. If there are components of creativity and if we can measure the level of these components, would there be any differences between the creative components of the Arts, Sciences and engineering tracks.

CHAPTER 2

LITERATURE REVIEW

This article summarizes the development of college students' creativity in different subject areas. In the school, I searched for empirical research on the level of creativity of liberal arts students and science students. Searched the "Creativity Test" on the school's internal website for 5,440 papers, plus the "University Students" search at the same time, there were 675 papers; using the "Full Text" filter, there were 206 papers; when using "Peer Review" For screening, there were 120 papers; using "English" screening, there were 116 papers, 91 were not related to the research topic, and the remaining 25 were useful for research. There were 28 articles searched by "Torrent Test", and 1 article could be downloaded by "Full Text" and "English". There were 6 external searches. There were a total of 32 papers.

2.1 What is Creativity

The word creativity is derived from the Latin "creare". The meaning of "creare" is create, establish, produce. It has the similar meaning as another Latin word "crescere" (growth). From the etymological point of view, the main idea of creativity is to create new things in the original situation of nothing.

In psychology, the meaning of creativity has always been controversial. And there is a significant time node in the number of studies. Before the mid-1990s (Guilford, 1950; Sternberg and Lubart, 1996), there was relatively little research on creativity, but in the past 20 years, research on creativity has surged (Sternberg & Dess, 2001). Franken (1993) defines creativity as the tendency to produce or recognize ideas, alternatives, or possibilities that may be useful for solving problems, communicating

with others, and entertaining yourself and others. Torrance (1965, 1966, 1988) uses this concept to define creative thinking as the ability to discover problems, make guesses, make new ideas, and communicate the results. As suggested by Duffy (1998), creative thinking is the ability of seeing things in a novel way, learning from experience and connecting it with new situations, thinking in unconventional and unique ways, using unconventional methods to solve problems and create something unique and original. Davis (1997) understands creativity from a universal perspective. He believes: “Creative thinking is a lifestyle, a personality trait, a way of perceiving the world, a way of getting along with people, a way of living and growing. Living creativity is to develop one’s own talent and become a creative person. The person can discover new fields, generate new ideas and solve some problems that others cannot solve (p. 269–281).” Combining the above viewpoints, creativity can be defined as the ability to use existing knowledge to produce a new, unique, socially or personally valuable product according to a certain purpose. This is the psychological quality necessary to successfully complete a creative activity. The product here can be a new concept, a new idea, a new theory, a new technology, a new process and a new product.

2.2 Types and Characteristics of Creativities

According to the process of creativity itself from germination to formation, Heinelt (1974) divided creativity into pre-creativity, latent creativity and true creativity. The pre-creativity refers to the preparation stage of creativity or the germination stage of creativity. It cannot produce creative results. For example, children's fantasies, young people's longings, and desires. The latent creativity refers to a broad understanding of creativity. Potential creativity is unique and novel for

individuals but has been discovered or invented by humans. The true creativity is a narrow understanding of creativity, which refers to providing unique, novel and socially valuable creative results, which are unprecedented.

According to the level of creativity, Arieti (1976) divides creativity into ordinary creativity and great creativity. The ordinary creativity refers to what every mentally sound person has. It can make people feel satisfied, eliminate frustration, and provide a positive attitude towards human beings and life for human beings. The creativity of primary and middle school students belongs to this one type. The great creativity refers to the creativity that creates great achievements for mankind and promotes social progress. The creativity of people like Newton and Einstein belong to this category.

Creativity is conceptualized as a human ability or characteristic (Barron, 1988; Taylor, 1988) or cognitive process (Boden, 1992; Johnson-Laird, 1988; Schank, 1988; Weisberg, 1986), Influenced by thinking style or personality traits (Richardson & Crichlow, 1995; Sternberg, 1988), and associated with divergent thinking (Clapham, 1997; Guilford, 1956; Torrance, Torrance, 1988).

Regarding the characteristics of creativity, different scholars have put forward their own views. More comprehensive views include Maslow, Guildford, and Hutchison.

Guildford is a famous American research expert on creativity. He believes that the main characteristics of creativity are: (1) sensitivity, that is easy to accept new phenomena and discover new problems; (2) fluency, that is quick thinking, quick response, can give a variety of responses or answers to specific problem situations smoothly; (3) flexibility, that is strong adaptability and adaptability, the ability to change orientation flexibly, can play free association, (4) originality, that is, the ability

to generate new extraordinary thoughts, which is manifested in generating novel, rare, and pioneering ideas and achievements; (5) redefinition , that is good at discovering specific things Multiple methods of use; (6) Penetration, that is the ability to recognize the inherent meaning, characteristics, or diversity of things through the surface phenomena of things and change meanings.

Hutchison is also an American psychologist. He analyzed the research results of more than one hundred creativity, and proposed that the main characteristics of creativity are: (1) originality, It is an extraordinary creative design that has not been in the past, this is the main feature of creativity ; (2) novelty, that is new and extraordinary creative design, this feature is similar to the originality, but the originality refers to unprecedented, and the novelty focuses on the new, not the same as the general; (3) fluency, that is the number of response ideas per unit time; (4) flexibility, that is for things or problems in an objective environment, being sensitive to the difficulty of perception and easy to find the need for improvement, while It is also good at finding solutions; (5) elaboration, that is adopting precise methods and detailed procedures in the process of a work, and carefully considering the relationship between each part and the whole.

David Kelley taught at the Hasso Plattner Design Institute at Stanford University. Its goal is to make students creative, which is what Bandura said "Self-efficacy" is similar to the hierarchy of needs. Another theory that shows the connection between self-confidence and creativity is the hierarchy of needs proposed by American psychologist Abraham Maslow. In order to make people feel the need for self-fulfillment and express their needs creatively, he needs to meet the need to feel a sense of accomplishment and gain self-confidence.

2.3 Composition of Creativity

2.3.1 Knowledge

Among the elements of creativity, general knowledge and experience provide a broad background for creation, while expertise including professional knowledge, creative knowledge, and special field knowledge directly affects the level of creativity.

2.3.2 Intelligent factors

Intelligent factors include three abilities, one is general intelligence, such as observation, attention, memory, and operation ability, which embodies the ability of people to retrieve, process, and comprehensively use information to indirectly and generalize things; second, creative thinking Ability, mainly refers to divergent thinking ability, such as creative imagination ability, logical processing ability, thinking regulation ability, intuition thinking ability, reasoning ability, inspiration thinking and ability to capture opportunities, etc. It reflects people's psychological activities when they are creative thinking Level is the essence and core of creativity. The third is special intelligence, which refers to the ability shown in a certain professional activity and guarantees the high efficiency of a certain professional activity.

2.3.3 Non-intellectual factors

Non-intelligent factors are mainly related to creative consciousness and creative spirit. Creative consciousness refers to the comprehensive awareness and understanding of the information related to creation and the creative activities, methods, and processes themselves. It can also be simply understood as the desire to create, including motivation, interest, curiosity, curiosity, inquiry, initiative, and

sensitivity to problems. The spirit of creativity can also be simply described as the courage of creation. In creative activities, the creative spirit is often the key to success.

2.4 Creativity Differences in Different Professional Fields

2.4.1 Differences in creativity caused by physiological basis

With the cross penetration of psychology and neurology research, people realized that creativity is a high-level function of the human brain. Human understanding of human brain potential and its function provides the basis of brain science for the cultivation of human creativity. Since the middle of the 20th century, especially since the 1990s, the latest research results of brain science, such as the infinite theory of human brain potential, the theory of division of function between the two hemispheres of the brain, Herman's "whole brain model" theory, Gardner's multiple intelligence research results such as theory reveal the infinite and plasticity of brain potential, and provide a solid and scientific theoretical basis for cultivating students' creativity. There are a lot of examples in the history of science to prove that creativity is formed on the basis of the collaborative work of the left and right brain. In the book "The Art of Thinking", Warrens divided the creative process into four stages: preparation stage, brewing stage, clear stage and verification stage. At different stages, the left and right brains play different roles. During the preparation and verification periods, the left brain is actively active and plays a leading role. At this time, people mainly use the left brain's speech and logical thinking functions, use various logical methods to find the crux of the problem, and test hypotheses and form strategies. During the brewing period and the open-minded period, the right brain plays a leading role. These two stages are the periods when new ideas and concepts are produced, and they are also

the most critical periods in the creative process. Non-logical functions such as imagination, intuition, and inspiration in the right brain played an important role in this period. In the preparation period and verification period of creative activities, although the left brain activity is the main activity, the right brain is also active. Similarly, during the brewing period and the open-minded period, although the right brain activity is the main activity, the left brain activity is also inseparable. The synergy between the left and right brains is the physiological basis of creativity. Arts students and Science students have differences in creativity due to differences in innate left and right brain control functions.

2.4.2 Different thinking causes differences in creativity

The characteristics of creative thinking (forming creative thinking methods) come from the following three main aspects: (1) creative thinking as a person (2) creative thinking as a product, and (3) creative thinking based on research evidence as a process has been documented (Maisel, 2007; Weisberg, 2006; Karwowski, 2006; Clapham, 2004; Simonton, 2003; Schultz, Tannenbaum & Lauterborn, 1996; Isaksen, Dorval & Treffinger, 1994; Davis, 1992; Khatena, 1992; Besemer & O'Quin, 1987; Davis & Rimm, 1980; Torrance, 1979; Plass, Michael & Michael, 1974; Schaefer, 1971; Wallas, 1926).

The two main states of the creative thinking process are convergence and divergence. Convergence thinking is usually defined as a way of thinking aimed at finding the right solution, while divergent thinking is defined as a way of thinking aimed at generating all possible alternatives. Different thinking may be more useful for finding problems and new solutions, while convergent thinking may be more useful for solving existing problems (Brophy, 1998).

Arts students have a greater influence on creative factors such as "ingenuity", "thinking acumen" and "thinking flexibility", and their thinking methods are mainly divergent thinking. The creativity of Science students is higher in novel and unique qualities, and the way of thinking is convergent thinking.

Therefore, the difference in the way of thinking also shows differences in creativity.

2.5 Torrance Creative Thinking Test (TTCT)

2.5.1 Introduction to quiz

There is currently no way to absolutely assess creativity, but there are some tests that can provide more accurate data. Among the available methods, the Torrance Test of Creative Thinking (TTCT) (Torrance, 1966, 1974) represents "one of the most popular and commonly used procedures for evaluating creative thinking" (Rosenthal et al., 1983, p. 35). Among all the tools included in the Eighth Psychometric Yearbook (Buros, 1978), TTCT ranks 24th in the total number of references and is the most cited in all creativity tests (Lissitz & Willhoft, 1985). TTCT is the most widely used creativity test (Davis, 1997) and it is translated into more than 35 different languages (Millar, 2002).

2.5.2 The main content of the test

TTCT was developed by Torrance in 1966. It has two forms: TTCT-Verbal (TTCT-V) and TTCT-Figural (TTCT-F). The characteristic of Torrance's creative thinking test lies in the gameplay of its operation process, that is, the various tests are organized in the form of games, which looks relaxed and happy. Covers divergent thinking skills, curiosity, hypothetical thinking, imagination, emotional expression, humor, and the ability to break conventions. The Torrance test consists of three

subtests: picture construction, picture completion, and line activity. These sub-tests are based on Torrance's definition of creative thinking to score the five components of creative thinking. The five components are (1) Fluency: the number of related reactions, which can explain the agility and rapid level of the imagination created by the teste. (2) Originality: the degree of novelty of an idea, indicating the novelty, uniqueness, and unusual level of the subject's idea. (3) Elaboration: the ability to develop, embroider, polish and execute. Carefully conceive the number of added ideas. (4) Resistance to premature closure: complete a figure with a straight line or a simple curved line. (5) Abstractness of titles: sense the essence of a problem, know what is truly essential counting on choice of words, abstractness, wideness.

2.5.3 TTCT and Creativity Test

TTCT had been using as a standard test for creativity testing for more than 50 years. TTCT has been known as a good creativity measurement tool, not only to identifying the gifted student in the educational environment, but also for general practice (Kim, 2006). After 50 year, Runco, Millar, Acar, and Carmond (2010) had run longitudinal test on the old data to check reliability and validity of the tool again. The result was confirmed that TTCT addressed the value of divergent thinking as an expressive of creative expression and achievement throughout the lifespan. Kim (2017) conducted study on TTCT if the two type of test are trustworthy and concluded that the figural type is more comprehensive, reliable, and valid measure of creativity than the verbal type. Almeida, Prieto, Ferrando, Oliveira, and Ferrandiz (2007) had confirmed in their research on the construct validity of Torrance test of creative thinking that creativity as cognitive characteristic are (1) more associated with divergent thinking than convergent thinking; (2) is more individual attribute than

universal construct; (3)is more insight novelty than process and routine; (4) is more problem-finding than problem-solving; and (5) is more remote than spontaneous. This is in other word, TTCT is a suitable creativity measurement tool.

2.6 Creativity Test and University Student

In the past ten years, Puryear (2015) has studied the case of creativity. His study shows that all people are creative, some have more creativity, and some have less creativity. Fields (2014) believes that it is challenging to find an effective and reliable tool to test the creativity of university students. He confirmed challenging the status quo, separate, synthesis, cognition, associate and communicate, awareness, similarity, external motivation, sensitivity, experiment and combine, dimensional thinking and problem in testing the reliability of university test tools. The twelve factors -solving represent the key elements for creating a tool to measure creativity. In addition, he suggested that college education should still consider using the TTCT test because it focuses on improving the effectiveness of the test, which can be regarded as an effective predictor of creativity. De Dreu, Baas and Nijstad (2008) established the dual path theory of emotion and creativity. They view creativity as fluency and originality. Students who indicated that they had not been abused performed better in fluency and flexibility in creativity tests than those who had experienced abuse, and students who performed artistic activities scored higher on creativity tests. They believe that positive emotions affect creativity through flexible cognition, while negative emotions affect creativity through perseverance. Teachers 'lack of enthusiasm is an obstacle to the development of creativity. Teachers' support and incentives are procedures that promote students 'creativity, so teachers will prosper or destroy students' creativity. At present, people pay more attention to creativity, such

as art rather than science. Wang (2012) studied whether the extensive reading or writing practice of college students is related to higher creativity. He believes that students who spend more time on reading / writing are more creative, especially the well-designed parts. There is no significant relationship between creativity and self-confidence, it is related to insight, especially to scientific creativity. Personality and dissemination ability are important predictors of artistic achievement.

2.7 Research Questions

According to the above comments, many tests prove that TTCT is effective. Everyone is creative, but everyone's creativity is different. People's creativity is affected by knowledge, intelligence, and different subject areas. There is indeed a difference in creativity between liberal arts students and science students. The liberal arts students' thinking style is mainly divergent thinking, which is greatly influenced by sensitivity and originality. The creativity of English majors in reading / writing that is the creativity of the fine design part, is relatively high. Creativity has a clear relationship with science, and science students are highly novel and unique. The previous studies carried out some unilateral measurements. There was no systematic comparison of the creativity of liberal arts and science students. According to Torrance's creative thinking field, the text aims to one research question:

RQ: Which group of students are dominating in which domains of Torrance's Creative Thinking?

CHAPTER 3

RESEARCH DESIGN

3.1 Research Methodology

The current research mainly focuses on the description of the characteristics of creativity and the basic methods of creativity measurement. There has not been a systematic study of the creativity differences in the liberal arts and sciences. The previous research has only focused on the research on the creativity characteristics of a professional in the liberal arts and sciences.

The methodology selected for this research is the mixed methodology. Quantitative approach will be the method to begin with. The research hypothesis is that there will be different set of creativity types for different track of educational preferences. We just don't know which styles is the preference on which. Out of the Torrance's creativity thinking domain, which is dominating for art and which is for science students, is to be solved by quantitative survey. The results will also be confirmed by the semi-structured qualitative interview afterward.

3.2 Research Questionnaire Coding

The research is to measure the 5 domains of Torrance's creative thinking field. The TTCT-figural test is to be used to test the level of divergent thinking (Jackson, L. A., Witt, E. A., Games, A. I., Fitzgerald, H. E., Von Eye, A., & Zhao, Y., 2012). These 5 domains consist of *Fluency* - number of interpretable, meaningful, and relevant ideas generate within a certain period of time (the greater the number, the higher the creativity); *Originality* – rarity or unusualness of responses (Count numbers of ideas). ; *Abstractness of titles* – Making sense of story (Likert scale on level of

abstraction of story); *Elaboration* – degree of detail in the responses (Likert scales given to the selection of images with high degree of details). ; *Resistance to premature closure* - complete a figure with a straight line or a simple curved line (Likert scale given to the selection of image with drawing closure).

3.3 Demographic Characteristics

Participants in this study were two different groups of Arts students and Science students in Baise University. From the experimental process, the main factors affecting the prediction model and results are concentrated in certain changes in demographic data, such as age, gender, hobbies, educational background, and different professional fields. The study mainly explores the differences between Baise University students' different career study areas through five aspects (fluency, originality, abstract of the title, elaborate, resistance to premature closure) of the Torrance Creativity Test (TTCT). Therefore, the factors that affect the test results should be excluded as much as possible. Based on the above factors, the test selected undergraduates from freshmen to juniors of different communities. Because their age range is 18-20 years old, not much different in age. The university community is a spontaneous organization of students. It brings together students with the same hobbies to communicate. Baise University stipulates the admission requirements for undergraduates. It must pass the national unified high school graduation exam and obtain the required scores to enter the university. Therefore, Baise University's undergraduate education background and intelligence are not much different.

3.4 Research Objective

The researcher has obtained the full consent of the research subjects before the study and explained the application of the experimental results and the impact on the

subjects in detail. The research obtained the informed and consent of the management structure of Baise University.

This study selected 80 students for the test, of which 38 were Arts students and 42 were Science Students. There are 16 male students and 64 female students in the 80 participants, aged 10-20 years old. According to the direction of professional development to distinguish between Arts and Science. 1) Science is a highly theoretical subject, such as International Economics and Trade, Marketing, Traditional Chinese Medicine, Pharmaceutical Preparations, Mathematics and Applied Mathematics, Information and Computing Science, Applied Chemistry, Resource Environment and Urban and Rural Planning Management, Human resource Management, Bioengineering, Food Science and Engineering, Light Engineering, and Biological Engineering are all Science majors. Science majors are mostly about data, which exist in reality and belong to the category of natural sciences. Science involves many formulas and theorems and tends to use data to solve problems. Therefore, learning Science requires strong logical thinking skills.2) The Arts generally refer to related majors in some cultural categories and language categories. Such as Painting, Modern Chinese, English, History, Law and other majors. The content of the Arts study does not have any established formula theorem, dominated by human emotions. Therefore, studying Arts requires strong memory, good writing skills and imagination.

3.5 Research Methods

3.5.1 Questionnaire

Print out the completed questionnaire for students to conduct on-site testing. Because the questionnaire requires the tester to draw different things as much as possible within a certain period of time, the more the number is drawn, the more

creative it is. In order to ensure the accuracy of the test data, let the students relax before the test, tell them to answer their real ideas according to the requirements of the question, and there is a dedicated person to remind the students on the test time of each question. Then use SPSS to analyze the data of Frequency, Average, t- Test and ANOVA. Finally, use Excels for t-Test

3.5.2 Interview

Structured interview questionnaires were formulated after the quantitative survey result. The questionnaires were designed for two groups of the Art and Science students focusing on the different results of finding in the area of dominance of creativity thinking between the two groups. The interviews were then conducted online over the internet to 2 representatives from each group with random selection.

The Art group questionnaire was design based on the use of fluency in creativity and how it impacts to the work in the field related to the field of study and the missing details of elaboration and pre-mature closure. While for the Science students, the contrary kind of questionnaires were developed on the use of elaboration and pre-mature closure field of study and the missing details of fluency.

CHAPTER 4

DATA ANALYSIS

4.1 Questionnaire Validity Test

Questionnaire was reviewed by two experts following the design concept of Torrance's TTCT-Figural test and was approved for similarity to be used for data collection in this research as a mini-TTCT compliance form.

4.2 Questionnaire Reliability Test

Questionnaire was tested with Cronbach Alpha to 5 testers and achieve the passing score of 0.725 before sending out for data collection in Baise University in China. Data was collected with an assistant researcher who is well explained on the structured of the questionnaire. The scoring and interpretation were done by the researcher.

4.3 Questionnaire Result Analysis (Quantitative)

4.3.1 Frequency analysis

The Torrance Creative Thinking Test（TTCT）includes fluency, originality, abstract of title, elaborate and resistance to premature closing to calculate score. The frequency overview profile for creative performance of Arts and Science students of Baise University are summarized in Table 1- Table 5. The respondents were 80 students in total and most respondents were Arts students (52.5%) with minority Science students (47.5%).

Table1: Arts /Science Students Fluency Frequency Analysis Table

Score		Fluency										Total
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Career Track Area of Study	**Art**	1	4	3	3	5	8	5	7	4	2	42
	Science	2	2	10	11	6	4	1	2	0	0	38
Total		3	6	13	14	11	12	6	9	4	2	80

As shown in Table 1, There were 42 Art students, of which 11 (26.2%) were distributed in 1-4 score, 25 (59.5%) were distributed in 5-8 score and 6 (14.3%) were distributed in 9-10 score. Among the 38 Science students, 4 (10.5%) scored 1-2, 31 (81.6%) scored 3-6, and 3 (7.9%) scored 7-10. Based on the above analysis, it can be found in the Arts students creativity fluency gathered in 5 - 8 score, while the Sciences students were gathered in 3-6 score. It reflected that Arts students scored higher than Science Students in the frequency distribution.

Table 2: Arts / Science Students Originality Frequency Analysis Table

Score		Originality																Total
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**16**	**24**	
Career Track Area of Study	**Art**	2	1	3	5	4	5	4	6	3	0	0	4	1	1	1	2	42
	Science	0	4	4	7	4	3	4	4	2	2	1	1	0	1	0	1	38
Total		2	5	7	12	8	8	8	10	5	2	1	5	1	2	1	3	80

As shown in Table 2, There were 42 Art students, of which 6 (14.3%) were distributed in 1-3 score, 24 (57.1%) were distributed in 4-8 score and 12 (28.6%) were distributed in 9-24 score. Among the 38 Science students, 4 (10.5%) scored 1-2, 26(68.4%) scored 3-8, and 8 (21.1%) scored 9-24. Based on the above analysis, it can be found that Arts students were gathered in 4-8 score in originality ability, and Science students are gathered in 3- 8 score, which can be obtained by frequency distribution basically the same as Art students.

Table 3: Arts / Science Students Abstract of Title Frequency Analysis Table

Score		Abstract of title				Total
		0	1	2	3	
Career Track Area of Study	Art	7	5	15	15	42
	Science	6	12	12	8	38
Total		13	17	27	23	80

As shown in Table 3, There were 42 Art students，of which 12(28.6%) were distributed in 0-1 score, 30 (71.4%) were distributed in 2-3 score. Among the 38 Science students, 6 (15.8%) scored 0, 24 (63.2%) scored 1-2, and 8 (21.1%) scored 3. From the above data analysis, the Arts students' creativity of abstraction of title concentrated in 2-3 score，then the Sciences students concentrated in 1-2 score, it can be derived in frequency distribution. The Arts students are slightly higher than the Science students.

Table 4: Arts / Science Students Elaborate Frequency Analysis Table

Score		Elaborate				Total
		0	1	2	3	
Career Track Area of Study	Art	7	15	16	4	42
	Science	4	7	8	19	38
Total		11	22	24	23	80

As shown in Table 4, This is about the frequency of elaborate of the participants. There were 42 Art students, of which 7 (16.7%) were distributed in 0 score, 31 (73.8%) were distributed in 1-2 score and 4 (9.5%) were distributed in 3 score. Among the 38 Science students, 4 (10.5%) scored 0, 15（39.5%）1-2 score, and 19 (50%) scored 3. Based on the above analysis, it can be found that Arts students are concentrated between 1-2 score in creativity of elaborate, and Science Student is distributed at a high frequency of 3 score. It can be concluded that Science students' elaborate ability is higher than Arts students in frequency distribution.

Table 5: Arts / Science Students Resistance to Premature Closing Frequency Analysis Table

Score		**Resistance to Premature Closing**						**Total**
		0	**1**	**2**	**3**	**4**	**5**	
Career Track Area of Study	**Art**	9	8	16	4	3	2	42
	Science	5	5	2	10	8	8	38
Total		14	13	18	14	11	10	80

As shown in Table 5, This is about the frequency of resistance to premature closing of the participants. There were 42 Art students, of which 33 (78.5%) were distributed in 0-2 score, 7 (16.7%) were distributed in 3-4 score and 2 (4.8%) were distributed in 5 score. Among the 38 Science students, 4 (10.5%) scored 0, 15（39.5%）1-2 score, and 19 (50%) scored 3. Based on the above analysis of the data,

it can be found that Arts students are concentrated between 0-2 points in creativity against premature closure, and Science students are concentrated between 3-5 score, which can be derived from the frequency distribution higher than Arts.

4.3.2 Average and Significance Analysis

The average and significance analysis of Torrance Test of Creative Thinking (TTCT) mainly analyzes the difference in the performance of creativity between the Arts students and Sciences students of Baise University.

Table 6: Arts / Science Students Creativity Analysis in Average Table

Test of Creative	**Career Track Area of Study**	**N**	$\overline{X}$	**SD**
Fluency	**Art**	42	5.95	2.389
	Science	38	4.13	1.630
Originality	**Art**	42	7.74	5.061
	Science	38	6.45	4.170
Abstract of title	**Art**	42	1.90	1.078
	Science	38	1.58	1.004
Elaborate	**Art**	42	1.40	0.885
	Science	38	2.11	1.060
Resistance to Premature Closing	**Art**	42	1.76	1.358
	Science	38	2.92	1.699

According to the comparison of the average in Table 6, the average of Arts

students in the fluency of creativity is 5.95, while the average of Science students is 4.13. This shows that the fluency of creativity of liberal arts students is greater than that of science students. In the original expression of creativity, the average of Art students is 7.74 and the average of Science students is 6.45. Therefore, the fluency of Art students' creativity and the fluency of Science students' creativity are basically the same. The abstraction of the title of creativity manifests that the average of Art students is 1.90, and it slightly larger than the average of Science students of 1.58. It shows that the abstract of title of creativity of Arts students is slightly greater than Science students' creativity of abstraction of the title. The performance of students in the elaborate of creativity is an average of 1.40 for Art students and 2.11 for Science students. It can be seen that the elaborate of Art students is less than the elaborate of Science students. Therefore, the elaborate of creativity of Science students is higher than Art students elaborate of creativity. The creativity of students to resist premature closure is represented by an average of 1.72 for Art students and 2.29 for Science students. It shows that the creativity of Art students to resist premature closure is less than Science students, So Art students are higher than Science students.

Table 7: Arts / Science Students Creativity Performance about Saliency Analysis

Test of Creative	**F**	**t**	**Sig**
Fluency	6.131	3.940	0.000
Originality	0.715	1.237	0.220
Abstract of title	0.012	1.395	0.167
Elaborate	1.531	-3.219	0.002
Resistance to Premature Closing	2.540	-3.386	0.001

As shown in Table 7, the P-value of creativity in fluency of Arts and Science students of Baise University is 0.000, the p-value of originality is 0.220, the P-value of abstract of title is 0.167, the P-value of elaborate for 0.002 and the p-value of resistance to premature closing is 0.001. It can be seen from Table 6: 1) The fluency of Art students' creativity is greater than that of Science students. 2) The originality in the creativity of Arts students is basically the same as the originality in the creativity of Science students. 3) The abstraction of the titles in the creativity of liberal arts students is slightly higher than that of science students. 4) The refinement of creativity of science students is higher than that of liberal arts students. 5) The ability to resist premature closure in the creativity of Arts students is higher than that of Science students. According to the analysis in Table 6 and Table 7, the p-value of Arts and Science students in fluency (0.000), elaborate (0.002) and Resistance to Premature Closing (0.001) are all less than the critical value 0.0005, so Arts and Sciences students of Baise University in fluency, elaborate and resistance to premature closing have significant differences. The p-values of creativity of Arts students and Science students on originality (0.220) and abstract of title (0.167) are greater than 0.005. Therefore, there is no significant difference in originality and abstract of title between Arts students and science students of Baise University.

4.3.3 Art and Science students' creativity of ANOVA analysis

Apart from the difference in career track area of study, Art students and Science students do not know whether there is a difference in gender. In order to find the answer, conducted ANOVA of variance according to the two dimensions of Arts students / Science students and male / female students. The results are shown in Table 8.

Table 8: Arts / Science Students Creativity Performance about ANOVA Analysis Table

Test of Creative	**Sum of squares**	**F**	**Sig**
Fluency	398.388	5.091	0.003
Originality	1726.750	0.708	0.550
Abstract of title	87.000	1.483	0.226
Elaborate	80.388	6.917	0.000
Resistance to Premature Closing	209.188	4.481	0.006

As shown in Table 8, Arts students and Science students' creativity in fluency was p-value = 0.003 <0.05, the p-value on elaborate = 0.000 <0.05, and the p-value on resistance to premature closing = 0.006 < 0.05, p-value on origin = 0.550> 0.05, p-value on abstract of title = 0.226> 0.05. According to the above data analysis, the results of ANOVA analysis were consistent with the results of the independent sample test (Table 7), so rejecting the original hypothesis. It is clear that there was significant difference in fluency, elaborate and resistance to premature closing among Arts and Science students of Baise University, and there was no significant difference in originality and abstract of title.

Table 9: Arts / Science Students Creativity in Gender-based LSD Analysis Table

DV	(I) Career Track Area of Study	(J) Career Track Area of Study	A_I-A_J (I-J)	SE	Sig
Fluency	**Science&male**	Science&Female	-.223	.693	.748
		Art&Female	-1.873*	.610	.003
		Art&Male	-1.957*	.657	.004
	Science&Female	Science&Male	.223	.693	.748
		Art&Female	-1.650*	.688	.019
		Art&Male	-1.733*	.730	.020
	Art&Female	Science&Male	1.873*	.610	.003
		Science&Female	1.650*	.688	.019
		Art&Male	-.083	.651	.899
	Art&Male	Science&Male	1.957*	.657	.004
		Science&Female	1.733*	.730	.020
		Art&Female	.083	.651	.899
Originality	**Science&Male**	Science&Female	-1.180	1.560	.452
		Art&Female	-1.121	1.372	.416
		Art&Male	-2.135	1.480	.153
	Science&Female	Science&Male	1.180	1.560	.452
		Art&Female	.058	1.547	.970
		Art&Male	-.956	1.644	.563

(Continued)

Table 9 (Continued): Arts / Science Students Creativity in Gender-based LSD Analysis Table

DV	(I) Career Track Area of Study	(J) Career Track Area of Study	A_I-A_J (I-J)	SE	Sig
Originality	**Art&Female**	Science&Male	1.121	1.372	.416
		Science&Female	-.058	1.547	.970
		Art&Male	-1.014	1.466	.491
	Art&Male	Science&Male	2.135	1.480	.153
		Science&Female	.956	1.644	.563
		Art&Female	1.014	1.466	.491
Abstract of title	**Science&Male**	Science&Female	-.342	.345	.325
		Art&Female	-.609*	.303	.048
		Art&Male	-.498	.327	.133
	Science&Female	Science&Male	.342	.345	.325
		Art&Female	-.267	.342	.438
		Art&Male	-.156	.364	.670
	Art&Female	Science&Male	.609*	.303	.048
		Science&Female	.267	.342	.438
		Art&Male	.111	.324	.733
	Art&Male	Science&Male	.498	.327	.133
		Science&Female	.156	.364	.670
		Art&Female	-.111	.324	.733
Elaborate	**Science&Male**	Science&Female	-.861*	.303	.006
		Art&Female	.239	.266	.371
		Art&Male	.517	.287	.076

(Continued)

Table 9 (Continued): Arts / Science Students Creativity in Gender-based LSD Analysis Table

DV	(I) Career Track Area of Study	(J) Career Track Area of Study	A_I-A_J (I-J)	SE	Sig
Elaborate	Science&Female	Science&Male	.861*	.303	.006
		Art&Female	1.100*	.300	.000
		Art&Male	1.378*	.319	.000
	Art&Female	Science&Male	-.239	.266	.371
		Science&Female	-1.100*	.300	.000
		Art&Male	.278	.284	.331
	Art&Male	Science&Male	-.517	.287	.076
		Science&Female	-1.378*	.319	.000
		Art&Female	-.278	.284	.331
Resistance to Premature Closing	Science&Male	Science&Female	-.988	.508	.055
		Art&Female	.728	.446	.107
		Art&Male	.589	.481	.225
	Science&Female	Science&Male	.988	.508	.055
		Art&Female	1.717*	.503	.001
		Art&Male	1.578*	.535	.004
	Art&Female	Science&Male	-.728	.446	.107
		Science&Female	-1.717*	.503	.001
		Art&Male	-.139	.477	.772
	Art&Male	Science&Male	-.589	.481	.225
		Science&Female	-1.578*	.535	.004
		Art&Female	.139	.477	.772

*. $Sig(A_I\text{-}A_J)=0.05$

According to the data in Table 9, it can be found that:

1) Fluency: The Science & Male, Art & Male and Art & Female were P-value <0.05, and the A_I-A_J with the Art & Male and Art & Female was negative, so the fluency of Science & Male was significantly lower than that of Art & Male and liberal Art & Female. The Art & Female was P-value <0.05, and the A_I-A_J with the Art & Male and Art & Female was negative, so the fluency of the Art & Female was significantly lower than the Art & Male and Art & Female.

2) Originality: In terms of originality, Art & Male, Art & Female, Science & Male and Science & Female was P-value > 0.05, so there was no significant difference between the four.

3) Abstract of title: In the abstraction of the title, the P value of the Science & Male and the Art & Female were P-value < 0.05. Therefore, there was significant difference between the Science & Male abstract and the Art & Female in the title abstraction, and the A_I-A_J between the Science & Male and the Art & Female is negative. Art & Female was significantly higher than Science & Male.

4) Elaborate: Science & Male and Science & Female in the elaborate were P-value < 0.05, so there was a significant difference between Science & Male and Science & Female in elaborate. Moreover, the A_I-A_J was negative, so Science & Male are lower than Art & Female; Both Art & Female and Science & Female were P-value < 0.05, so there was a significant difference between the Science & Male and Science & Female in terms of elaborate, and the mean difference is negative, so the Art & Female were lower than the Science & Female. Both Art & Male and Science & Male were P- value a < 0.05, so there was a significant difference between the

Science & Male and the Science & Female in terms of elaborate, and the A_I-A_J was negative, so the Art & Male are lower than the Science & Male.

5) Resistance to Premature Closing：In Art & Male, Art & Female and Science & Female in resistance to premature closing were P-value < 0.05, and the A_I-A_J was negative, so both Art & Male and Art & Female were significantly lower than Science & Female.

4.3.4 Baise University Arts and Science students in paired samples analysis

In order to compare the sample tests of Arts students and Science students more directly, Excel tools were used for paired sample testing. For further verify the results of the analysis.

Table 10: Arts Students / Science Students Fluency Significant Differences in Paired Samples Analysis Table

Career Track Area of Study	**N**	**Mean**	**STDev**	**p-Value**
Art Students	38	5.95	2.39	0.000
Science Students	42	4.13	1.63	

H0: Art Student has Fluency Creativity Equal to Science Student Fluency Creativity. H1: Art Student has different Fluency Creativity from Science Fluency Creativity. As shown in Table 10, The p-Value of t-test paired two sample for means is 0.000 < 0.050. We reject H0. We accept H1 that there are significant different between

Art and Science student in Frequency Creativity. Moreover, the average fluency of Arts students' creativity (5.59) is higher than that of Science students (4.13), so the fluency of Arts students' creativity fluency is significantly higher than that of science students.

Table 11: Arts Students / Science students Originality Significant Differences in Paired Samples Analysis Table

Career Track **Area of Study**	**N**	**Mean**	**STDev**	**p-Value**
Art Students	38	7.74	5.06	0.222
Science Students	42	6.45	4.17	

H0: Art Student has Originality Creativity Equal to Science Student Originality Creativity. H1: Art Student has different Originality Creativity from Science Originality Creativity. As shown in Table 10, the p-Value of t-test paired two sample for means is 0.222 > 0.05. We accept Ho: Art Student has no significant different of Originality Creativity to Science Student.

Table 12: Arts/Science Students Elaborate Significant Differences in Paired Samples Analysis Table

Career Track Area of Study	**N**	**Mean**	**STDev**	**p-Value**
Art Students	38	1.40	0.89	0.020
Science Students	42	2.11	1.06	

H0: Art Student has Elaborate Creativity Equal to Science Student Elaborate Creativity. H1: Art Student has different Elaborate Creativity from Science Elaborate Creativity We reject H0. As shown in Table 12, the p-Value of t-test paired two sample for means is 0.020 < 0.05. Therefore, We accept H1 that there are significant different between Art and Science student in Elaborate Creativity. With Science Student Higher Mean of Elaborate Creativity, Science Student demonstrate the possession of higher elaborate creativity domain.

Table 13: Arts/Science Students' Abstract of Title Significant Differences in Paired Samples Analysis Table

Career Track Area of Study	**N**	**Mean**	**STDev**	**p-Value**
Art Students	38	1.90	1.08	0.138
Science Students	42	1.58	1.00	

Ho: Art Student has Abstract of Title Creativity Equal to Science Student Abstract of Title Creativity. H1: Art Student has different Abstract of Title Creativity from Science Abstract of Title Creativity. As show in Table 13, the p-Value of t-test paired two sample for means is 0.138 > 0.05. We accept H0 that Art Student has no significant different of Abstract of Title Creativity to Science Student.

Table 14: Arts/Science Students' Resistance to Premature Closing Significant Differences in Paired Samples Analysis Table

Career Track Area of Study	N	Mean	STDev	p-Value
Art Students	38	1.76	1.36	0.003
Science Students	42	2.92	1.70	

H0: Art Student has Resistance to Premature Closing Creativity Equal to Science Student Resistance to Premature Closing Creativity. H1: Art Student has different Resistance to Premature Closing Creativity from Science Resistance to Premature Closing Creativity. As show in Table 14， the p-Value of t-test paired two sample for means is 0.003 < 0.05. We reject H0. We accept H1 that there are significant different between Art and Science student in Resistance to Premature Closing Creativity. With Science Student Higher Mean of Resistance to Premature Closing Creativity, Science Student demonstrate the possession of higher Resistance to Premature Closing creativity domain.

4.3.5 Analysis Results

In summary, the following conclusions can be found:

1) The creative fluency of Art students of Baise University was significantly higher than that of Science students, and Arts female students have the best creative fluency.

2) Baise University Science students elaborate and resistance to premature closing in creativity were significantly higher than Arts students, but there was no significant difference among the Science male students, the Arts male students and the Arts female students in creativity of resistance to premature closure.

3) The creative originality and the abstraction of title of Art students and Science students in Baise University have no significant difference, but the abstraction of the creativity of Arts female students was better than Science male students.

4.4 Interview Result Analysis (Qualitative)

4.4.1 Interview basic information

The interview was conducted using a semi-structured interview method. Before the interview, the "Outline of Interview on the Creativity of Arts/Science Students" was listed. The outline of the interview included 5 questions. From the basic information, fluency, elaboration and resistance to premature closure, analyze how creative traits play a role in career development and how creative attributes affect the work and life of Arts/Science students.

4.4.2 Interview information coding

From the first question regarding the quantity of ideas to have impacts on the work of the group of art and science students, here are the responds.

"I think the more ideas, the better, because it can enrich the con of the

creation and inspire different inspiration." (Art student 1)

"Then by optimizing and organizing your own ideas in multiple aspects and elements, you can form more outstanding artworks." (Art student2)

Both Art students appreciate having numerous ideas from fluency creativity before beginning of their work to be benefit. But the respond from the science student below demonstrate differently.

"When you have a lot of ideas, you need to create an artwork. No single idea can create a good artwork. You can connect ideas, find intersection, and use art to gather ideas." (Science student 1)

"A large number of ideas can summarize the details, constantly improve the art, and improve the novelty of the art." (Science student 2)

As he mentioned the word "Art" a few times in his sentence that meant he emphasized he was not an art-type of person. He emphasized that he was a science person and opposed that fluency creativity was for an art, and not for a science. This characteristic of having multiple of different ideas before beginning to do things was rather opposite to the science type of characteristic.

From the second question regarding the practice routines affects Art and Science students come up with the number of ideas. The following is their answer:

"I will discuss with others, check the information and write down my ideas in a notebook, I will try all the ways to think of as many ideas as possible" (Arts student 1)

"I will go to a quiet place, relax myself, and then think slowly. Or chat with friends and listen to their suggestions '' (Arts student 2)

The two Art students practiced as many ways as possible to increase their ideas.

It explained that Art students emphasize understanding different ideas from different perspectives, and pay more attention to relying on thinking from different angles to complete the work better, that is, the completion of the work requires a high degree of fluency in thinking. The answer for science students is this:

> *"I will use the brainstorming method to form a network diagram of thematic ideas in the brain, so that I can generate a lot of ideas" (Science Student 1)*
>
> *"I will consult the literature related to the task, and if there are more references, I will have an idea" (Science student 2)*

Science students emphasize the importance and value of ideas for accomplishing tasks. He mainly relies on a kind of thinking and content to expand and extend, summarizing and summarizing the main content of the work tasks. It can be seen that science students focus on the aggregation of thinking, and the fluency of creativity is relatively low.

The third question is about the degree of attention to detail before Arts and Science students work.

> *"The first thing I will consider is the overall planning of the work, of course, the details are essential, it can make the whole work more smoothly completed." (Arts student 1)*
>
> *"I think the details are very important. Before I start working, I will consider the content of the work. What else do I need to prepare for this" (Arts student 2)*

The Art students agree that the details are important. They think that paying attention to the details is to consider the overall content and planning of the work. In fact, their description of details is inaccurate, indicating that their level of creativity

elaborate is relatively low. While the degree of detail that Science students believe is even finer:

"I will pay great attention to details, and attention to details can improve work efficiency. For example, before collecting the materials of classmates, clarify the part of each person's work, emphasizing that the documents should be arranged in order of student number" (Science student 1)

"I will pay great attention to the details. I think the details can help us understand all the contents of the work and help us organize the work ideas so as to better understand the detailed status of the work." (Science student 2)

Science students emphasize the contribution of detail content to work efficiency in judging the detail, judge the value of detail content, and make it clearer in elaborate.

The fourth question is about how Arts and Sciences students can complete their work with the help of details.

"I will pay attention to judging the impact of details on the achievement of the overall goal, and then consider the value of details to the work tasks." (Arts student1)

"I will observe the details of my life and apply it to my actual work. For example, I will write down the contact information commonly used in the work and easily see it." (Arts student 2)

The Arts students emphasize the impact and value of details on the completion of the goal, and think that the details are the content of the whole part, so it can be known that the Arts students reject the exquisiteness of the content.

"I will first sort all the details, consider the value of each detail in the work.

Then analyze the relationship between each detail and the entire work, and finally formulate a plan to complete the work." (Science student 1)

“First of all, the work can be completed smoothly, and various details are required to avoid errors. Secondly, while grasping the details, you can also have a deeper understanding of the work.” (Science student 2)

Science students emphasize the value of details to work and the relationship between each detail and the overall work. Its purpose is to sort out the details to complete the task, indicating that science students are good at using creative elaborate to solve work tasks.

The fifth question is about the views of the Arts and Science students leading a project. Below is their answer:

"First of all, I will understand the basic work that should be done as a leader, and understand what the content of the project is." (Arts student 1)

"I will focus on improving myself and building a good image in the team, so that I can better lead the team to work" (Arts student 2)

The two Arts students emphasized the value and status of the leader in the project. Their focus was not on the overall project. They did not combine the project leader and the project, and their ability to resist premature closure was low.

"I will first consider whether this project is within my ability and whether it is related to my major. Finally, I will consider whether anyone will follow me to do this project" (Science student 1)

“I will first consider whether I can lead the team to do this project well? How can it bring benefits to the project.” (Science student 2)

Science students integrate personal characteristics into the project itself in the

overall process of the project, such as the relationship between ability and leadership, and the relationship between professional and project results. They are very concerned about whether the entire project can be run well under their leadership, and the results are very important to them. It can be seen that science students have a relatively high ability to resist premature shutdown.

4.4.3 Interview results analysis

Through the interview and analysis of students, we can know that Arts students will come up with more ways from different angles and different postures. Therefore, Arts students have more creative fluency thinking. The Science students pay more attention to the use of details and the fusion of parts and the whole, thinking that the results are very important. Therefore, Science students have more creative elaborate and resistance to premature closure thinking. The results of the interview analysis are consistent with the results of the questionnaire analysis.

CHAPTER 5

CONCLUSION AND DISCUSSION

From this study, it is clear that TTCT is a reliable and trustworthy tool to measure creativity thinking.

The following conclusions can be drawn from this study:

1. The Arts students put more emphasis on starting from different angles and ideas in terms of fluency, while the Science students pay more attention to the results and the results of the work.

2. Science students pay more attention to the role of each detail in their work in terms of elaborate and resistance to premature closure, while Arts students pay more attention to the ideas and goals of the work.

3. Arts students pay more attention to the impact of goals and ideas on their work and career development, while Science students pay more attention to career planning and work planning from the perspective of the specific content of the work, the details of the task and the division of work of the members.

Arts students are more fluency than Science students, while Arts students pay more attention to research ideas and career and work goals. Therefore, Arts students' easy employment is characterized by change and diversity. They like to interact with people. Engaged in providing information, usually including government officials, educators, lawyers, judges and other legal workers, social workers, artists, etc. Science students are superior to Arts students in terms of elaborate and resistance to premature closure. They are more willing engage in detailed work. The characteristics

of this type of work are attention to detail and actual conditions, consideration of the rationality of the problem, like precise work, like to use logic analysis and query to explore unknown fields, so science students may be engaged in future occupations, including office workers, machinery operators , Chemical physics and other basic scientific researchers, computer programmers, doctors and nurses, and computer programmers.

5.1 Limitation

The TTCT -F version that was used in this research was a minimal version. This version is limited to the course assessment of the 5 broad domains of the creativity thinking. The sub-fields criterions of references measures of erosional expressiveness, storytelling articulateness, movement oration, expressiveness of titles, synthesis of lines, unusual visualization, extending or breaking boundaries, humor, richness of imagery, colorfulness of imagery, and fantasy which are additional scores of in-depth creativities that provide insights information will be available from the full version of TTCT version.

With the full version, more insightful details would explore in some other in-depth information about the art and science group of students or other perspective of creativity of how these students can apply with their career future.

5.2 Business Implication

The different advantages of the creativity development of Arts and Sciences students in business applications can be adjusted from the perspective of career matching of different positions in business management and business marketing to adjust the business development model. The creativity of entrepreneurs and senior executives needs to focus on novel ways of thinking. It can promote enterprises to

produce more products and improve service or technical level to generate more new ideas and new paths. Therefore, Science students with creative elaborate and resistance to premature closure should be concerned about the adaptation of their posts. In the business marketing model, users and entrepreneur empathy and consumer behavior research need people with more active thinking and more creative ideas. Therefore, Arts students should be fluency in their job adaptation.

5.3 The Future Research

The study has identified significant differences between the fluency, elaborate and resistance to premature closure of creativity in Arts and Science students in Baise University. Nowadays, with the increasingly fierce modern international competition, creativity is the core driving force for the development of enterprises. The core competitiveness of an enterprise is basically a competition for talents, and only the right person can adapt to the right position to maximize the talent advantage. Combined with the research results, it is worth pondering whether the future positions of Arts and Science students can maximize their job value according to the characteristics of creativity. Therefore, the future research direction focuses on liberal arts and science students in corporate management, the matching problem between the positions engaged in production and marketing and the characteristics of creativity.

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APPENDICES

APPENDIX A

Questionnaire

Test of Creativity Thinking-Art & Science (TTCT)

There are 5 pages to this questionnaire. It would take less than 10 minutes to complete all the answers

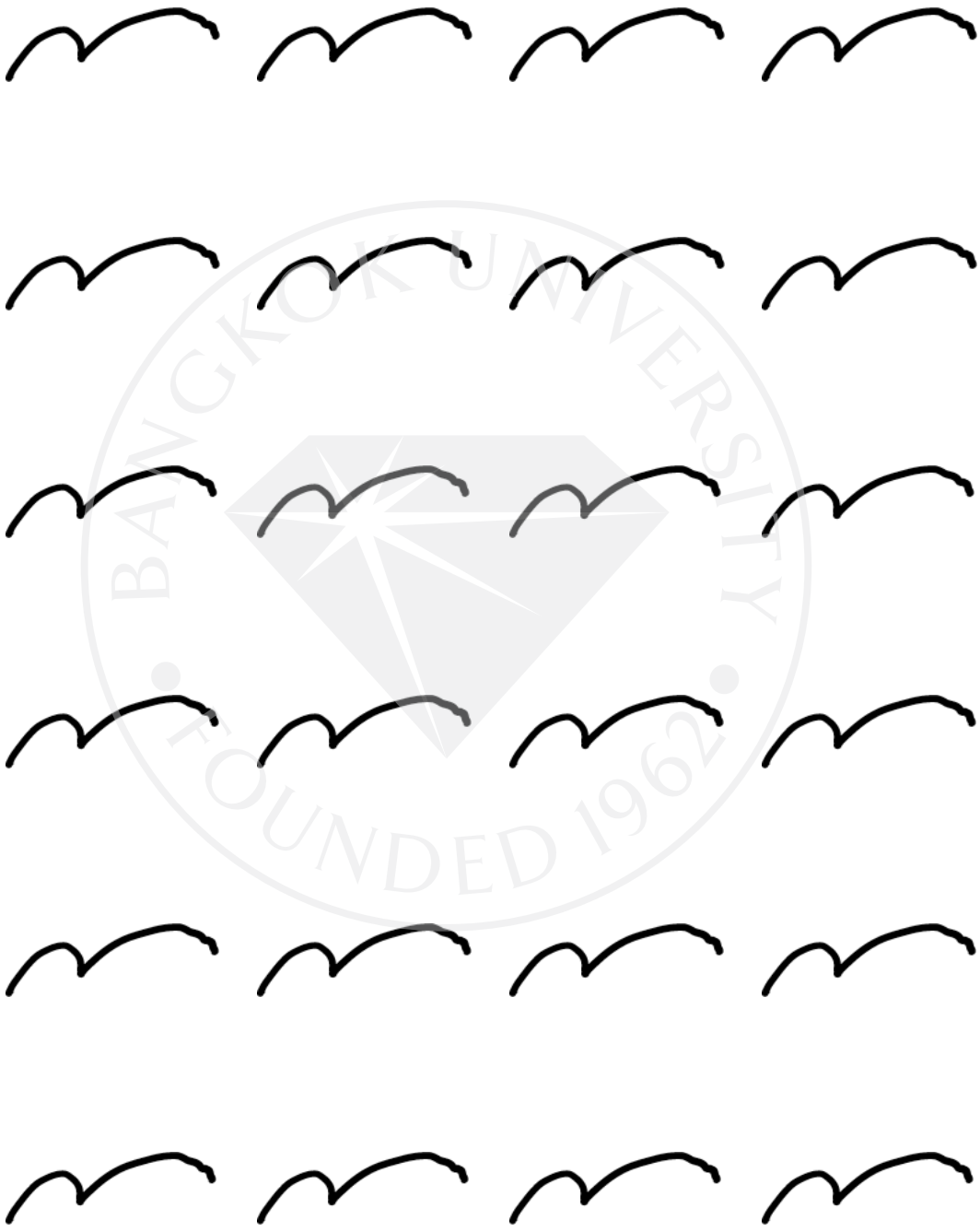
Please tell us a bit about yourself:

Age: _____ Gender: ☐ Male ☐ Female

Career Track Area of Study: ☐ Art ☐ Science

1. Given this picture of a brick. Write down as many uses of a brick that you can think of. Use a comma ";" to separate between word. -- 2 minute

2. Given the below picture, what can this line be drawn into? (Write as many ideas as possible). -- 2 minutes



3. When you see this picture, what do you think of? -- 2minutes

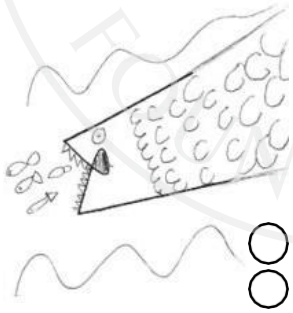
4. From these pictures, pick the one that you like and dislike.

1 
Like
Dislike

2 
Like
Dislike

3 
Like
Dislike

4 
Like
Dislike

5 
Like
Dislike

6 
Like
Dislike

7 
Like
Dislike

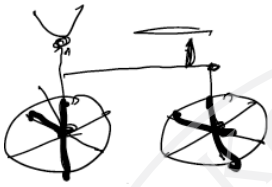
8 
Like
Dislike

9 
Like
Dislike

10 
Like
Dislike

5. All pictures are constructed from the given starter image, choose as many pictures as you like.

Starter image



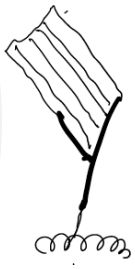
1

2

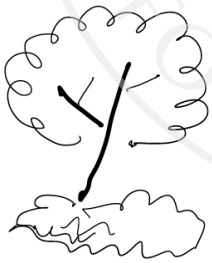
3

4

5



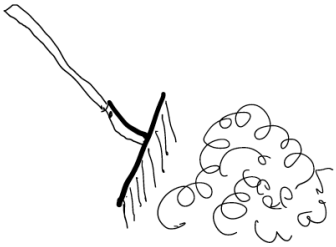
6



7

8

9



10

Solution Sheet

1. Test of Fluency: Count Number of Comma-separated words

2. Test of Originality: Count number of ideas

3. Test of Abstract of title:

[0] Girl …. Physical object explanation

[1] little girl …. Adjective explaining the object

[2] The girl is running to a dog …. A story of that object

[3] Happiness expression … feeling expression, abstract about the object.

4. Test of Elaborate:

Like: 2, 3, 5, 6, 9 → +1 point

Dislike: 1, 4, 7, 8, 10 → -1 point

5. Test of Resistance to Premature Closing:

Selection of Q. 1,4, 6, 7, 9 → 1 point

Selection of Q. 2, 3, 5, 8, 10 → 0 point

APPENDIX B

Structured Questionnaires

1. How would quantity of ideas help you create a fine piece of art?

2. What is your practice routines before getting started to come up with numbers of ideas?

3. Before you start your job, how much in detail you have to see it done?

4. How getting to details help you getting by with your work?

5. If someone ask you to lead on a project, what would you like to know first?

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