Enhancement of creative thinking and creative abilities in art and design students at the Central University of Technology, Free State

by

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Declaration

I, Daniel Johannes Janeke declare that this dissertation entitled, 'Enhancement of creative thinking and creative abilities in art and design students at the Central University of Technology, Free State', is a presentation of my own original research work conducted at the Central University of Technology, Free State. Wherever contributions of others were involved, every effort has been made to indicate this clearly, with due reference to the literature, and acknowledgement of collaborative research and discussions. No part of this dissertation has been submitted for any other degree or processional qualification.

The work was conducted under the guidance of Professor Annabel Fossey (DSc) [supervisor] and Ms Elsje Du Plooy (M Tech) [co-supervisor].

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I certify that the above statement is correct.

Professor Annabel Fossey (DSc)

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Colourful appreciation and love to

a creative God Almighty,

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an innovative Holy Ghost,

an inspiring Prof. Fossey (Annabel),

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and last but not the least at all, my family, and friends,

who kept me in their prayers

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Abstract

Introduction: Future civilisations hinge upon the creative capabilities of young people, therefore creativity should be fostered from a young age. Because creative people think in unconventional ways and challenge conventional thinking, they are able to solve complex problems and thus could make a significant contribution to the 21st century world-of-work. It is widely accepted that there exists a "creativity gap" amongst students, because of social, environmental, and educational experiences. Also, creativity skills vary extensively amongst entry level students in the department of Design and Studio Art at the Central University of Technology, Free State.

Aim: This study was thus undertaken to determine the potential to implement a Creativity Workshop to stimulate the emergence of creativity amongst a Test group of entry level students in Art and Design. Therefore, for this study the hypothesis that was tested is: *A creativity workshop will enhance creative skills amongst entry level University art and design students.*

Methods: The success of the Creativity Workshop was assessed by measuring creative skills through a Creativity Test that was implemented in a Test group of students (n = 24) and compared with a Control group of students (n = 30). Twenty-nine Creativity sub-domains were identified and grouped into four creativity domains (*Diverse Thinking, Creative Strengths, Innovation Skills,* and *Practical Skills*). The Creativity Workshop Instrument addressed the respective creativity skills in 19 different activities probing students for written and/or drawing responses. The Creativity Test Instrument comprised of 17 activities addressing the different Creativity sub-domains of the four Creativity domains.

Results: A Student's *t*-test revealed that the overall performances of the two groups of students were the same, indicating that the Creativity Workshop did not make a significant difference to the overall creativity performances of the Test group of students, thus the results did not support the hypothesis at an $\alpha = 0.05$. However, the mean score of the Test group (±430) was notably better than that of the Control group (±390). In contrast, *t*-tests revealed that the Workshop impacted

significantly on the performances of the Test group in two of the four Creativity domains (*Creative Strengths* and *Practical-Skills*), as well as on three of the 12 sub-domains (*Synthesis of Incomplete figures*, *Internal Visualisation, Extending or Breaking of Boundaries*) of the *Creative Strengths* domain, which focuses on the ability to use imagination to generate new ideas from a unique perspective in image development. This workshop thus improved students' abilities to combine two or more incomplete figures to visualise beyond exteriors and focus on the internal, as well as to extend lines beyond boundaries. The impact of the Creativity Workshop could also be recognised in two of the four activity types of the Creativity Test. The Test group outperformed the Control group in the activities, *Image Development* and *Object Repetition*. For two of the 17 activities of the Creativity Test, significant differences were established between the Test group and the Control group. In the activity *Adding Details to Medium Blocks*, the Test group outperformed the Control group by adding additional details to the figures in the boxes, thereby creating unique pictures. Similarly, the Test group outperformed the Control group in the activity of *Using cut out Shape for Design*, by pasting a cut-out shape into a blank space and then completing an imagined picture where the cut-out is part of.

Conclusion: The Creativity Workshop made a substantial contribution to the enhancement of creative and innovative skills in the Test group. In particular, students' imaginations came to the forefront, by showing their ability to apply imaginary thoughts when conceiving and developing images. Thus, the outcome of this study strongly suggests that students that were exposed to the Creativity Workshop were able to make mental leaps away from the obvious and the commonplace.

Chapter 1

Introduction to the Study

1.1 Introduction

Creativity is essential for all humans. In particular, creativity is the foundation of success for creative people such as artists, designers, architects and engineers. Creativity involves the tendency and the ability of experimentation, trial and error, thinking in unconventional ways, challenging conventional thinking, and solving complex problems (Gundry, Ofstein and Monllor, 2016). Creativity contributes significantly to language acquisition, imaginative play, adaptation, innovation, problem solving, planning, and decision-making (Andiliou and Murphy, 2010). One of the driving mechanisms of developing creativity is through education (Runco, Acar and Cayirdag, 2017). Education develops the creative potential of students and expands on their attitudes and abilities.

Creativity has been identified as a key educational goal for the 21st century. According to Robinson (Richardson and Mishra, 2018), the future of civilisations hinge upon the creative capabilities of young people, therefore creativity should be fostered from a young age. However, barriers that hamper the development of creativity include cultural barriers, environmental barriers, and personal barriers (Fazelian and Azimi, 2013). Thus, all people have different degrees of creativity.

It is now widely accepted in the literature that creativity can, in fact, be taught, nurtured and developed (Patston *et al.*, 2018). Unfortunately, there is a "creativity gap" between student expectations of creativity and the reality of classroom practice (Gralewski, 2019). Yet, despite all the emphasis placed on nurturing creativity, classrooms are still struggling with accommodating students' creative development (Bereczki and Kárpáti, 2018). In England, for example, legislation

has made provision for creativity in schools; however, it continues to be problematic (Kuo *et al.*, 2017).

This study has been proposed because studies have shown that creativity can be enhanced through training (Castillo-Vergara *et al.*, 2018). There are two main branches for creative training: one branch entails exercise and practice, while the other branch focuses on reflexive creativity training, which is centred on the development of understanding theories, models, tools, techniques or processes. Therefore, reflexive creativity training mainly uses debates, lectures, conferences, seminars and workshops (Castillo-Vergara *et al.*, 2018).

1.2 Aim and Objectives

Art and design students in Department of Design and Studio Art at Central University of Technology, Free State, demonstrate degrees of creativity (personal experience). Some have had some secondary education in art practice, while others have had no experience in art practice. Therefore, in some students there exists what can be described as a "creativity gap". This gap disadvantages these students when compared to students in which the gap is small or non-existent. Therefore, the aim of this study was to devise and test an introductory workshop to stimulate, develop and enhance creative thinking and skills in entry level art and design students in Department of Design and Studio Art of the Central University of Technology, Free State.

. The following overall hypothesis was thus tested in this study:

H_a: *A creativity workshop will enhance creative skills amongst entry level University art and design students.*

To achieve the aim of the study, the following objectives were devised:

1. To undertake a comprehensive review of the literature;

2. To devise a test to assess creative thinking and creative skills amongst entry level art and design students;
3. To develop an introductory workshop to develop and enhance creative thinking and creative skills;
4. To test creative thinking and creative skills amongst entry level art and design students; and
5. To analyse the data and reach conclusions.

1.3 Limitations of the study

The limitations of this study include firstly, that it was conducted amongst entry level art and design students studying at a South African University of Technology, and secondly, because of the rigid timetable at the academic institution, the workshop and the test had to be completed soon after the arrival of the students.

1.4 Ethical consideration

This research project was awarded ethical clearance by the Research and Innovation Committee of the Faculty of Humanities. Central University of Technology, Free State.

1.5 Layout of the dissertation

This dissertation has been arranged into nine chapters:

Chapter 1: In this chapter, the field of study described, the problem is highlighted, the main hypothesis posed, and the aim and objectives presented.

Chapter 2: In this chapter, a review of previous literature on creativity, its role in education, how it is tested, as well as how creativity can be fostered, are discussed.

Chapter 3: In this chapter, the research methods that were followed to achieve the respective objectives are described. This includes a description of the study design, the preparation of the Creativity workshop, the preparation of the Creativity Test Instrument and the methods that were followed to analyse student performance.

Chapter 4: In this chapter, the development of the Creativity Workshop and the Creativity Test Instruments are described.

Chapter 5: In this chapter, the development of the rubrics for the Creativity Test Instrument is described.

Chapter 6: In this chapter, the student demographic information is provided.

Chapter 7: In this chapter, the analyses of student responses to different activity types are presented.

Chapter 8: In this chapter, the analyses of the creativity performances of the students are presented.

Chapter 9: In this concluding chapter the key finding from this study are discussed and conclusions presented about the value of an introductory workshop.

Chapter 2

Literature Review

2.1 Introduction

Creativity forms a fundamental component of all human behaviour. It contributes to a variety of activities performed by humans, which include the designs of engineers and architects, as well as art production (Bryant and Throsby, 2006). It facilitates the development of personalities, thereby playing a major role in cultural lifestyle. Creativity also has social and economic implications and is regarded as being essential for the development and progress of human civilisations (Calavia, Blanco and Casas, 2021). It is essential to support creative activities in children because it provides societies with imaginative thinkers, leaders, and entrepreneurs (Yates and Twigg, 2017).

Creativity in human behaviour has been the focus of study for many years by philosophers, psychologists, sociologists, mathematicians, and neurophysiologists, because of its complex functioning in human brain development (Bryant and Throsby, 2006). Most dictionaries emphasise that creativity is the ability to produce new products or new solutions to problems, while using imaginative and routine skills (Merriam-webster Dictionary, n. d.). However, it is generally accepted that creativity means going beyond traditional ways of thinking, doing, knowing, and making, resulting in new and original thoughts and ideas (Bryant and Throsby, 2006).

2.2 Creativity

Creativity is a complicated and multi-dimensional concept. It is a highly original and mental process involving cognitive, social, and emotional processes (Wu *et al.*, 2014). Although many authors have attempted to provide definitions and descriptions for creativity, an adequate definition still remains a

subject of debate amongst scholars. This on-going debate demonstrates the validity of Shea's statement that "Only a very rash person would attempt to define creativity in either the arts or science" (Bryant and Throsby, 2006). While the debate continues, scholars do acknowledge that creativity is a highly valuable skillset that can make a significant contribution to the development and growth of a society (Brand, Hendy and Harrison, 2015).

When considering antiquity until recent times, creativity can be viewed in mainly three ways. Firstly, during the Renaissance and Romanticism eras, creativity was mainly highlighted by the application of self-expression, originality, and divergent thinking (Glăveanu, 2018). Secondly, in the Enlightenment era, creativity became interlinked with science, discovering problem solving, which is a fundamental aspect of creativity today. Thirdly, in Post-modern times, creativity was reconsidered and understood to be a far more complex and multifaceted concept or phenomenon. Creativity became integrated into everyday life and used in a variety of ways, to mix and match, to experiment and to create novel and original outcomes (Glăveanu, 2018).

When referring to dictionary definitions for creativity, they are mostly oversimplified descriptions. Typically, dictionaries describe creativity as the ability to produce new and original products. The Merriam-Webster Dictionary (Merriam-webster Dictionary, n. d.) defines creativity as the ability to create, whereas the Cambridge Dictionary (Cambridge Dictionary, n.d.), and the Oxford Learners Dictionary (Oxford, Learners Dictionary, n.d.) defines creativity as the use of skill and imagination to produce something new or to produce art. However, creativity is far more complex than these simplistic descriptions. Scholars have provided more multi-dimensional and comprehensive descriptions for creativity. In 1963, Ghiselin argued that creativity is not only an innovative and valuable idea, but it is also the generation of a problem-solving strategy. Guilford (1973) defined creativity as the embodiment of a thought in the form of external behaviour, which consists of the three characteristics, fluency, flexibility, and originality (Wu *et al.*, 2014). More recently, Chen (2016)

defined creativity as a concept or feature that has social and economic implications, playing a crucial role in cultural lifestyle. A more concise and interesting definition was provided by Sanchez-Capdequi (2000), who described creativity as a human activity, which generates a non-pre-existent human order (Bryant and Throsby, 2006).

Creative people may have different understandings of creativity than stated by conventional definitions. Glück, Ernst and Unger, (2006) surveyed artists from different artistic domains to establish if these artists could provide a clearer definition of creativity. The survey revealed that no clear definition could be established between the group of painters, sculptors, and artists in the more constrained professions, such as architects and designers. The only aspect that the surveyed group could agree upon was that creative people should have many ideas.

Several forms of creativity have been described in the literature. Three of the major forms of creativity include conventional creativity, design creativity and idea creativity (Starkey, Toh and Miller, 2016; Yu Shan *et al.*, 2018) Conventional creativity refers to ordinary ideas that are commonly accepted as workable solutions to a problem. Design creativity, on the other hand, probes for more novel ideas through asking, imaging, planning, creating, and improving on conventional ideas (Dumas, Schmidt and Alexander, 2016; Yu Shan *et al.*, 2018). Idea creativity is the foundation of product creativity and innovation when new and imaginative ideas are turned into reality.

Creativity can also be described in terms of its role in everyday situations. Historically, two different types of creativity were recognised. The Small-c creativity type refers to every-day creativity in hobbies and problem-solving during relaxation and work activities (Beghetto and Kaufman, 2007; Fürst and Grin, 2018). On the other hand, the Big-C creativity type, also known as eminent creativity, refers to high-level creativity that has a major impact on culture. More recently, two additional creativity types have been added to the two historical creativity types. One of these additional

creativity types is referred to a Mini-c, which describes the basic processes of combining pieces of information, mostly in academic practice (Beghetto and Kaufman, 2007; Fürst and Grin, 2018). The second additional creativity type, Pro-c, refers to a higher professional level of creative activities that are found, for example, in art and science.

2.3 Characteristics of creative people

Creative people are people with specific personal characteristics and traits. The traits of creative people are used to produce novel ideas and solutions to problems (Bryant and Throsby, 2006). Creative people are artistic and often eccentric individuals who produce new things that break new ground in their society and environment. All people have some degree of creativity; however, they differ in the extent of their creative abilities (Sternberg, 1999; Wu *et al.*, 2014). Creative people have a creative mind-set that goes beyond common knowledge and have been associated with a wide range of behavioural and mental characteristics (Brand, Hendy and Harrison, 2015). They are typically curious, inquisitive and are open to new experiences (Sternberg, 1999; Gralewski, 2019). Many creative people tend to be confident, assertive, nonconformists, risk takers, and independent people. They are also viewed as being artistic and have excellent design capabilities (Chan and Yuen, 2014). People with a higher level of creativity also possess interlinked cognitive elements such as, intellectual abilities, knowledge, thinking styles, and self-motivation (Brand, Hendy and Harrison, 2015; Cortes *et al.*, 2019). However, Amabile in 1983 argued that creativity is not a personal trait or ability, but a specific behaviour that is a result of personal characteristics, cognitive abilities and is also influenced by social environments (Amabile, 2012).

The home and educational environment play a major role in triggering or inhibiting a person's individual creativity. The cultural and social environment to which a person is exposed may have a significant impact on the person's development of creativity or the prevention of the formation of creativity (Fazelian and Azimi, 2013). When members in the social environment of a creative person

do not believe in the person's creative ability, it may cause such a person to lose interest in furthering creative development and innovation. In some societies, a creative imagination is perceived with scepticism and disbelief when it should be regarded as a tool that stimulates innovative growth (Brand, Hendy and Harrison, 2015).

Motivation to engage in creative behaviour is measured in terms of how often a person engages in creative ideas in their daily lives. The main forms of motivation include intrinsic motivation, extrinsic motivation, self-determination, and self-efficacy (An, Song and Carr, 2016). Intrinsic motivation refers to an internal desire to perform an activity for its own sake rather than from the desire for some external reward. Extrinsic motivation refers to a desire to perform a particular behaviour or to engage in an activity because of an external stimulus, for example to avoid something unpleasant (An, Song and Carr, 2016). Self-efficacy refers to a person's ability to exert control over their own motivation, behaviour, and social environment. Self-determination refers to a person's ability to make personal decisions.

Highly creative people are often influencers. They influence other people because they are self-aware and demonstrate specific behavioural patterns (Hoff and Carlsson, 2002). Their influencing abilities stem from traits such as being confident, inventive, passionate, belief in their own thoughts, holding critical perspective, and acceptance of challenges.

Many characteristics have been assigned to creative people. In Table 2.1, a list of characteristics that creative people may possess is provided together with brief descriptions.

Table 2.1 Core characteristics and description of creative people

Trait of a creative person	Description	Reference
Divergent thinker	A divergent thinking person view things in many ways at the same time, tends to trust their intuition and tends to challenge anything that exists. Such a person has the ability to see the whole picture, see patterns, and grasp solutions with only a few pieces, even with major pieces missing.	(Black, 2008) (Lee, & Min, (2016)
Flexible thinker	A flexible thinking person does not fix on a single idea, keeps looking for many different ideas or ways to do things, sees things from many different perspectives and is willing to try many possibilities in situations or challenges.	(Guilford, 1973) (Black, 2008)
Idea generator	An idea generating person produces many ideas or possibilities when working on a challenge. Such a person also elaborates the process of developing a theory, policy, or system, and adding more detail to what has already been said or asked.	(Guilford, 1973) (Black, 2008)
Observer	An observant person uses their senses consciously, sub-consciously and unconsciously, even non-consciously. Such a person thrives on multiple ways of perceiving; thus seeing, hearing, touching, smelling, tasting, and sensing things.	(Black, 2008) (Lee, & Min, 2016)
Curious	A curious person's nature is to question. Such a person's questioning nature is often mistaken as criticism.	(Montgomery, 1993)
Fantasiser	A fantasising person constantly wanders through their own imaginary worlds.	(Lee, & Min, (2016)
Original	An original person thrives on thinking about what has never been thought of before and doing the unusual. Such a person often solves unsolvable problems.	(Guilford, 1973) (Black, 2008)

2.4 Creative process

The creative process is a complex problem-solving activity that involves several cognitive abilities. The initial motivation that activates the creative process is a problem (Kabukcu, 2015). Therefore, the motivation of the creative process is the activation of an interest in the problem either in the form of an inspiration or an irritation. Creativity and innovation are the two cognitive abilities that are applied during the creative process (Kabukcu, 2015). Creativity is seen as the ability to develop novel solutions to a problem, while innovation is the ability to use these novel solutions to solve the problem.

The process of creativity comprises of a number of sequential stages to realise a final product. This process involves firstly the development of an idea, thereafter; through thoughts and actions the final product of the idea is produced (Warr and O'Neill, 2005). Essentially, the creative process is a cognitive process through which an individual generates new and novel ideas. In 1926, the social psychologist and co-founder of the London School of Economics, Graham Wallas, divided the creative process into four cognitive stages (Mcdonald, 1999). These sequential stages entail preparation, incubation, illumination, and verification. The preparation stage involves mainly the preparation for the creative process in which the problem is clarified. Incubation is the simplest stage of all the stages and is recognised as a passive stage of waiting for the manifestation of the idea or solution. During illumination, the appearance and realisation of new ideas take place (Mcdonald, 1999; Hammershøj, 2014). Three forces feature during illumination. These forces are transcendence, judgment, and imagination. Through the transcendence force, ideas appear as novel, while through the judgment force a decision is made about whether the idea is relevant or not, and finally through the imagination force all the relevant novel ideas are bound together as a whole. During the verification stage, the novel ideas are tested and adjusted.

Although the different stages of Wallas are still viewed as the foundation of the creativity process, scholars tend to package the stages into different combinations and make their own extensions. For example, Parnes (1999) proposed a sequence of six stages for the creative process: objective finding, fact finding, problem finding, idea finding, solution finding, and acceptance finding (Lassig, 2020). On the other hand, Cho (2017) divided the creative process into two stages; the ideation stage, where novel ideas are created, and the implementation stage where creative products are produced (Cho, 2017; Yu Shan *et al.*, 2018). Within these stages the cognitive abilities of analysis, generation, evaluation, and implementation are used.

The creative process plays a primary role in the work of an artist. When an artist produces an art piece, it is a unique and an unrepeatable result of a creative idea that was transformed into an art product using the creative process (Yavuz, 2004; Monroy, 2015; Withagen and van der Kamp, 2018; Benton, Varotsis and Vasalou, 2019). Therefore, during the creative process an artist conveys a message through the production of an artwork (Monroy, 2015; Withagen and van der Kamp, 2018). Artists mostly use their life experiences to generate ideas to support their art creations (Bryant and Throsby, 2006). Life experiences produce a wealth of information that an artist can use to generate creative ideas for art production. These experiences are collected every day in an artist's life and stored in their minds.

2.5 Creativity in education

In recent years, educators have become interested in creativity as a vital concept in education. Two major aspects drive the importance of creativity in education. Firstly, leaners achievements are viewed as important outcomes of education, and secondly, leaners' education should provide them with the necessary skills for their future so that they can participate effectively in a knowledge-based economy (Mullet *et al.*, 2016; Castillo-Vergara *et al.*, 2018). In the current education environment, leaners intuition is sharpened in the early phase of education (primary education). In this phase,

learners are taught to think and act differently, to use their imagination, curiosity, and their ability to solve problems (Castillo-Vergara *et al.*, 2018; Garcia and Mukhopadhyay, 2019). However, during the second phase of education (secondary education), creativity tends to be of lesser importance in learners education. In tertiary education (higher education), creativity, once again gains importance, but only in those careers related to artistic and creative activities.

Fostering creativity in the classroom has become important for teachers around the world. Because creativity is a fundamental skill, it is regarded as an important part of the learning process and should be developed at school level (Kaufman and Beghetto, 2009; Runco, 2003; Gajda, Karwowski and Beghetto, 2017; Gralewski, 2019). At the 2010 UNESCO Second World Conference on art in education in Seoul, in the Republic of Korea, participants acknowledged the critical role of art in the constructive transformation of educational systems (UNESCO, 2013). Studies have shown that creativity can be taught in an educational context (Kaufman and Beghetto, 2014; Nordin and Malik, 2015; Bereczki and Kárpáti, 2018). Furthermore, creative skills can also be stimulated through appropriate instruction and guidance by teachers through the development of creativity knowledge, cognitive functions, personality, and the environmental context (Jung and Chang, 2017; Castillo-Vergara *et al.*, 2018). Several key indicators of creativity in education have been identified and should be considered in the classroom to foster creativity (Calavia, Blanco and Casas, 2021). Some of these indicators are incorporation, practicality, novel, atmosphere, stimulation, analysis, cooperation, intrinsic motivation, participation, flexibility, uncertainty, time, divergence, self-evaluation, and redefinition. Therefore, creativity features more strongly in school curricula development, particularly in the early phase (Bereczki and Kárpáti, 2018). By integrating creativity in school curricula, creativity can make a meaningful contribution in the everyday lives of learners (Chen, 2016).

2.5.1 Challenges for the integration of creativity in education

One of the major boundaries that hamper the integration of creativity in education is superfluous definitions and descriptions for the concept of creativity. While scholars identify with creativity being a process and also a product, there still remains much confusion about what drives the process of creativity (Alfonso-benlliure, Meléndez and García-ballesteros, 2013; Brand, Hendy and Harrison, 2015; Castillo-Vergara *et al.*, 2018). Therefore, despite encouragement to stimulate creativity in education, creativity has proven to be difficult to conceptualise and integrate into educational curricula.

The implementation of creativity in curricula is also hindered by the structure of many educational systems. Educational systems are often unreasonably strict, and their programmed instructions tend to stimulate or constrain creativity within the education system (Castillo-Vergara *et al.*, 2018). Constraining elements within such systems include unnecessary rules, ignoring novel ideas presented by leaners, not allowing learners to learn through their mistakes, and teachers that are inflexible and controlling (Castillo-Vergara *et al.*, 2018). These constraints thus limit the development of educational procedures to stimulate creativity amongst learners.

How teachers see the real world plays a major role in whether creativity is regarded as important in education. Teachers' beliefs shape how educators engage in the practice of teaching creativity (Bereczki and Kárpáti, 2018). Although literature has confirmed that creativity can be taught in the classroom, many teachers do not believe that it is possible to stimulate and develop creativity amongst learners (Patston *et al.*, 2018). Teachers often have a misunderstanding of creativity, which is frequently distorted and in contrast with the existing scientific theories of creativity. Three common misconceptions of teachers are the idea that creativity requires originality but not appropriateness, that creativity is a talent that mainly relates to artists, and that the creative process requires the production of tangible products (Andiliou and Murphy, 2010; Bereczki and Kárpáti, 2018). These

misunderstandings result in teachers promoting a concept of creativity that may not be creativity in reality (Mullet *et al.*, 2016; Bereczki and Kárpáti, 2018). Also, teachers' distorted beliefs of creativity often label intelligent learners displaying socially desirable traits as being creative, while the true creative learner seems to be less preferred in the classroom.

While studies have shown that a leaner's creative potential can be taught and grown in the education system, there still remains a creativity gap between social expectations of learners' creativity and the reality of classroom practices. The creativity gap can be described as the actually expressed creative activities and achievements (Runco, Acar and Cayirdag, 2017). Therefore, three differences between the unfulfilled creative potential of an individual, group, or society, and the creativity gap have been recognised (Gralewski, 2019). Firstly, teachers rarely engage in activities to stimulate the creative potential of leaners. Secondly, teachers promote and stimulate creativity incorrectly, and thirdly, teachers do not believe that they have the necessary expertise to support and stimulate leaners creative potential. Mostly, teachers believe that their knowledge about creativity is incomplete, particularly their knowledge about the personal characteristics of a creative learner.

2.5.2 Higher education

Creativity is becoming increasingly important for the development of the 21st century knowledge society. Globally, countries are focusing on building a higher level of creativity in humanity (Feldges, Pieczenko and Michael, 2018). By stimulating creativity allows a nation to develop novel solutions to emerging problems. When creativity is perceived to be of key importance, it becomes a major driver of innovation (NACCCE, 1999; Feldges, Pieczenko and Michael, 2018). Therefore, by promoting and enhancing creativity in higher education (HE) could contribute to a nation's economic competitiveness and contribute to economic prosperity, as well as social and individual wellbeing (Ferrari, Cachia and Punie, 2009).

The primary purpose of HE is to prepare students to succeed in the natural environment and the world-of-work (Runco, Acar and Cayirdag, 2017). Although success depends on various things, one of the major contributors to success is creative thinking (Metzl, 2009). With the rapid developments in the world, creativity has been brought to the forefront (Runco, Acar and Cayirdag, 2017). For HE graduates to be successful in the world-of-work, HE should therefore prepare these students for new types of complexity and uncertain environments that are constantly in flux (Ferrari, Cachia and Punie, 2009). In addition, creative skills are increasingly valued by employers, in part because creativity is required for innovation that provides a competitive advantage, and in part because the economy in general depends more and more on innovation. While creativity is recognised as an important life skill, the question remains, what HE and educators are doing to foster creativity and develop a student's level of creativity (Egan *et al.*, 2017).

Creativity needs to be fostered in HE Institutions for two main reasons. Firstly, HE Institutions harbour students who are constantly using creativity to interact with one another, and secondly, creativity is a requirement in terms of the teaching process itself. In teaching, it is the intention to generate ideas and possibilities, invent ways of exploring complex problems and to combine ideas and things in novel ways (Jackson, 2006; Egan *et al.*, 2017).

HE can develop a student's creativity potential. The two major enablers that support the shift towards a more creative and innovative HE system, where creativity can be taught and learned, are creative learning and innovative teaching (Ferrari, Cachia and Punie, 2009). Creative learning involves the awareness and understanding of novel ideas through focusing on thinking skills that allows a student to go beyond academic achievements. Therefore, the creative learning process focusses more on understanding than on memorisation. Creative learning is thus based on a student's empowerment and centredness. Studies have shown that creating the right creative

learning environment has the potential to raise the student's realisation, motivation, enthusiasm, their openness to new ideas; and it appears to support emotional development and social skills (Feldges, Pieczenko and Michael, 2018). Innovative teaching is a process that leads to creative learning and involves the implementation of new methods, technology, and contents, which could benefit students and their creative potential (Ferrari, Cachia and Punie, 2009). Increasingly, new media and technologies are used in formal and informal teaching and can act as a platform to foster creativity within students (Feldges, Pieczenko and Michael, 2018). However, to stimulate creativity with technology, it is important that both educators and students have a critical understanding of how to use technology to be able to benefit from it. Besides creating an environment for creative learning and innovative teaching, educators in HE need to have a clear awareness and understanding of what creativity is and what creativity entails, to fully understand how it can be taught.

An enabling creative learning environment promotes creativity in the HE institutions. To develop creative learning in HE; three important aspects should be recognised and addressed (Keller-Mathers, 2011). Firstly, a basic understanding of the dimensions of creativity is essential. Secondly, to nurture creative learning for self and others; and thirdly, a basic understanding of the diverse ways to deliberately develop creativity in HE is necessary. Through a systematic review of more than 200 scholarly education literary sources, Davies *et al.*, (2013) identified eight characteristics that promote a creative learning environment. These characteristics include the physical environment, the availability of resources and materials, the use of the outdoor environment, the pedagogical environment, role play, the correct utilisation of time, the relationships between educators and students, and also the utilisation of other environments beyond the educational environment. By recognising these characteristics, curricula can be adjusted to promote creative learning.

Innovative teaching in HE requires that educators foster a learning environment for creative learning. For educators to successfully create a climate that stimulates creative learning, the student should be at the centre of the learning process (Ferrari, Cachia and Punie, 2009). In a study amongst students at a large German university, transformational teaching, which encompasses a student-centred learning approach, was examined (Slavich and Zimbardo, 2013; Pachler, Kuonath and Frey, 2019). The results of this study confirmed that transformational teaching relates to increased trust in an educator, which in turn increases study engagement, student creativity, and objective task performance. For creativity to contribute to creative learning amongst students, curricula should allow the students the freedom and time for discovery, while also taking students' interests into account (Pachler, Kuonath and Frey, 2019). The different assessment processes should also allow for the development of both creative knowledge gaining and creative skills.

While it is evident that creativity is a significant skill that must be addressed in, HE, there are a number of challenges associated with enhancing students' creative learning processes. The rigid management practices in HE Institutions often suppress creative learning amongst students (Maclaren, 2012; Egan *et al.*, 2017). Therefore, educators struggle to change universities' inherent, systematic educational systems. Current education practices, in particular outcome-based education, have placed unnecessary emphasis on knowledge memorisation (Jackson, 2017). This has resulted in students losing their ability to think independently, thereby causing their creativity to remain latent. Furthermore, disagreements amongst educators about whether creativity is fundamentally product oriented, or process oriented within assessment is a further challenge in HE (Johnson-Laird, 1987; Egan *et al.*, 2017). Many educators also do not know how to use creativity to prepare students for the world-of-work (Azzam, 2009; Jackson, 2017; Feldges, Pieczenko and Michael, 2018).

Some Universities have attempted to measure the level of creativity and to stimulate creativity amongst their students. In one study, the level of development of creativity was assessed amongst 69 2nd and 3rd year students of educational specialties "Educational Psychology" and "Social Pedagogy and Self cognition" at the Al-Farabi KazNU, Kazakhstan (Mynbayeva, Vishnevskay and Sadvakassova, 2016). The results showed that 36.7% of the students demonstrated a high level of creativity. These students were open to new ideas and tended to solve tasks presented to them in an original way. In another study conducted at an American University, Karpova, Marcketti and Barker (2011) devised exercises that were designed to help students to experience and practice non-traditional ways of thinking, to identify opportunities, to create, to evaluate, and to promote their ideas. Both interactive and experiential learning approaches were used in these exercises. The figural format of the Torrance Test of Creative Thinking (TTCT) was used assess creativity amongst these students. The results of this study indicated that the ability to think creatively can be increased as the result of training. In 2010, students and instructors from the Department of Electrical, Electronics and System Engineering, Faculty of Engineering and Built Environment and Faculty of Information Science and Technology, of the University Kebangsaan Malaysia, participated in the Malaysian ROBOCON International Robot Contest (Ayob *et al.*, 2011). The Torrance and Safter construct-based model was used to determine whether experiential learning activities through participation in the contest stimulated creativity (Torrance and Safter, 1999; Ayob *et al.*, 2011). Initial findings suggested that students' creativity was nurtured and enhanced as a result of problem-solving processes experienced in the robot contest. In a meta-analysis of 17 studies published between 1992 and 2019, the effectiveness of interventions designed to cultivate students' scientific creativity was systematically reviewed (Bi *et al.*, 2020). The findings of this review demonstrated that problem-solving had a large effect on students' scientific creativity and scientific reasoning. In another study targeting educators and students at colleges and universities in Taiwan, it was found

that an 8-hour workshop named "2015 Creativity Workshop for Future Engineers", enhanced creative skills in 17 schools and 45 student participants (Chang and Chiu, 2016).

With the ever-changing world-of-work of the 21st century, it has become essential for HE to prepare students for this changing environment. Students have to be prepared to adapt to change, to work in jobs that may not even exist at present and face unpredictable events (Papaleontiou-Louca *et al.*, 2014). Curricula have to be revised to rather concentrate on how students use such knowledge and not focus on delivering knowledge/information. Thus, by introducing creativity, originality, and innovation into curricula, students will gain the necessary skills for the world-of-work of the 21st century. More recently the European University Association (EUA) developed the Creativity Project in 2007 that addressed five major factors that influence creativity and creative thinking (Papaleontiou-Louca *et al.*, 2014). These factors were diversity, future orientation, quality mechanisms, quality processes and learning organisations. Diversity takes into consideration aspects like, talents, interests and previous qualifications as crucial factors for fostering creativity among students and staff*;* Future orientation means that university practices should concentrate on the future rather than the past; Quality mechanisms, indicate the systems which will be used to monitor the institution's ethical and strategic choices; Quality processes focuses on the capacity to change as a way to integrate future challenges; and Learning organisations is about an institution's ability to explore the possibility for staff to reach common goals through collective and individual practices.

Many universities have recognised that curricula need to be revised so that they address the requirements of the Fourth Industrial Revolution of the 21st century. In the past, scientific concepts were addressed mainly from the perspective of science, technology, engineering, and mathematics (STEM) (van Broekhoven, Cropley and Seegers, 2020). However, there is now broad recognition that creativity is a vital 21st century skill (Cropley, 2016; Cropley, Cropley and Sandwith, 2017; van

Broekhoven, Cropley and Seegers, 2020). Many Universities are now revising their curricula so that the same scientific concepts are taught through inquiry and problem-based learning methods used in the creative process, commonly referred to as STEAM, which has been derived from science, technology engineering, art and mathematics (van Broekhoven, Cropley and Seegers, 2020). For example, the City University of London has now a master's degree in Innovation, Creativity and Leadership (the MICL). The University of Malta also offers a master's degree in Creativity and Innovation (Papaleontiou- Louca *et al.*, 2014).

2.6 Creativity stimulated through art

More recently, educators have recognised that the introduction of art-based activities in education could promote well-rounded, knowledgeable, and skilled scholars and students. Art in education provides learners with skills they will need beyond formal education, problem-solving, communication, the ability to develop new skills, to be innovative, to be flexible and adaptable to change (UNESCO, 2013). Such art-based educational curricula require students to developed works of art using a range of media, as well as participating in the performing arts (Anderson and Kachorsky, 2019; Rieger *et al.*, 2020). By introducing art-based activities in curricula, students learn how to think, to move beyond memorisation, to develop an attitude of inquiry and reflection, and to develop the ability to generate creative ideas, by thinking outside the box (Forbes and Hickey, 2009; Davis, 2013; Rieger *et al.*, 2020). Furthermore, art-based education also enhances students' cognitive development so that they are able to connect different realities through emotions that make it possible for them to empathise with issues beyond their own experiences. These cognitive skills play a major role in students' creativity, self-learning, and to understand, interpret and solve problems (de Arriba, Girardi and Vidagañ, 2019).

Increasing the art experience in education will benefit the world-of-work. For example, when students are exposed to art in education, they are able to positively influence their workplace

environment (An and Youn, 2018). These students contribute to profitability and marketing persuasiveness, external and internal company relationships, the development of leadership and organisational culture, self-discovery and personal growth, collaboration, activation of emotions and energy, and creativity through openness to new experiences and widened perspectives (van den Broeck, Cools and Maenhout, 2008; Katz-buonincontro, 2011).

2.7 Creativity assessment

It is known today that creativity can be taught, nurtured, developed, and assessed. The main purpose to measure creativity is to assess an individual's curiosity, exploration, imagination, and creative thinking (Tran *et al.*, 2017). The measurement of creativity began before the fifties in the 20th century. Guilford was the pioneer in the evaluation of intelligence in creative accomplishments (Castillo-Vergara *et al.*, 2018). Guilford (1956; 1959; 1960; 1986) coined the term "divergent thinking", which was measured in a test which he and his colleagues developed. In this test, the skills of fluency, flexibility, originality, and elaboration were used as measures of creativity (Kim, 2006; Chou, Chen and Chou, 2014; Castillo-Vergara *et al.*, 2018). Fluency assesses the number of ideas; flexibility evaluates the themes or categories in the group of ideas; and originality addresses the number of original or unusual ideas (Runco, Acar and Cayirdag, 2017). Since Guilford's seminal work, these skills have been universally assumed in the evaluation of creativity, labelling responses according to quantity and quality. Guilford's work also pioneered further development of other measuring instruments of creativity.

In the sixties of the 20th century, two tasks were developed to measure creativity. The Alternative Uses Task was created by Guilford in 1967 to measure divergent thinking. The second task, the Remote Association Task, was developed by Mednick in 1962 and measures convergent thinking (Cortes *et al.*, 2019). In the Alternative Uses Task, participants are asked to think of novel uses for an everyday object. In this task, the participants are directed to think of the most unusual, creative,

appropriate, and alternative uses in their responses, therefore participants should critically evaluate each thought and determine if it is unusual and valid (Kaplan, 2018; Cortes *et al.*, 2019). Later, Kröger *et al.*, (2013) developed a modified version of the Alternative Uses Task. In the modified version the two components originality and appropriateness are both rated separately as well as together.

In the Remote Association Task, convergent thinking is measured. In this task, participants are provided with three unrelated words and asked to add a fourth word that binds all four words into a compound association. The Remote Association Task was developed by Mednick in 1962 (Shaughnessey, 1995). For example, the three unrelated words, pine, sauce, and crab can be bound together with the word apple to produce the association of apple and pine crab sauce (Cortes *et al.*, 2019). The Remote Association Task is scored for the correctness of a response, response time, and for the number of responses in the time given. Today, a number of variations of the Remote Association Task are in use (Merten and Fischer, 1999; Besselink, 2016). These variations include the Free Single-word Association Test, the Multiple-choice Association Test, the Common Association Test, the Individual Association Test, and a rating of uncommonness in a Free Association Test.

Today, scholars are constantly seeking for more trustworthy instruments to measure creativity. However, this has proven to be a challenging task, because of a lack of consensus of how scholars define creativity (Belcher and Rubovits, 1981; Horn and Salvendy, 2006; Said-Metwaly, Van den Noortgate and Kyndt, 2018). Several tests for the measurement of creativity have been developed based on the creator's perception of the nature of creativity (Haase *et al.*, 2018) (Table 2.2). These tests measure specific cognitive processes such as divergent thinking, making of associations, construction, combination of broad categories, and working on many ideas simultaneously (Cropley, 2000). Several non-cognitive aspects of creative personal properties are also measured by these

tests, which include impulse expression, desire for novelty, risk-taking, and personal properties such as flexibility, tolerance for independence, and positive attitude to differentness. Although many tests for creativity have been developed, the Torrance Test of Creative Thinking (TTCT) is the most widely used and studied test for creativity (Cramond *et al.*, 2016; Said-Metwaly, Kyndt and Van den Noortgate, 2020).

Table 2.2 Overview of creativity tests and their test methods and types

Test	Type	Reference
One or multi-item scales (Self-assessment)		
Creative Person Scale	Verbal	CPS, 1979; Gough, 1979
Creative Climate Questionnaire	Verbal	CCQ, 1990; Ekvall, 1990; SOQ, 1990
Runco's Ideational Scale	Verbal	Runco, 2001; Lim, 2001; Plucker, 2001
Creative Self-Efficacy	Verbal	Farmer, 2002; Tierney, 2002
Creative Activity Questionnaire	Verbal	Carson et al., 2005; CAQ, 2005
Biographical Index Creativity Behaviour	Verbal	Batey, 2007; BICB, 2007
Creative Behaviour Index	Verbal	CBI, 2011; Dollinger, 2011
The Short Scale for Creative Self	Verbal	Karwowski et al., 2012; SSCS, 2012
Performance Tests Creative Process Type Idea-generation (divergent thinking, flexibility, variation)		
Duncker's Candle Problem	Figural	Duncker 1945; Lees, 1945
Alternative Uses Test	Verbal	Guilford, 1956; UUT, 1956
Remote Associate Test	Verbal	Mednick, 1962; RAT, 1962
Torrance Test of Creative Thinking	Figural and verbal	Torrance, 1966; TTCT, 1966
Amabile's Haiku Task	Verbal	Amabile, 1983
Demonstration Form of Torrance Tests	Figural and verbal	Goff, 2002; Torrance, 2002
Abbreviated Torrance Test for Adults	Verbal	Goff, 2002; Torrance, 2002
Test of Creative Thinking, Drawing Production	Figural and verbal	TCT-DP, 2004; Urban, 2004
Rebus Test	Figural and verbal	Cunningham, 2008; MacGregor, 2008
Modified version of the Alternative Uses Test	Verbal	Kröger, et al., 2013

2.7.1 Torrance Test of Creative Thinking

Since the TTCT was first published in 1966, it has become a popular way of measuring creative thinking abilities. Dr E. Paul Torrance (1915 - 2003) from Milledgeville, Georgia in the United States of America, is regarded as the "Father of Creativity," and is best known for developing the TTCT (Hébert *et al.*, 2002). Torrance's career started during his time as high school teacher in rural Georgia in 1937. Some difficult pupils, who demonstrated unconventional ideas, were sent to boarding schools by their families. Torrance noted that these pupils became successful politicians, business owners, high ranking military officials, educators in arts, science, and other fields of study, and were more than only quirky children (Cramond *et al.*, 2005). During the development of the TTCT, Torrance revised activities created by other scholars, such as Barron (1957), Flanagan (1957), Guilford (1956; 1967; 1970), as well and Wallach and Kogan (1965) (Hébert *et al.*, 2002). Since the first version of the TTCT, it has undergone five reforms; in 1974, 1984, 1990, 1998 and in 2008 (Kim, 2006; Shen and Lai, 2014).

The main purpose of the TTCT was to develop a reliable and valid test of creative thinking abilities. In the development of the TTCT, Torrance wanted to understand and nurture creative qualities, which could help people to express their creativity (Kim, 2006). Torrance suggested that the TTCT should be used to understand the function of the human mind and its development; to discover effective bases for individualising instruction; to provide clues for remedial and psychotherapeutic programmes; to evaluate the effectiveness of materials, curricula, and teaching procedures within educational programmes; as well as to stimulate the awareness of hidden potentials in individuals.

During the development of the TTCT, Torrance proposed specific standards that each activity should comply with. He suggested that the activities in the test should be in accordance with the nature or circumstances of everyday life; should be appropriate for all ages and educational levels, from kindergarten to HE; should be easy enough to make creative responses; and should be fun,

accessible to any gender, race, and different experiential backgrounds (Torrance, 1966; Hébert *et al.*, 2002). He further suggested that a testing venue should have a game-like and fun atmosphere to stimulate creative thinking and creative problem-solving. Thus, administrators of the tests should invite the examinees to enjoy the activities and view the tests as a series of fun activities, thereby reducing test anxiety (Kim, 2006).

Initially, the administration of the TTCT required lengthy testing time. For this reason, a shortened version of the TTCT, the Demonstration Form of Torrance Tests (D-TTCT), was developed in 1980 (Goff and Torrance, 2002; Shen and Lai, 2014; Mullin, 2017). The D-TTCT contained the same rationale of activities as the activities in the original TTCT but required less testing time. The success of the D-TTCT with adults led to the development of the current Abbreviated Torrance Test for Adults (ATTA).

The activities in the TTCT comprises of two different formats. The figural format (Form A) expects the examinee to think creatively with pictures, while the verbal format (Form B) expects the examinee to think creatively with words (Cramond *et al.*, 2016; Said-Metwaly, Kyndt and Van den Noortgate, 2020). The intellect model, developed by Guilford in 1950, was used to inspire the development of the activities for each of the formats of the TTCT (Shaughnessey, 1995). This Guilford model described four traits associated with creative abilities: fluency, flexibility, elaboration, and originality. Responses to activities in figural format are drawn, while responses to activities in verbal format are written or provided orally (Cropley, 2000; Kim, 2006). The benefit of the figural format is that any person from any gender and race, any language, socioeconomic status, and cultural background can complete the test (Leutner *et al.*, 2017).

The figural format of the TTCT activities comprises of three different types of activities. The picture construction type of figural activity expects that the examinee should respond with a picture

comprising of different drawn components, provided in the test (Cropley, 2000). The picture completion type of figural activity expects that the examinee completes a partially drawn picture, while the lines/circles figural activity expects that the examinee draws a picture comprising of lines and/or circles provided in the test. These different figural activities are usually scored in terms of five creative abilities: fluency, originality, elaboration, abstractness of titles, and resistance to premature closure. However, 13 additional creative abilities may be scored, which include, for example, storytelling articulateness, synthesis of incomplete figures, and fantasy (Cropley, 2000). Although there have been several revisions of the TTCT figural manual, the figural activity types of the TTCT are inherently still unchanged (Kim, 2017). A small study was conducted to access the creativity level amongst undergraduate students in the Department of Electrical, Electronics and Systems Engineering, Faculty of Engineering and Built Environment of the University Kebangsaan in Malaysia. The Figural Form A of the TTCT was administered to 18 students of which 15 were male (Ayob *et al.*, 2012). Five creativity indicators were assessed in three activities involving different responses to complete drawings. These indicators of creativity were fluency, originality, abstractness of titles, elaboration, and resistance to premature closure. The results indicated that 67% of the students had an above average creative ability. In another study, the Figural Form A of the TTCT was administered to 125 Kiswahili speaking children, aged 8–12 years old, in the poor areas of Dar es Salaam, Tanzania (Humble, Dixon and Mpofu, 2018). Owing to the pen and paper nature of the TTCT, it was conducted to ascertain whether the creativity construct of Divergent Thinking is dimensionally equivalent in an African setting to that of a Western setting. The five creativity indicators, fluency, originality, elaboration, abstractness of title, and resistance to premature closure, were also assessed in this study. The results showed that the total creativity index score was correlated with a child's birth order, fluency of English in the household and self-perceptions of the child.

Six types of activities have been devised for the TTCT activities with verbal format. These verbal activities are asking, guessing causes, guessing consequences, product improvement, unusual uses, unusual questions, and supposition (Cropley, 2000). In the TTCT, an examinee is provided with a picture for which the examinee should respond in words. The verbal activities are usually scored in terms of fluency, originality, and flexibility (Kim, 2006, 2017). In a two-part study, Wang, (2016) investigated to what extent language ability played a role in the perception of written or verbal creativity. In part one of the study, the creative ability amongst 161 native English-speaking students was compared with 33 second language English speaking students in an American University. The ATTA indicated a significant difference in creative ability between the two groups of students, showing that the mean scores of the native English-speaking students were much higher than the mean scores of the second language English speaking students. In part two of the study, 76 Chinese second language English speaking students at a Chinese University were given the TTCT. Approximately half of the students were given the TTCT in Mandarin; the other half was given the test in English. The results of this study revealed that no significant differences existed in creativity scores, showing that English ability was not a critical factor in the TTCT.

2.8 Discussion

Teachers and lecturers world-wide have recognised that creativity can be enhanced in the classroom. Creativity is an important skill for learners to master because it equips them for the world-of-work. By being more creative, graduates can make more meaningful contribution to the world-of-work. Businesses are recognising more and more the important role that highly creative people can make in their businesses. Therefore, by finding ways to enhance creativity in a curriculum should make a substantial contribution to a leaner's lifelong learning potential.

Chapter 3

Materials and Methods

3.1 Introduction

Entry level Art and Design students in the Department of Design and Studio Art at Central University of Technology, Free State, have vastly different experiences in art practice. Some have had some secondary education in art practice, while others have had no experience prior to registering for the qualification. Creativity and art skills amongst these students thus vary extensively (personal experience). This empirical study was thus undertaken to address this creativity gap amongst entry level Art and Design students by implementing a data-based decision-making instructional intervention (August *et al.*, 2010). Data-based decision-making involves collecting, analysing and interpreting data to make decisions about educationall practices (Andersen, 2020). Thus, to address the creativity gap, an intervention in the form of a Creativity Workshop Instrument was developed and implemented. Student performances in response to the intervention were evaluated in this study using quantitative methods. Initially, the entry level students were divided into two groups, referred to as the Control group and the Test group. The intention was to implement a Creativity Workshop Instrument amongst the Test group of students in an attempt to stimulate the emergence of creativity amongst these students. Therefore, the aim of this study was to devise and test a creativity workshop to stimulate, develop and enhance creative thinking and creative abilities amongst entry level art and design students in the Department of Design and Studio Art. The following overall hypothesis was thus tested in this study:

Ha: *A creativity workshop will enhance creative skills amongst entry level University art and design students*

3.2 Study design

To ascertain if an introductory workshop could enhance creative thinking amongst entry level students, this study was undertaken in four phases. Before the commencement of the four phases, a comprehensive review of the literature was undertaken to gather literary sources that provide knowledge and ideas about the stimulation of creativity in young people, and the assessment thereof. The four phases of the study include the description of the student population group in Phase 1; the preparation of the Creativity Workshop Instrument, the Creativity Test Instrument, and the rubric for the Creativity Test Instrument in Phase 2; the application of the Creativity Workshop and Creativity Test Instruments in Phase 3 and the analysis of the student performances in Creativity Test in Phase 4. Figure 3.1 provides a flow diagram of the study design of the research project.

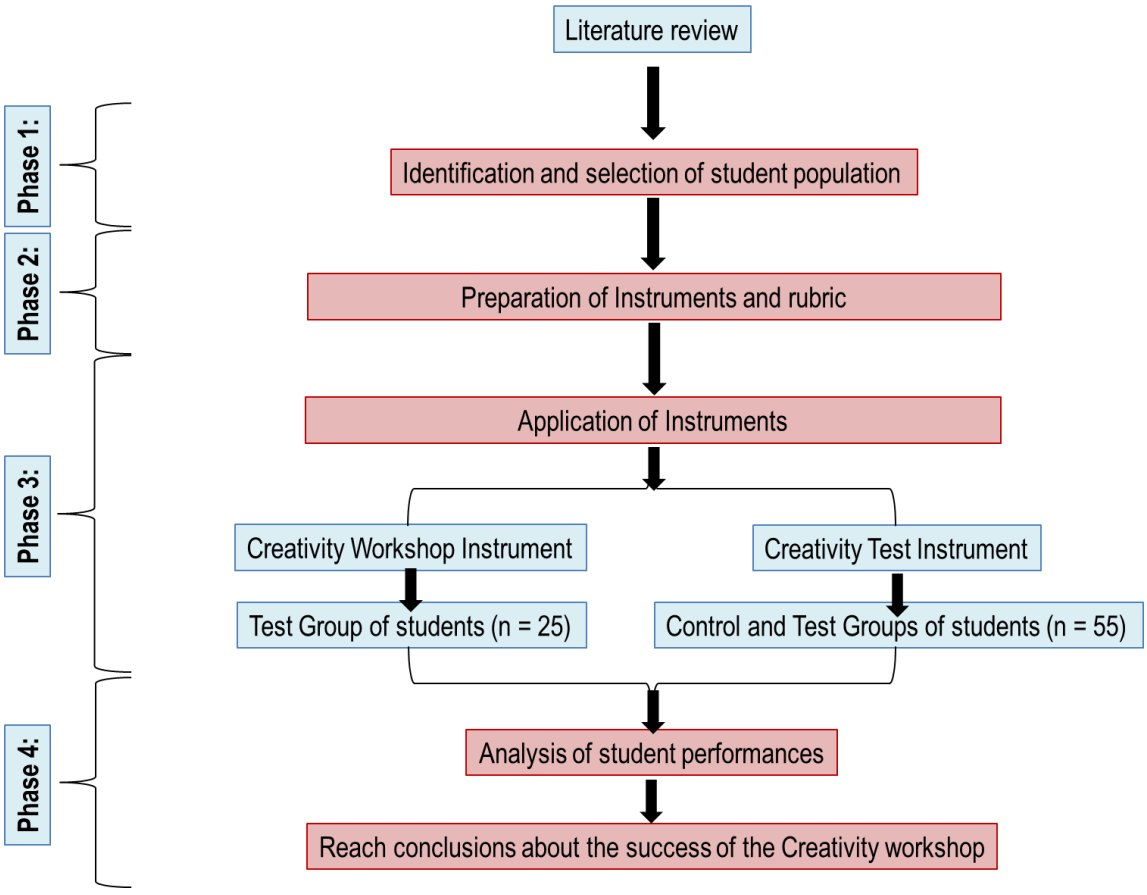


Figure 3.1 Flow diagram of the study design

3.3 Methods for Phase 1: Description of Student Population

Each year, approximately 60 first year students register for the Diploma in Design and Studio Art in the Department of Art and Design at the Central University of Technology, Free State. These entry level students were selected for this study. In the Department of Design and Studio Art, these students are usually grouped into four more or less equally sized groups for teaching purposes. Soon after registration, the students are grouped into convenience teaching groups, A, B, C and D, in a first-come-first-serve manner (Etikan, Musa and Alkassim, 2016). For this study, two more of less equally sized student groups were required; the Test group of students that would attend the Creativity Workshop and the Control group of students that would not attend the Creativity Workshop. The Test group of students was formed by combining the two convenience teaching groups A and C, while the Control group of students was formed by combining the convenience teaching groups B and D. Initially, 60 students of the two student groups started to complete the Creativity Test Instrument, however, after the tea break only 55 returned to complete the Creativity Test Instrument. Therefore, the Control group comprised of 25 students and the Test group of 30 students.

3.4 Methods for Phase 2: Preparation of Creativity Workshop Instrument, Creativity Test Instrument, and rubric

3.4.1 Development of Creativity Workshop and Creativity Test Instruments

For this study, two instruments were designed and constructed for completion by the participating entry level Art and Design students. These instruments were the Creativity Workshop and the Creativity Test Instruments. An extensive review of the literature was undertaken to find appropriate information and ideas to support the design and construction of the two instruments. From the literature search, several sources of literature were identified that provided appropriate information about creativity skills that should be covered by the activities contained in the two instruments.

Several creativity skills were identified and reviewed in a focus group discussion, comprising of the two supervisors of the study, as well as a senior academic from the Department of Design and Studio Art at the Central University of Technology, Free State. A focus group was consulted to validate the choice of creativity skills prior to the development of the instruments (de Vos *et al.*, 2011). After a lengthy discussion, the focus group suggested that 29 creativity skills should be considered when constructing the various activities of the instruments. In this study, these creativity skills were then grouped into four convenient Creativity domains: *Diverse Thinking, Creative Strengths, Innovation Skills and Practical Skills*. After grouping the creativity skills into domains, they were referred to as Creativity sub-domains. Nineteen activities were designed for the Creativity Workshop Instrument and 17 for the Creativity Test Instrument. Table 3.1 provides a list of activity types that were considered when the Creativity Workshop and the Creativity Test Instruments were designed. The table also contains the references to the literary sources that were consulted during the construction of the respective activities in the two instruments.

Table 3.1 Activity types, creativity skills and references considered during the creation of the Creativity Workshop and the Creativity Test instruments

Type of activity	Creativity skills stimulated activity type		Reference
List unusual uses for a common object.	Fluency Flexibility Originality	Internal visualisation Humour Imagination	(Dippo, 2017) (Torrance, 2018) (Rogie, no date)
Improve a common object, for example by adding unusual enhancements or solving problems.	Fluency Flexibility Originality Elaboration	Emotional expressiveness Internal visualisation Humour Product improvement	(Yamamoto, 1964) (Sumners, 2011) (Anderson, 2012) (Machado, Costa and Siqueira, 2019)
Describe imagined situations.	Fluency Flexibility Originality Resistance to premature closing Elaboration	Emotional expressiveness Storytelling articulateness Movement or action Humour Richness of imagery Imagination	(Filippetti, Krumm, and Lemos, 2015) (Torrance, 2018) (Acar *et al.*, 2019) (Rogie, no date)

Type of activity	Creativity skills stimulated activity type		Reference
List problems/ consequences for a specific situation.	Fluency Flexibility Originality Resistance to premature closing	Elaboration Unusual visualisation Humour Identify problems	(Del Marmol, 2015) (Dostál, 2015) (Rogie, no date) (Torrance, 2018)
List appropriate responses to images, for example questions, solutions, causes and consequences.	Fluency Flexibility Originality Resistance to premature closing	Emotional expressiveness Humour Identify consequences Overall observation	(Yamamoto, 1964) (Sumners, 2011) (Anderson, 2012) (Machado, Costa and Siqueira, 2019)
Create pictures by adding details.	Originality Abstractness of titles Resistance to premature closing Elaboration Storytelling articulateness Movement or action Expressiveness of titles Synthesis of incomplete figures	Synthesis of lines Unusual visualisation Internal visualisation Extending or breaking boundaries Humour Richness of imagery Colourfulness of imagery Visual association Unusual uses Combination	(Yamamoto, 1964) (Sumners, 2011) (Del Marmol, 2015) (Cramond *et al.*, 2016) (Machado, Costa and Siqueira, 2019) (Rogie, no date)
Create a drawing in response to music.	Imagination Originality		(Sumners, 2011) (Anderson, 2012) (Machado, Costa and Siqueira, 2019)
Write a short story using limited words.	Originality Humour Imagination		(Sumners, 2011) (Machado, Costa and Siqueira, 2019)

3.4.2 Development of Creativity Test Instrument rubric

A scoring guide, or rubric, was developed to grade the student performances in the Creativity Test. This rubric contained the evaluation criteria for the 17 activities that were constructed for the Creativity Test Instrument. For each activity, separate rating scales were devised for each of the Creativity sub-domains covered by the particular activity. Three different rating scale formats were devised for the different Creativity sub-domains, each consisting of different levels. These rating scale formats included a Yes/No rating scale, an element counting rating scale, as well as a

descriptive instructional rating scale. The Yes/No rating scale comprised of two levels, while both the element counting rating scale and the descriptive instructional rating scale comprised of six levels each. Evaluation criteria were devised for each of the levels of a particular rating scale of a Creativity sub-domain within a particular activity. This means that several sets of evaluation criteria, one per Creativity sub-domain, were devised for each activity based on the number of sub-domains covered by the activity. For the Yes/No rating scale, five marks were awarded for a Yes answer and zero marks for a No answer. For the element counting rating scale and the descriptive instructional rating scale, the six levels were numbered zero to five. Level 5 of the rating scale was awarded five marks, level 4 four marks, level 3 three marks, level 2 two marks, level 1 one mark, and level 0 zero marks. The evaluation criteria for all the ratings of the different activities were recorded in an Excel spread sheet.

3.5 Methods for Phase 3: Application of the Creativity Workshop and Creativity Test Instruments

The Creativity Workshop Instrument was applied to the Test group students approximately two weeks after they registered for the Diploma in Design and Studio Art. The Creativity Workshop Instrument was typed, printed in colour, and multiplied for distribution during the Workshop. The Test group of students were gathered in a lecture theatre in the Department of Design and Studio Art during the morning of the Workshop. At 09:00 hours, the students were briefed on how the Workshop would be conducted, after which they were asked to sign a letter of voluntary participation. For each of the 19 activities, a specified time was allocated ranging from seven to ten minutes. Each of the activities were started and ended with a stopwatch. After each activity, the students were encouraged to discuss amongst themselves and provide ideas about the activity for approximately five minutes. After activities six and 12, the students were allowed to take a 15-minute tea break. The Creativity Workshop took approximately four hours.

The Creativity Test Instrument was administered to both the Control group and Test group of students the day after the Creativity Workshop had taken place. Similarity to the Creativity Workshop Instrument, the Creativity Test Instrument was typed, printed in colour, and multiplied. The Creativity Test Instrument was also administered in a similar fashion to that of the Creativity Workshop Instrument; however, no discussions were permitted during the Creativity Test. In contrast to the Creativity Workshop, only one 15-minute tea break was permitted after activity eight. The Creativity Test took approximately two hours and 15 minutes.

3.6 Methods for Phase 4: Analysis of student performances in Creativity Test

Once the student performances in the Creativity Test were assessed, several comparisons were made to determine the success of the Creativity Workshop. Several Student's t-tests were performed on student scores to compare the student performances of the Control group of students with the Test group of students. The significance of the Student's t-test was determined at an α value of 0.05. Table 3.2 provides a list of the different Student's t-test comparisons that were performed on the student assessments of the Creativity Test.

Table 3.2 Student's *t*-test comparisons performed on the student performances in the Creativity Test

Comparison	Reasoning	Alternative hypothesis
1. Overall student creativity performance	To compare the mean overall student performances in the Creativity Test of the Control group of students with the Test group of students.	Overall H_a: *A creativity workshop will enhance creative skills amongst entry level University art and design students.*

Comparison	Reasoning	Alternative hypothesis
2. Student creativity performance per Creativity domain	To compare the mean student performances in the Creativity Test per Creativity domain of the Control group of students with the Test group of students.	*H_1: The Test group of students performs better than the control groups of students in the respective Creativity domains.*
3. Student creativity performance per Creativity sub-domain	To compare the mean student performances in the Creativity Test per sub-domain of the Control group of students with the Test group of students.	*H_2: The Test group of students performs better than the Control groups of students in the respective Creativity sub-domains.*
4. Student creativity performance per activity type	To compare the mean student performances in the Creativity Test per activity type and their sub-activities of the Control group of students with the Test group of students.	*H_3: The Test group of students performs better than the control groups of students in the respective activity types and their sub-activities.*

3.7 Discussion

For this study, a Creativity Workshop Instrument and a Creativity Test Instrument were designed and constructed to stimulate creativity and to assess specific creativity skills amongst entry level students in the Department of Art and Design, at the Central University of Technology, Free State. Approximately half of the students attended the Creativity Workshop; thereafter all students completed the Creativity Test. Student performances were assessed to establish if the Test group of students benefitted from the Creativity Workshop.

Chapter 4

Development of Creativity Workshop and Test Instruments

4.1 Introduction to Creativity Workshop and Test Instruments

In this study, a Creativity Workshop Instrument was devised and implemented amongst entry level students in Art and Design with the intention to stimulate the emergence of creativity amongst these students. The Test group of students attended the Creativity Workshop, exposing them to several creativity activities. The success of the Creativity Workshop was then assessed through a Creativity Test that the Test and Control groups of students had to complete. It should be noted that the Control group of students were exposed to the Creativity Workshop after the completion of the Creativity Test to ensure that no students were disadvantaged by the study. Both the Creativity Workshop and the Creativity Test Instruments were developed using creativity guidelines that were identified in the literature.

4.2 Creativity domains and sub-domains of the Creativity Workshop and Test Instruments

An extensive review of the literature was undertaken to determine which creativity skills can be used to stimulate creativity in a workshop and to assess creativity with a test instrument. From the literature, several creativity skills were identified and reviewed in a focus group discussion. These creativity skills were referred to as Creativity sub-domains. The focus group further suggested that the Creativity sub-domains should be grouped into four convenient Creativity domains describing the broad areas of creativity. The focus group also suggested the addition of five Creativity sub-domains in the Creativity domain, *Innovation Skills*, making up a total of 29 sub-domains. Table 4.1 provides a list of the Creativity domains with their respective Creativity sub-domains that supported the design of the Creativity Workshop and Test instruments.

Table 4.1 Creativity domains and sub-domains used for the development of the Creativity Workshop and Test Instruments.

Creativity domain	Creativity sub-domain	References
1. Diverse Thinking	1.1 *Fluency* 1.2 *Flexibility* 1.3 *Originality* 1.4 *Appropriateness of Titles* 1.5 *Resistance to Premature Closing* 1.6 *Elaboration*	(Yamamoto, 1964) (Sumners, 2011) (Del Marmol, 2015) (Costa, Machado and Siqueira, 2019) (Rogie, no date)
2. Creative Strengths	2.1 *Emotional Expressiveness* 2.2 *Storytelling Articulateness* 2.3 *Movement or Action* *2*.4 *Expressiveness of Titles* 2.5 *Synthesis of Incomplete Figures* 2.6 *Synthesis of Lines* 2.7 *Unusual Visualisation* 2.8 *Internal Visualisation* 2.9 *Extending or Breaking Boundaries* 2.10 *Humour* 2.11 *Richness of Imagery* 2.12 *Colourfulness of Imagery*	(Sumners, 2011) (Costa, Machado and Siqueira, 2019) (Rogie, no date)
3. Innovation Skills	3.1 *Problem-Solving* 3.2 *Identify Problems** 3.3 *Identify Questions** 3.4 *Identifying Causes** 3.5 *Identify Consequences** 3.6 *Imagination* 3.7 *Overall Observation**	(Yamamoto, 1964) (Sumners, 2011) (Anderson, 2012) (Costa, Machado and Siqueira, 2019)
4. Practical Skills	4.1 *Unusual Uses* 4.2 *Combination* 4.3 *Completion* 4.4 *Product Improvement*	(Yamamoto, 1964) (Sumners, 2011) (Olewitz, 2017)

* = Sub-domains added during the focus group discussion

4.2.1 Description of domain: *Diverse Thinking*

Diverse Thinking relates to the cognitive ability to recognise, compare, and to produce several different components or aspects (Point and Singh, 2003). Six Creativity sub-domains were categorised as part of the *Diverse thinking* domain. These Creativity sub-domains included *Fluency*, *Flexibility*, *Originality*, *Abstractness of Titles*, *Resistance to Premature Closing* and *Elaboration.* Table 4.2 provides a description of each of the six Creativity sub-domains of the *Diverse Thinking* domain.

Table 4.2 Description of the Creativity sub-domains of the *Diverse Thinking* domain.

	Sub-domain	Description/definition	References
1.	**Fluency**	Fluency relates to the number of relevant responses, which may include figures or words.	(Filippetti, Krumm and Lemos, 2015) (Torrance, 2018) (Acar *et al.*, 2019)
2.	**Flexibility**	Flexibility relates to the number of different components or aspects in relevant responses. Therefore, flexibility relates to the variety and diversity of ideas and different conceptual categories.	(Acar *et al.*, 2019)
3.	**Originality**	Originality relates to the ability to produce uncommon and/or unique responses, which requires creative strength. Therefore, Originality can be anything that leads to new knowledge that challenges conventional thinking.	(Filippetti Krumm and Lemos, 2015) (Torrance, 2018) (Acar *et al.*, 2019) (Sánchez, Makkonen and Williams, 2019)
4.	**Appropriateness of Title**	Appropriateness of a title relates to the ability to capture the essence of the information involved in the image in the title. Therefore, Appropriateness of a title is the cognitive ability to know what is important, and to enable the viewer to see the picture more deeply and richly.	(Filippetti Krumm and Lemos, 2015) (Torrance, 2018)
5.	**Resistance to**	Resistance to premature closing relates to the degree of	(Filippetti, Krumm and

	Sub-domain	Description/definition	References
	Premature Closing	openness to go beyond the most logical way to complete a figure, therefore making a mental leap that enables original ideas.	Lemos, 2015) (Torrance, 2018)
6.	**Elaboration**	Elaboration relates to the ability to develop, embroider and embellish the basic figure/object/response and also the surrounding space around the figure/object/response. Therefore, Elaboration is the ability to developed details of the process, theory, policy, or system in further detail.	(Filippetti Krumm and Lemos, 2015) (Torrance, 2018) (Acar *et al.*, 2019) (Rogie, no date)

4.2.2 Description of domain: *Creative Strengths*

The *Creative Strengths* domain focuses on the ability to use imagination to generate new ideas from a unique perspective in image development. For the domain, *Creative Strengths*, twelve Creativity sub-domains were identified in the literature. These Creativity sub-domains included sub-domains that addressed *Storytelling*, *Synthesis of Actions*, *Visualisation*, and emotional aspects, such as *Emotional Expressiveness*, *Expressiveness of Titles*, *Humour* and *Colourfulness of Imagery*. In Table 4.3 are descriptions of the twelve Creativity sub-domains of the *Creative Strength's* domain.

Table 4.3 Description of the Creativity sub-domains of the *Creative Strengths* domain.

	Sub-domain	Description/definition	References
1.	**Emotional Expressiveness**	Emotional expressiveness relates to the ability to communicate feelings and emotions, verbally or nonverbally, through drawings and titles. Nonverbal cues in pictures include facial expressions, body language, gestures with hands, facial expressions, tears, kissing and outstretched arms. Verbal cues in titles include words such as sad, happy, joy,	(Robinson, 2007) (Stecker, 2010) (Torrance, 2018)

	Sub-domain	Description/definition	References
		anger, surprise, fear and disgust.	
2.	**Storytelling Articulateness**	Storytelling articulateness relates to the ability to communicate an idea clearly and powerfully or tell a story by providing some kind of environment and sufficient detail to put things into context. Therefore, Storytelling articulateness is more than providing facts and includes figural and/or verbal indicators of the object's history or story. Emotions are a fundamental aspect of Storytelling articulateness.	(Howard, 2011) (Lugmayr *et al.*, 2017) (Torrance, 2018)
3.	**Movement or Action**	Movement or action relates to the ability to include movement or action in the figure/object/response. Through Movement or action cues, the sense of motion is amplified.	(Torrance, 2018) (Rogie, no date)
4.	**Expressiveness of Title**	Expressiveness of a title relates to the ability to go beyond a simple description, thereby communicating something about the picture(s) that the graphic cues, alone, do not express without the title. Therefore, Expressiveness of title indicates the ability to transform visual information into emotions and feelings, expressed in words.	(Torrance, 2018)
5.	**Synthesis (mixture) of Incomplete Figures**	Synthesis of incomplete figures relates to the ability to combine two or more incomplete figures. The combination of two or more figures departs from the commonplace and established, thereby indicating the ability to see relationships between diverse and unrelated elements.	(Torrance, 2018)
6.	**Synthesis (mixture) of Lines**	Synthesis of lines relates to the ability to combine two or more sets of lines.	(Torrance, 2018)
7.	**Unusual Visualisation**	Unusual visualisation relates to the ability to cognitively see and practically present ideas/figures or objects in a view that is uncommon.	(Torrance, 2018) (Rogie, no date)
8.	**Internal Visualisation**	Internal visualisation relates to the ability to visualise beyond exteriors and pay attention to the internal, dynamic	(Torrance, 2018)

	Sub-domain	Description/definition	References
		workings of things. Therefore, Internal visualisation relates to the representation of an object/figure inside or in cross section.	
9.	**Extension or Breaking of Boundaries**	Extending or breaking of boundaries relates to the ability to extend lines, up, down, out or over boundary lines. Therefore, Extending or breaking of boundaries relates to permit the mind to make mental leaps away from the obvious and commonplace.	(Torrance, 2018) (Rogie, no date)
10.	**Humour**	Humour relates to the ability to represent unusual combinations and surprises such as absurdity in human behaviour, hyperbole, jokes and unusual world lay.	(Torrance, 2018)
11.	**Richness of Imagery**	Richness of imagery relates to the ability to add variety, vividness, liveliness and intensity to the represented imagery.	(Torrance, 2018) (Rogie, no date)
12.	**Colourfulness of Imagery**	Colourfulness of imagery relates to the ability to excite or activate the senses by adding touch, smell, sight, flavour, earthiness, the unreal, spooky, nudes and fantasy from literature, television, movies, etc.	(Torrance, 2018)

4.2.3 Description of domain: *Innovation skills*

Innovation Skills allow individuals to become innovative in what they do. These skills are usually a combination of functional skills, cognitive skills, behavioural skills, and technical skills. Innovation skills thus allow an individual to practice basic skills such as reading and numeracy, to think creatively and critically; to solve problems and manage risk; and to execute high level of technical performances (Spinoglio, 2015). Seven Creativity sub-domains were identified in the literature for the domain *Innovation Skills*. These Creativity sub-domains focus on imagination and the cognitive

ability to identify, for example, problems, questions, causes and consequences. A description of each of the seven Creativity sub-domains of the *Innovation Skills* domain is provided in Table 4.4.

Table 4.4 Description of the Creativity sub-domains of the *Innovation skills* domain.

	Sub-domain	Description/definition	References
1.	**Problem-Solving**	Problem-solving relates to the ability to determine the source of a problem and find an effective solution. Therefore, Problem-solving can be described as a cognitive process where logic, as well as imagination is used to make sense of a situation and come up with an intelligent solution.	(Dostál, 2015) (Stoeffler *et al.*, 2020)
2.	**Identify Problems**	Identify problems relates to the ability to recognise dissatisfaction, obstructions, and inner conflict in a particular situation.	(Dostál, 2015)
3.	**Identify Questions**	Identify questions relates to the ability to request information through a question about a particular situation.	(Groenendijk and Stokhof, 2017) (Lewis, no date)
4.	**Identify Causes**	Identify causes relates to the ability to identify the cause(s) that gives rise to an action, phenomenon, or condition.	(Cambridge Dictionary, no date) (Merriam-webster Dictionary, no date)
5.	**Identify Consequences**	Identify consequences relates to the ability to identify the consequence, result or effect of an action or condition.	(Cambridge Dictionary, n. d.) (Merriam-webster Dictionary, n. d.) (Oxford Dictionary, no date)
6.	**Imagination**	Imagination relates to the cognitive ability to form new ideas, images or concepts by combining elements and forming mental images of something not present to the senses.	(Smolucha and Smolucha, 1986) (Møller, 2015)
7.	**Overall Observation**	Overall observation relates to the action or process of closely observing, monitoring, or recording significant details of something or someone's behaviour.	(Takyi, 2015) (Oxford Dictionary, n. d.)

4.2.4 Description of domain: *Practical Skills*

The *Practical Skills* domain in this study relates to practical ways to develop images. Four practical-based Creativity sub-domains were identified within the domain of *Practical Skills*. These sub-domains included *Unusual Uses*, *Product Improvements*, and the *Combination* and *Completion* of processes. Table 4.5 provides a description of each of these practical-based Creativity sub-domains of the *Practical Skills* domain.

Table 4.5 Description of the Creativity sub-domains of the *Practical Skills* domain.

	Sub-domain	Description/definition	References
1.	**Unusual uses**	Unusual uses relate to the cognitive ability to list nonobvious uses for a common object.	(Dippo, 2017)
2.	**Combination**	Combination relates to the ability to join or mix two or more things together to form a single unit.	(Oxford Dictionary, n. d.)
3.	**Completion**	Completion relates to the act of guiding a process to the state of being complete.	(Oxford Dictionary, n. d.)
4.	**Product Improvement**	Product improvement relates to the ability to add modifications to a product or manufacturing process, and/or to enhance the product or manufacturing process.	(Oxford Dictionary, n. d.)

4.3 Creativity Workshop Instrument

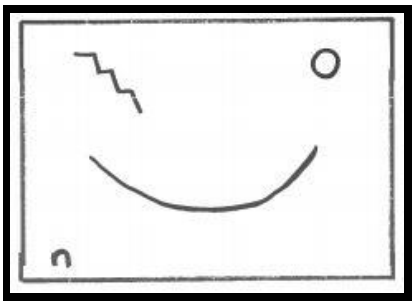
A Creativity Workshop Instrument was devised to stimulate creativity amongst the Test group of entry level art and design students at CUT. The Creativity Workshop Instrument was devised so that it addressed the creativity skills described in the Creativity sub-domains of the four Creativity domains identified for this study. The Creativity Workshop Instrument comprised of 19 different activities probing a student for a written and/or drawing response. In some instances, an object was displayed in front of the class (for example Activity 2), while in other cases a student has to visualise

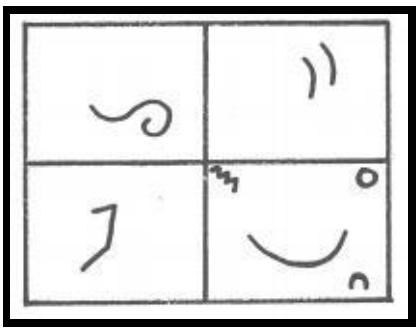
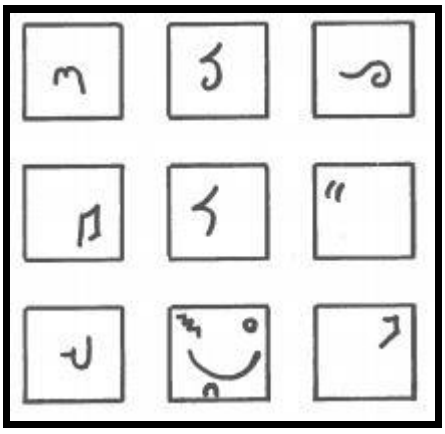
an object from memory (for example Activity 3). Table 4.6 shows the 19 activities of the Creativity Workshop Instrument.

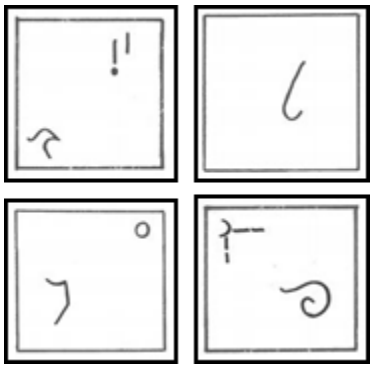
Table 4.6 Composition of the Creativity Workshop Instrument.

Activity number	Activity	Sub-domain assessed
1.	Listen to a short music piece. Now draw the first thing that pops into your mind.	Imagination
2.	Think of as many possible uses for this common empty, Lucky Star, pilchards (fish) can. 	Fluency, Flexibility, Originality, Internal Visualisation, Humour, and Imagination
3.	Turn rubbish into gold! What else can you do with a newspaper and an empty toilet roll?	Fluency, Flexibility, Originality, Internal Visualisation, Humour Imagination, and Problem-Solving

Activity number	Activity	Sub-domain assessed
4.	Make the unremarkable remarkable. 1. Examine the object in front of the class. 2. Through imagination, reposition this object from the class into your home. 3. Place it in your home in such a manner that it has a surprising new purpose. 4. Describe the purpose that you have imagined for this object in your home. 5. Describe the object that you see here in front of the class. 	Fluency, Flexibility, Originality, Internal Visualisation, Problem-Solving, Humour, and Imagination
5.	1. Pick a word from the list below and write it in the space provided. 2. Now add to that word, the word above and the word below in the list. 3. Write a short story using these three words. List of words: • Face • Mr. Brown • Drawing • Confusing • Misplaced • Duck	Originality, Humour, and Imagination
6.	This is a team activity. *(Two boxes, labelled; Business and World needs, will be displayed in the front of the workshop venue. The box named Brand Name Business contains index cards with the names of major businesses written on them. The box named World Needs contains index cards with specific world needs written on them.* 1. Each team must randomly choose an index card from the **major brand name business box.** 2. Each team must randomly choose an index card from the **world needs box**.	Fluency, Flexibility, Originality, Internal Visualisation, Problem-Solving, Humour, and Imagination

Activity number	Activity	Sub-domain assessed
	3. The major brand name business index card provides the name of the company that your team works for. 4. **Through discussion amongst your team members**, propose an improvement of one of your company's products so that it addresses the world need mentioned on your world needs index card. Attempt to develop the product's features and/or benefits so that it serves the target audience mentioned on the world needs index card.	
7.	In the space below, list as many possibilities for the following day: Suppose you could be a **superstar for one day**; what possible things could happen to you? Try to think out of the box. Do not be afraid to guess.	Fluency, Flexibility, Originality, Resistance to Premature Closing, Elaboration, Emotional Expressiveness, Storytelling Articulateness, Movement or Action, Humour, Richness of Imagery, and Imagination
8.	In the square below, add lines to create your own picture(s).  Write down a title for your picture:	Originality, Abstractness of Titles, Resistance to Premature Closing, Elaboration, Movement or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Combination, and Completion
9.	In the four squares below, add lines to create your own picture(s).	Originality, Abstractness of Titles, Resistance to Premature Closing, Elaboration, Movement or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines,

Activity number	Activity	Sub-domain assessed
	 Write down a title for your picture:	Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Combination, and Completion
10.	In the squares below, add lines to create your own picture(s).  Write down a title(s) for your picture(s):	Originality, Abstractness of Titles, Resistance to Premature Closing, Elaboration, Movement or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Combination, and Completion
11.	View the **list of potential titles** below. **For each square** select one title from the list that inspires you to create a complete picture in the square. *List of potential titles:* Happy as a bird What in the world? It is human nature Is there a doctor in the building? The art of noise, What's that smell?	Originality, Abstractness of Titles, Resistance to Premature Closing, Elaboration, Movement, or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Problem-Solving, Colourfulness of Imagery, Combination, and Completion

Activity number	Activity	Sub-domain assessed
	 Write down your selected title for each square, and complete your pictures	
12.	In the open space below, draw object(s) and/or figure(s) using the following shapes; together with any additional details you wish to add. You may also include words. Add catchy titles to your object(s) and/or figure(s) that you drew. 	Originality, Abstractness of Titles, Resistance to Premature Closing, Elaboration, Storytelling Articulateness, Movement or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Visual Association, Unusual Uses, and Combination
13.	You must complete as many diamond shapes with a small picture as fast as possible.	Originality, Resistance to Premature Closing, Elaboration, Movement or Action, Unusual Visualization, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, and Completion

Activity number	Activity	Sub-domain assessed
		
14.	Write down one colour for each of the following words that best represents that word. There is no wrong answer. Lazy Happy Loud Soft	Visual and Verbal Association, and Imagination
15.	1. View the picture below. 2. Think of as many possible appropriate questions that suits the picture. 3. Write down these questions in the space provided. 	Fluency, Flexibility, Originality Resistance to Premature Closing, Emotional Expressiveness, Humour, Identify Questions, and Overall Observation
16.	1. View the picture below. 2. Think of as many possible reasons or things that could have caused the action shown in the picture. 3. Write down these reasons or things in the space provided. 	Fluency, Flexibility, Originality Resistance to Premature Closing, Emotional Expressiveness, Humour, Identifying Causes, and Overall Observation

Activity number	Activity	Sub-domain assessed
17.	1. View the picture below. 2. Think of as many possible consequences that could follow the event shown in the picture. 3. Write down these possible consequences in the space provided. 	Fluency, Flexibility, Originality Resistance to Premature Closing, Emotional Expressiveness, Humour, Identify Consequences, and Overall Observation
18.	In the space provided, list all the possible consequences that you can think of for this unlikely event or condition. What would happen if the language of birds and animals could be understood by humans?	Fluency, Flexibility, Originality, Resistance to Premature Closing, Emotional Expressiveness, Humour, and Identify Consequences
19.	In the space provided, list as many problems that you can identify for this situation: What would happen, if all the shoes in the world were the same size?	Fluency, Flexibility, Originality, Resistance to Premature Closing, Elaboration, Unusual Visualisation, Humour, and Identify Problems

4.4 Creativity Test Instrument

A Creativity Test Instrument was composed to test the creativity skills of all the participants in this study. This Creativity Test Instrument was completed by the Control and the Test groups of the entry level art and design students. The Creativity Test Instrument comprised of 17 activities addressing different Creativity sub-domains of the four Creativity domains identified for this study. For ease of reading the Creativity Test Instrument, the 17 activities were grouped into four activity types as described in Table 4.7.

Table 4.7 Description of the four activity types of the Creativity Test Instrument.

Activity type	Description of activity type	Activity number	Sub-activity within activity type
Improvisation	Improvisation is the cognitive skill to be open to new viewpoints and actions that have not yet been realised. This skill includes, for example, the action of making or doing something not planned, beforehand, and using whatever can be found to produce an art form (Borgo, 2015).	1. 2. 3.	Unusual Uses for a Doll Hand Possibilities for Being Invisible Product Improvement of Soft Toy
Image Development	Image development consists of activities to develop an image. These activities include, for example, distortion, elaboration, magnification, multiplication, reversal, and rotation (Grandstaff, 2012).	4. 5. 6. 7. 8.	Adding Details to Large Block Adding Details to Medium Blocks Adding Details to Small Blocks Combining Shapes for Design Using cut out Shape for Design
Object Repetition	Object repetition consists of activities that use specific shapes repeatedly within an activity space. These activities include, for example, the repetition of one object or shape or to combine repeated object or shapes (Getty, 2011).	9. 10.	Adding Details to Cylinders Adding Details to Separate Lines
Problem-Solving	Problem-solving relates to cognitive processes where logic and imagination are used to finding solutions to difficult or complex problems. These processes include, for example,	11. 12. 13. 14. 15. 16.	Solving Mother Hubbard's problem Question Activity Reason activity Consequence Activity 1 Consequence Activity 2 List Problems

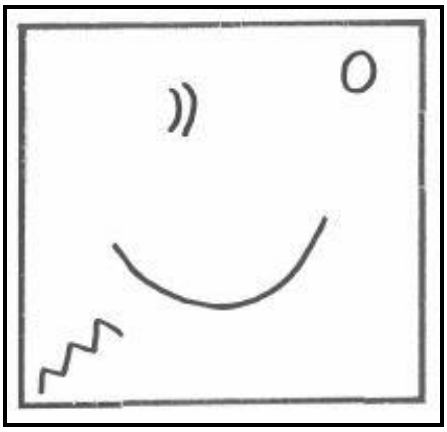
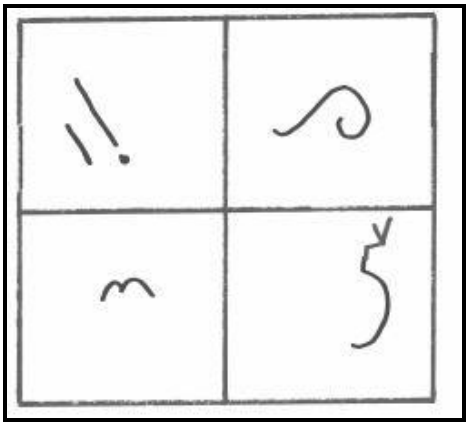
Activity type	Description of activity type	Activity number	Sub-activity within activity type
	abstraction, searching, learning, decision making, inference, analysis, and synthesis (Qiu *et al.*, 2008).	17.	Candle Problem

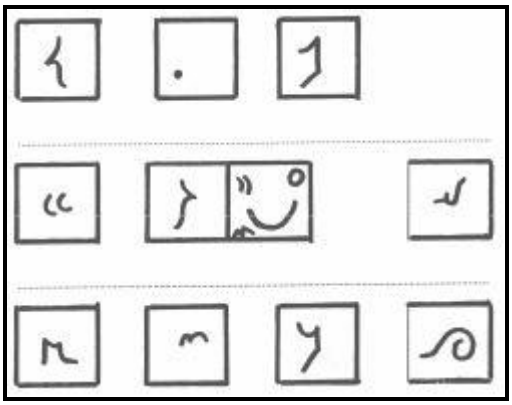
The 17 activities probed for by the Creativity Test Instrument addressed similar actions as what was probed by the Creativity Workshop Instrument. In the Creativity Test Instrument, the entry level art and design students of the Control and the Test groups were asked provide written and/or drawing responses to the 17 activities that addressed the respective sub-domains of the four creativity domains. Table 4.8 shows the 17 activities of the Creativity Test Instrument.

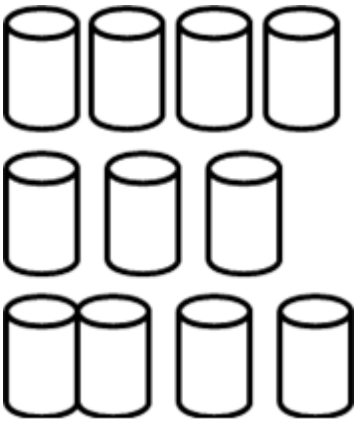
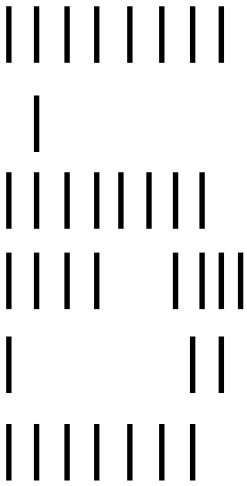
Table 4.8 Composition of the Creativity Test Instrument.

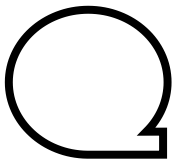
Activity number and name	Activity	Sub-domain assessed
1. Unusual uses for a doll hand	In the space below, list the most interesting, cleverest, and most unusual uses that you can think of for the object on the table in front of the class. Try to think out of the box.  What is the conventional name for the object on the table? ……..... You have 7 minutes to complete this activity.	Fluency, Flexibility, Originality, Internal Visualisation, Humour, and Imagination Unusual Uses

Activity number and name	Activity	Sub-domain assessed
2. Product improvement of soft toy	In the space below, list the most interesting, cleverest, and most unusual ways that you can use to improve on this child's toy displayed in front of the class; so that a child will have more fun when playing with it. What does one call the toy on the table in front of the class?  You have 7 minutes to complete this activity.	Fluency, Flexibility, Originality, Elaboration, Emotional Expressiveness, Internal Visualisation, Humour, and Product Improvement
3. Possibilities for being invisible	In the space below, list as many possibilities for the following day: Suppose you could be invisible for one day; what possible things could happen to you? Try to think out of the box. Do not be afraid to guess. You have 8 minutes to complete the activity.	Fluency, Flexibility, Originality, Resistance to Premature Closing, Elaboration, Emotional Expressiveness, Storytelling Articulateness, Movement or Action, Humour, Richness of Imagery, and Imagination
4. Adding details to large block	By adding additional details with your pencil to the figures in the box below, create your own picture or pictures. Try to think out of the box. Remember to provide titles to your pictures.	Originality, Abstractness of Titles, Resistance to Premature Closing, Elaboration, Movement or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery,

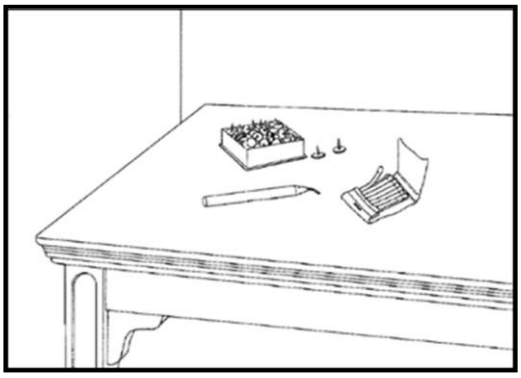
Activity number and name	Activity	Sub-domain assessed
	 You have 8 minutes to complete the activity.	Colourfulness of Imagery, Combination, and Completion
5. Adding details to medium blocks	By adding additional details with your pencil to the figures in the boxes below, create your own picture or pictures. Try to think out of the box. Remember to provide titles to your pictures.  You have 8 minutes to complete the activity.	Originality, Abstractness of Titles, Resistance to Premature Closing, Elaboration, Movement or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Combination, and, Completion

Activity number and name	Activity	Sub-domain assessed
6. Adding details to small blocks	By adding additional details with your pencil to the figures in the boxes below, create your own picture or pictures. Try to think out of the box. Remember to provide titles to your pictures.  You have 10 minutes to complete the activity.	Originality, Abstractness of Titles, Resistance to Premature Closing, Elaboration, Movement or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Combination, and Completion
7. Combining shapes for design	In the open space below, draw object(s) and/or figure(s) using all or some of the following shapes, together with any additional details you wish to add. You may also add words. Try to think out of the box. Remember to provide your picture a title.  You have 10 minutes to complete the activity.	Originality, Abstractness of Titles, Resistance to Premature Closing, Elaboration, Storytelling Articulateness, Movement or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Visual Association, Unusual Uses, and Combination

Activity number and name	Activity	Sub-domain assessed
8. Adding details to cylinders	By adding additional details with your pencil to the shapes below, create your own picture or pictures. Try to think out of the box. Remember to provide your pictures titles.  You have 10 minutes to complete the activity.	Fluency, Flexibility, Originality, Abstractness of Titles, Resistance to Premature Closing, Elaboration, Movement or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Unusual Uses, Combination
9. Adding details to separate lines	By adding additional details with your pencil to the shapes below, create your own picture or pictures. Try to think out of the box. Remember to provide your pictures titles.  You have 10 minutes to complete the activity.	Fluency, Flexibility, Originality, Abstractness of Titles, Resistance to Premature Closing, Elaboration, Movement, or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Unusual Uses, and Combination

Activity number and name	Activity	Sub-domain assessed
10. Using cut out shape for design	Cut out the shape from the piece of paper that has been handed out to you. Now, imagine a picture in which this shape is part of. Paste the shape in the blank space below and complete the picture that you had imagined. Try to think out of the box. Remember to provide your picture a title on the line below.  You have 10 minutes to complete the activity.	Originality, Abstractness of Titles, Resistance to Premature Closing, Elaboration, Storytelling Articulateness, Movement or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Visual association, Unusual Uses, and Combination
11. Solving Mother Hubbard's problem	In the space below, list as many **solutions** you could think of to solve Mother Hubbard's problem in the following nursery rhyme. Try to think out of the box. Don't be afraid to guess. **Nursery rhyme:** Old Mother Hubbard Went to the cupboard To get her poor doggie a bone When she got there The cupboard was bare So, the poor little doggie had none You have 10 minutes to complete the activity.	Fluency, Flexibility, Originality, Resistance to Premature Closing, Elaboration, Emotional Expressiveness, Humour, Problem-Solving, and Identify roblems
12. Consequence figural activity	In the space below, write down all the possible **questions** that you can think off, when viewing the picture below. Try to think out of the box. Don't be afraid to guess.  You have 10 minutes to complete the activity.	Fluency, Flexibility, Originality, Resistance to Premature Closing, Emotional Expressiveness, Humour, Identify Consequences, and Overall Observation

Activity number and name	Activity	Sub-domain assessed
13. Reason figural activity	In the space below, list as many possible **reasons (things)** that could have caused the action shown in the picture below. Try to think out of the box. Don't be afraid to guess.  You have 10 minutes to complete the activity.	Fluency, Flexibility, Originality, Resistance to Premature Closing, Emotional expressiveness, Humour, Identify Consequences, and Overall Observation
14. Consequence figural activity	In the space below, list as many possible **consequences** that may follow after the event shown in the picture below. Try to think out of the box. Don't be afraid to guess.  You have 10 minutes to complete the activity.	Fluency, Flexibility, Originality, Resistance to Premature Closing, Emotional Expressiveness, Humour, Identify Consequences, and Overall Observation
15. Consequence verbal activity	In the space below, list all of the possible **consequences** that you can think of for the unlikely event listed below. Try to think out of the box. Do not be afraid to guess. **What would happen if humans where only 30 cm tall?** You have 10 minutes to complete the activity	Fluency, Flexibility, Originality, Resistance to Premature Closing, Elaboration Unusual Visualisation, Humour, and Identify Consequences
16. List problems	In the space provided, **list as many problems** that you can identify for this everyday situation. Think out of the box. **Situation: Doing homework while going to CUT in the morning.** You have 10 minutes to complete the activity	Fluency, Flexibility, Originality, Resistance to Premature Closing, Elaboration, Unusual Visualisation, Humour, and Identify Problems

Activity number and name	Activity	Sub-domain assessed
17. Candle problem	View the picture below. In the space below the picture, write down how you would attach the lit candle to the wall, while ensuring that no wax will fall on the table. Try to think out of the box.  You have 10 minutes to complete the activity.	Resistance to Premature Closing, Unusual Visualisation, Internal Visualisation, Unusual Uses, Problem-Solving, Combination, Product Improvement, and Overall Observation

4.5 Discussion

A total of 29 Creativity sub-domains, belonging to four Creativity domains were identified for this study. These Creativity sub-domains formed the foundation for the creation of a Creativity Workshop Instrument that was developed to stimulate creativity skills amongst entry level Art and Design students. This instrument comprised of 19 activities covering all four Creativity domains and Creativity sub-domains of creativity skills. A similar Creativity Test Instrument was also developed to assess the success of the Creativity Workshop. The Test Instrument comprised of 17 activities, also covering all four Creativity domain and sub-domains of creativity skills.

Chapter 5

Rubrics for the Creativity Test Instrument

5.1 Introduction

Seventeen activities were developed for the Creativity Test Instrument. These activities were grouped into four activity types: *Improvisation*, *Image Development*, *Object Repetition* and *Problem-Solving*. Each of these activities addressed the four Creativity domains, referred to as *Diverse Thinking Skills*, *Creative Strengths*, *Innovation Skills* and *Practical Skills*. To assess the creativity skills level amongst entry level students in Art and Design, rubrics were developed to assess the different activities of the Creativity Test Instrument. For the respective activities, three different formats of rating scales were devised, each consisting of different levels. These rating scale formats included a Yes/No rating scale, an element counting rating scale, as well as a descriptive instructional rating scale. The Yes/No rating scale comprised of two levels, while both the element counting rating scale and the descriptive instructional rating scale comprised of six levels each. Most of the rubrics of the activities comprised of the element counting rating scale format and the descriptive instructional rating scale format, while a few rubrics comprised of the Yes/No rating scale format. Table 5.1 lists the 17 activities according to activity type *Improvisation*, *Image Development*, *Object Repetition* and *Problem-Solving*. Because the rubrics and their mark allocations are relatively similar, comprehensive, and awkward to present in a crisp manner, one example for each activity type is presented in this chapter. These examples are marked with an asterisk in Table 5.1. The complete set of rubrics are presented in Appendix A

Table 5.1 Listing of activity groups and sub-activities within each group

Activity type name	Activity
Improvisation	1. Unusual Uses for a Doll Hand
	2. Product Improvement of Soft Toy
	3. **Possibilities for Being Invisible***
Image Development	4. Adding Details to a Large Block
	5. Adding Details to Medium Blocks
	6. Adding Details to Small Blocks
	7. Combining Shapes for Design
	8. **Using cut out Shape for Design***
Object Repetition	9. **Adding Details to Cylinders***
	10. Adding Details to Separate Lines
Problem-Solving	11. Solving Mother Hubbard's problem
	12. **Question Activity***
	13. Reason Activity
	14. Consequence Activity 1
	15. Consequence Activity 2
	16. List Problems
	17. Candle Problem

*= Activities for which rubrics are presented as examples in this chapter.

5.2 Rubrics and mark allocation for Activity 3 for Improvisation

For the *Improvisation* activity type, several rubrics were devised for the example activity, namely *Activity 3: Possibilities for being invisible*. This activity requested that a student presents as many possible actions in the imaginary situation of being invisible. In this activity, 10 sub-domains, belonging to the four creativity capability domains, were assessed. Student responses were assessed mostly in terms of descriptive instructional rating scales for the different sub-domains addressed in this activity. On other hand, the rubrics for the sub-domains: *Fluency*, *Flexibility*, *Emotional Expressiveness* and *Movement or Action*, involved the counting of the number of possibilities that a student listed. For example, for the sub-domain *Emotional Expressiveness*, the number of nonverbal and verbal emotional indicators listed by a student was counted. Nonverbal emotional indicators included responses such as facial expressions, gestures with hands, a tear, kissing, and outstretched arms, while verbal emotional indicators included words such as sad, happy, joy, cry and anger that appeared in the titles of the student responses, as well as in the written text of the responses. Table 5.2a provides a description of the rubrics for the different sub-domains addressed in *Activity 3*, while Table 5.2b describes the mark allocation linked to each rubric.

Table 5.2 Rubrics and mark allocation for *Activity 3: Possibilities for being invisible*.

a. Rubrics

Rating Scale		0 (Insufficient) 0%	1 (Partially sufficient) $0 < x \leq 25\%$	2 (Average) $25 < x \leq 50\%$	3 (Above average) $50 < x \leq 75\%$	4 (Satisfactory) $75 < x < 100\%$	5 (Outstanding) 100%
Sub-domain	**Number/degree/ presence**						
Fluency	Number of responses	1 or 0	3 or 2	5 or 4	7 or 6	8 or 9	more than 9
Flexibility	Number of categories	0	1	2	3	4	5 or more
Originality	Number of original elements	Response is common and familiar. Originality is absent.	Response demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.
Resistance to Premature Closing	Degree of open-minded ness	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way.	Presents only the most logical and expected way to solve the problem or to complete the figure.	Presents some degree of openness but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to complete the figure.	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure.	Presents an incomplete solution to the problem or an incomplete the figure but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.
Elaboration	Degree of elaboration	Detail is absent.	Indication of an attempt to add detail.	Detail is minimal.	Detail average, but not extensive nor well-developed.	Detail is extensive but not well-developed.	Detail is extensive and developed.
Emotional Expressiveness	Number of nonverbal/verbal	0 or 1	2	3	4 or 5	6 or 7	8 or more

Rating Scale		0 (Insufficient) 0%	1 (Partially sufficient) 0 < x ≤ 25%	2 (Average) 25 < x ≤ 50%	3 (Above average) 50 < x ≤ 75%	4 (Satisfactory) 75 < x <100%	5 (Outstanding) 100%
Sub-domain	**Number/degree/ presence**						
	emotional indicators						
Storytelling Articulateness	Number of figural and/or verbal indicators	Figural and/or verbal indicators are absent.	Indication of an attempt of figural and/or verbal indicators to create a (hi)story for the object.	Figural and/or verbal indicators are minimal to create a (hi)story for the object.	Figural and/or verbal indicators are average, but not enough to create a (hi)story for the object.	Figural and/or verbal indicators are broad but not well-developed to create a (hi)story for the object.	Figural and/or verbal indicators are extensive and developed to create a (hi)story for the object.
Movement or Action	Number of figural and/or verbal indicators	0	1	2	3	4	5
Humour	Presence of humour elements	Humour elements are absent.	Indication of an attempt to add humour elements.	Minimal humour elements are added.	Humour elements are average, but not extensive nor well-developed.	Humour elements are extensive but not well-developed.	Humour elements are extensive and well-developed.
Imagination	Degree of imagination present within the response	Imagination is absent.	Indication of imagination is present.	Degree of imagination is minimal.	Degree of imagination is average, but not extensive nor well-developed.	Degree of imagination is extensive but not well developed.	Degree of imagination is extensive and well developed.

b. Mark allocation

Mark allocation									
Diverse thinking skills domain					Creative strengths domain		Innovation skills domain		
Fluency	**Flexibility**	**Originality**	**Resistance to Premature Closing**	**Elaboration**	**Emotional Expressiveness**	**Storytelling Articulateness**	**Movement or Action**	**Humour**	**Imagination**
0 if x = 0 or 1	0 if x = 0	0 if x = 0	0 if x = 0	0 if x = 0	0 if x = 0 or 1	0 if x = 0	0 if x = 0	0 if x = 0	0 if x = 0
1 if x = 2 or 3	1 if x = 1	1 if 0 < x ≤ 25%	1 if 0 < x ≤ 25%	1 if 0 < x ≤ 25%	1 if x = 2	1 if 0 < x ≤ 25%	1 if x = 1	1 if 0 < x ≤ 25%	1 if 0 < x ≤ 25%
2 if x = 4 or 5	2 if x = 2	2 if 25 < x ≤ 50%	2 if 25 < x ≤ 50%	2 if 25 < x ≤ 50%	2 if x = 3	2 if 25 < x ≤ 50%	2 if x = 2	2 if 25 < x ≤ 50%	2 if 25 < x ≤ 50%
3 if x = 6 or 7	3 if x = 3	3 if 50 < x ≤ 75%	3 if 50 < x ≤ 75%	3 if 50 < x ≤ 75%	3 if x = 4 or 5	3 if 50 < x ≤ 75%	3 if x = 3	3 if 50 < x ≤ 75%	3 if 50 < x ≤ 75%
4 if x = 8 or 9	4 if x = 4	4 if 75 < x < 100%	4 if 75 < x < 100%	4 if 75 < x < 100%	4 if x = 6 or 7	4 if 75 < x < 100%	4 if x = 4	4 if 75 < x <	4 if 75 < x < 100
5 if x = 9 and more	5 if x = 5 or more	5 if x = 100%	5 if x = 100%	5 if x = 100%	5 if x = 8 or more	5 if x = 100%	5 if x = 5 or more	100% 5 if x = 100%	5 if x= 100%

5.3 Rubrics and mark allocation for Activity 8 for Image Development

The activity type group, *Image Development*, comprised of five different activities. All these activities focused on free-hand design. Three of the five activities required that a student completed specific figures presented in the Creative Test Instrument, whereas for the remaining two activities a student was required to create a free hand design using shapes provided in the Creative Test Instrument. Several rubrics were devised for the example activity, *Activity 8: Using cut out shape for design*, for the Image development activity type. In *Activity 8*, the student was instructed to create a free-hand design from a shape that had to be cut out and pasted on the activity sheet. In this activity, 17 sub-domains, belonging to the four Creativity domains, were assessed. In the assessment, the focus was placed mainly on the Creativity sub-domains; *Unusual Uses*, *Synthesis of Incomplete Figures* and *Synthesis of Lines*, which were assessed through the Yes/No rating scale. In the assessment of sub-domain, *Unusual Uses*, a student had to provide evidence of unusual uses of the cut-out shape. In the two sub-domains, *Synthesis of Incomplete Figures* and *Synthesis of Lines*, the student had to demonstrate the ability to fuse different figures and lines presented in the cut-out shape. Table 5.3a provides a description of the rubrics for the different sub-domains addressed in *Activity 8*, while Table 5.3b and Table 5.3c describe the mark allocation linked to each of the rubrics.

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Table 5.3 Rubrics and mark allocation for *Activity 8: Using cut out shape for design.*

a. Rubrics

Rating Scale		0 (Insufficient) 0%	1 (Partially sufficient) $0 < x \leq 25\%$	2 (Average) $25 < x \leq 50\%$	3 (Above average) $50 < x \leq 75\%$	4 (Satisfactory) $75 < x < 100\%$	5 (Outstanding) 100%
Subdomain	**Number/degree/ presence**						
Originality	Number of Original elements	Response is common and familiar. Originality is absent.	Response demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.
Appropriateness of Titles	Appropriateness of title	Title is absent.	Title is inappropriate.	Title is appropriate but contains inappropriate elements.	Title is partially appropriate.	Title is appropriate but incomplete.	Title is appropriate and complete.
Resistance to Premature Closing	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way.	Presents only the most logical and expected way to solve the problem or to complete the figure.	Presents some degree of openness but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to complete the figure.	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure.	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.
Elaboration	Degree of elaboration	Detail is absent.	Indication of an attempt to add detail.	Detail is minimal.	Detail average, but not extensive nor well-developed.	Detail is extensive but not well-developed.	Detail is extensive and developed.

Storytelling Articulateness	Number of figural and/or verbal indicators	Figural and/or verbal indicators are absent.	Indication of an attempt of figural and/or verbal indicators to create a (hi)story for the object.	Figural and/or verbal indicators are minimal to create a (hi)story for the object.	Figural and/or verbal indicators are average, but not enough to create a (hi)story for the object.	Figural and/or verbal indicators are broad but not well-developed to create a (hi)story for the object.	Figural and/or verbal indicators are extensive and developed to create a (hi)story for the object.
Movement or Action	Number of figural and/or verbal indicators	0	1	2	3	4	5
Expressiveness of Titles	Number of verbal emotional indicators.	0 or 1	2	3	4	5	6 and more
Humour	Presence of humour elements	Humour elements are absent.	Indication of an attempt to add humour elements.	Minimal humour elements are added.	Humour elements are average, but not extensive nor well-developed.	Humour elements are extensive but not well-developed.	Humour elements are extensive and well-developed.
Richness of Imagery	Degree of developing the richness of imagery	Richness of imagery is absent.	Indication of an attempt to develop richness of imagery.	Indication of some develop of richness of imagery, but minimal.	Development of richness of imagery is narrow.	Development of richness of imagery is relatively extensive or under-developed.	Development of richness of imagery is extensive and well-developed.
Unusual Visualisation	Number of unusual views	0	1	2	3	4	5 and more
Rating scale			**0**			**5**	
Subdomain	**Number/degree/ presence**						
Unusual Uses	The specific object is used for an unusual purpose		No			Yes	
Synthesis of Incomplete Figures	The presence of fusing incomplete figure/object		No			Yes	

	together		
Synthesis of Lines	The fusing of incomplete lines together	No	Yes
Internal Visualisation	Paying attention to the internal component, or not at all	No	Yes
Extending or Breaking Boundaries	Was boundaries broken?	No	Yes
Colourfulness of Imagery	The presence of fantasy and/or human nature within the response	No	Yes
Combination	Is the skill to combine present?	No	Yes

b. Mark allocation

Mark allocation					
Diverse Thinking Skills domain				Practical Skills domain	
Originality	**Appropriateness of Titles**	**Resistance to Premature Closing**	**Elaboration**	**Unusual Uses**	**Combination**
0 if x = 0	0 if x = 0	0 if x = 0	0 if x = 0	0 if x = 0	0 if x = no
1 if 0 < x ≤ 25%	1 if 25 < x ≤ 50%	1 if 0 < x ≤ 25%	1 if 0 < x ≤ 25%	1 if x = 1	5 if x = yes
2 if 25 < x ≤ 50%	2 if 50 < x ≤ 25%	2 if 25 < x ≤ 50%	2 if 25 < x ≤ 50%	2 if x = 2	
3 if 50 < x ≤ 75%	3 if 75 < x ≤ 50%	3 if 50 < x ≤ 75%	3 if 50 < x ≤ 75%	3 if x = 3	
4 if 75 < x < 100%	4 if 75 < x ≤ 100%	4 if 75 < x < 100%	4 if 75 < x < 100%	4 if x = 4	
5 if x = 100%	5 if x =100%	5 if x = 100%	5 if x = 100%	5 if x = 5	

c. Mark allocation

Creative Strengths										
Storytelling Articulateness	**Movement or Action**	**Expressiveness of Titles**	**Synthesis of Incomplete Figures**	**Synthesis of Lines**	**Unusual Visualisation**	**Internal Visualisation**	**Extending or Breaking Boundaries**	**Humour**	**Richness of Imagery**	**Colourfulness of Imagery**
0 if x = 0	0 if x = 0	0 if x = 0 or 1	0 if x = no	0 if x = no	0 if x = 0	0 if x = no	0 if x = no	0 if x = 0	0 if x = 0	0 if x = no
1 if 0 < x ≤ 25%	1 if x = 1	1 if x = 2	5 if x = yes	5 if x = yes	1 if x = 1	5 if x = yes	5 if x = yes	1 if 0 < x ≤ 25%	1 if 25 < x ≤ 50%	5 if x = yes
2 if 25 < x ≤ 50%	2 if x = 2	2 if x = 3			2 if x = 2			2 if 25 < x ≤ 50%	2 if 50 < x ≤ 25%	
3 if 50 < x ≤ 75%	3 if x = 3	3 if x = 4			3 if x = 3			3 if 50 < x ≤ 75%	3 if 75 < x ≤ 50%	
4 if 75 < x < 100%	4 if x = 4	4 if x = 5			4 if x = 4			4 if 75 < x < 100%	4 if 75 < x ≤100%	
5 if x = 100%	5 if x = 5 or more	5 if x = 6 and more			5 if x = 5 and more			5 if x = 100%	5 if x = 100%	

5.4 Rubrics and mark allocation for Activity 9 for Object Repetition

Two activities were developed for the activity type, *Object Repetition*, in the Creative Test Instrument. These activities focused on free-hand design, similarly to the activity type presented for *Image Development*. Several rubrics were devised for each of these activities. For the example activity, *Activity 9*, *Adding details to cylinders*, the student was requested to add additional detail(s) to a group of line-drawn cylinders, by transforming them into interesting designs. In this activity, 18 sub-domains, belonging to the four creativity capability domains, were assessed, with the focus placed mainly on the sub-domains: *Internal Visualisation*, *Extending or Breaking Boundaries* and *Combination*. For the assessment of the sub-domain, *Internal Visualisation*, a student had to recognise that the cylinders were volumetric shapes containing an interior space. For the sub-domain, *Extending or Breaking Boundaries*, a student had to demonstrate the ability to connect the interior space of the cylinders to the exterior space surrounding the cylinders. In contrast for the sub-domain, *Combination*, a student had to demonstrate the ability to combine two or more cylinders in one design. Table 5.4a provides a description of the rubrics for the different sub-domains addressed in *Activity 9*, while Table 5.4b and Table 5.4c describe the mark allocation linked to each rubric.

Table 5.4 Rubrics and mark allocation for *Activity 9: Adding details to cylinders.*

a. Rubrics

Rating Scale		0 (Insufficient) 0%	1 (Partially sufficient) $0 < x \leq 25\%$	2 (Average) $25 < x \leq 50\%$	3 (Above average) $50 < x \leq 75\%$	4 (Satisfactory) $75 < x < 100\%$	5 (Outstanding) 100%
Subdomain	**Number/degree/ presence**						
Fluency	Number off response	1 or 0	3 or 2	5 or 4	7 or 6	8 or 9	more than 9
Flexibility	Number off categories	0	1	2	3	4	5 or more
Originality	Number of original elements	Response is common and familiar. Originality is absent.	Response demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.
Appropriateness of Titles	Appropriateness of title	Title is absent.	Title is inappropriate.	Title is appropriate but contains inappropriate elements.	Title is partially appropriate.	Title is appropriate but incomplete.	Title is appropriate and complete.
Resistance to Premature Closing	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way.	Presents only the most logical and expected way to solve the problem or to complete the figure.	Presents some degree of openness but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to complete the	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure.	Presents an incomplete solution to the problem or an incomplete the figure but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.

				figure.			
Elaboration	Degree of elaboration	Detail is absent.	Indication of an attempt to add detail.	Detail is minimal.	Detail average, but not extensive nor well-developed.	Detail is extensive but not well-developed.	Detail is extensive and developed.
Movement or Action	Number of figural and/or verbal indicators	0	1	2	3	4	5
Expressiveness of Titles	Number of verbal emotional indicators.	0 or 1	2	3	4	5	6 and more
Unusual Visualisation	Number of unusual views	0	1	2	3	4	5 and more
Humour	Presence of humour elements	Humour elements are absent.	Indication of an attempt to add humour elements.	Minimal humour elements are added.	Humour elements are average, but not extensive nor well-developed.	Humour elements are extensive but not well-developed.	Humour elements are extensive and well-developed.
Richness of Imagery	Degree of developing the richness of imagery	Richness of imagery is absent.	Indication of an attempt to develop richness of imagery.	Indication of some develop of richness of imagery, but minimal.	Development of richness of imagery is narrow.	Development of richness of imagery is relatively extensive or under-developed.	Development of richness of imagery is extensive and well-developed.
Unusual Uses	Number of unusual purposes used	0	4	5	6	7	8 and more
Rating scale			**0**			**5**	
Subdomain	**Number/degree/ presence**						
Synthesis of Incomplete Figures	The presence of fusing incomplete figure/object		No			Yes	

	together		
Synthesis of Lines	The fusing of incomplete lines together	No	Yes
Internal Visualisation	Paying attention to the internal section, or not at all	No	Yes
Extending or Breaking Boundaries	Were boundaries broken?	No	Yes
Colourfulness of Imagery	The presence of fantasy and/or human nature within the response	No	Yes
Combination	Is the skill to combine present?	No	Yes

b. Mark allocation

Mark allocation							
Diverse thinking skills						Practical skills	
Fluency	**Flexibility**	**Originality**	**Appropriateness of Titles**	**Resistance to Premature Closing**	**Elaboration**	**Unusual Uses**	**Combination**
0 if x = 0 or 1	0 if x = 0	0 if x = 0	0 if x = 0	0 if x = 0	0 if x = 0	0 if x = 0	0 if x = no
1 if x = 2 or 3	1 if x = 1	1 if 0 < x ≤ 25%	1 if 25 < x ≤ 50%	1 if 0 < x ≤ 25%	1 if 0 < x ≤ 25%	1 if x = 1	5 if x = yes
2 if x = 4 or 5	2 if x = 2	2 if 25 < x ≤ 50%	2 if 50 < x ≤ 25%	2 if 25 < x ≤ 50%	2 if 25 < x ≤ 50%	2 if x = 2	
3 if x = 6 or 7	3 if x = 3	3 if 50 < x ≤ 75%	3 if 75 < x ≤ 50%	3 if 50 < x ≤ 75%	3 if 50 < x ≤ 75%	3 if x = 3	
4 if x = 8 or 9	4 if x = 4	4 if 75 < x < 100%	4 if 75 < x ≤ 100%	4 if 75 < x < 100%	4 if 75 < x < 100%	4 if x = 4	
5 if x = 9 and more	5 if x = 5 or more	5 if x = 100%	5 if x =100%	5 if x = 100%	5 if x = 100%	5 if x = 5	

c. Mark allocation

Creative strengths									
Movement or Action	**Expressiveness of Titles**	**Synthesis of Incomplete Figures**	**Synthesis of Lines**	**Unusual Visualisation**	**Internal Visualisation**	**Extending or Breaking Boundaries**	**Humour**	**Richness of Imagery**	**Colourfulness of Imagery**
0 if x = 0	0 if x = 0 or 1	0 if x = no	0 if x = no	0 if x = 0	0 if x = no	0 if x = no	0 if x = 0	0 if x = 0	0 if x = no
1 if x = 1	1 if x = 2	5 if x = yes	5 if x = yes	1 if x = 1	5 if x = yes	5 if x = yes	1 if 0 < x ≤ 25%	1 if 25 < x ≤ 50%	5 if x = yes
2 if x = 2	2 if x = 3			2 if x = 2			2 if 25 < x ≤ 50%	2 if 50 < x ≤ 25%	
3 if x = 3	3 if x = 4			3 if x = 3			3 if 50 < x ≤ 75%	3 if 75 < x ≤ 50%	
4 if x = 4	4 if x = 5			4 if x = 4			4 if 75 < x < 100%	4 if 75 < x ≤100%	
5 if x = 5 or more	5 if x = 6 and more			5 if x = 5 and more			5 if x = 100%	5 if x = 100%	

5.5 Rubrics and mark allocation for Activity 12 for Problem-Solving

The activity type, *Problem-Solving*, consisted of seven different activities. This activity type mainly consisted of written response activities, similarly to the activity type, *Improvisation*. These activities focused mainly on the cognitive skills of identifying a specific problem and also suggesting different solutions to the problem. Several rubrics were devised for the example activity, *Activity 12: Question Activity*. This activity requested that a student presents as many possible questions that relate to a specific image presented in the Creative test. The image presented a happening that occurred in the past. In this activity, 8 sub-domains, belonging to the four creativity capability domains, were assessed. The rubrics for the sub-domains, *Originality*, *Resistance to Premature Closing*, *Humour*, and also *Overall Observation*, were measured using the descriptive instructional scale. Table 5.5a provides a description of the rubrics for the different sub-domains addressed in *Activity 12*, while Table 5.5b describes the mark allocation linked to each rubric.

Table 5.5 Rubrics and mark allocation for *Activity 12: Question activity*

a. Rubric

Rating Scale		0 (Insufficient) 0%	1 (Partially sufficient) 0 < x ≤ 25%	2 (Average) 25 < x ≤ 50%	3 (Above average) 50 < x ≤ 75%	4 (Satisfactory) 75 < x <100%	5 (Outstanding) 100%
Subdomain	**Number/degree/ presence**						
Fluency	Number off response	1 or 0	3 or 2	5 or 4	7 or 6	8 or 9	more than 9
Flexibility	Number off categories	0	1	2	3	4	5 and more
Originality	Number of original elements	Response is common and familiar. Originality is absent.	Response demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.	Image demonstrates novel and unusual elements.
Resistance to Premature Closing	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way.	Presents only the most logical and expected way to solve the problem or to complete the figure.	Presents some degree of openness but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to complete the figure.	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure.	Presents an incomplete solution to the problem or an incomplete the figure but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.
Emotional Expressiveness	Number of nonverbal/verbal emotional indicators	0/1	2	3	4/5	6/7	8 and more
Humour	Presence of humour elements	Humour elements are absent.	Indication of an attempt to add	Minimal humour elements are added.	Humour elements are average, but not	Humour elements are extensive but not	Humour elements are extensive and

			humour elements.		extensive nor well-developed.	well-developed.	well-developed.
Overall Observation	Degree of Overall observation present within the response	Overall observation is absent.	Indication of Overall observation present.	Degree of Overall observation minimal.	Degree of Overall observation average, but not extensive nor well-developed.	Degree of Overall observation extensive but not well developed.	Degree of Overall observation extensive and well developed.
Rating scale			**0**			**5**	
Subdomain	**Number/degree/ presence**						
Identifying Questions	Is identification of question present?		No			Yes	

b. Mark allocation

Mark allocation

Diverse thinking skills				Creative strengths		Innovation skills	
Fluency	**Flexibility**	**Originality**	**Resistance to Premature closing**	**Emotional Expressiveness**	**Humour**	**Identifying Questions**	**Overall Observation**
0 if x = 0 or 1	0 if x = 0	0 if x = 0	0 if x = 0	0 if x = 0 or 1	0 if x = 0	0 if x = no	0 if x = 0
1 if x = 2 or 3	1 if x = 1	1 if 0 < x ≤ 25%	1 if 0 < x ≤ 25%	1 if x = 2	1 if 0 < x ≤ 25%	5 if x = yes	1 if 25 < x ≤ 50%
2 if x = 4 or 5	2 if x = 2	2 if 25 < x ≤ 50%	2 if 25 < x ≤ 50%	2 if x = 3	2 if 25 < x ≤ 50%		2 if 50 < x ≤25%
3 if x = 6 or 7	3 if x = 3	3 if 50 < x ≤ 75%	3 if 50 < x ≤ 75%	3 if x = 4 or 5	3 if 50 < x ≤ 75%		3 if 75 < x ≤ 50%
4 if x = 8 or 9	4 if x = 4	4 if 75 < x < 100%	4 if 75 < x < 100%	4 if x = 6 or 7	4 if 75 < x < 100%		4 if 75 < x ≤100 %
5 if x = 9 and more	5 if x = 5 or more	5 if x = 100%	5 if x = 100%	5 if x = 8 or more	5 if x = 100%		5 if x = 100%

5.6 Summary of activities grouped according to domain and sub-domain

With the implementation of a Creativity Test Instrument to assess the creativity skill's level amongst entry level students in Art and Design, a list of 29 sub-domains were developed and grouped together into four creativity domains. Within each of the 17 activities of the Creativity Test Instrument, a relevant subset of the 29 sub-domains was used to assess the activity. Table 5.6 shows the different sub-domains that were assessed in each of the 17 activities of the Creativity Test Instrument.

Table 5.6 Summary of activities grouped according to domain and sub-domain.

Activity type	Activity number	Activity name	Sub-domain assessed in activity	Number sub-domains assessed in activity
Improvisation	1	Unusual Uses for a Doll Hand	Fluency, Flexibility, Originality, Internal Visualisation, Humour and Imagination	6
	2	Product Improvement of Soft Toy	Fluency, Flexibility, Originality, Elaboration, Emotional Expressiveness, Internal Visualisation, Humour, Product Improvement and Imagination	8
	3	Possibilities for Being Invisible	Fluency, Flexibility, Originality, Appropriateness of Titles, Resistance to Premature Closing Elaboration, Emotional Expressiveness, Storytelling Articulateness, Movement or Action Internal visualisation, Humour	11
Image Development	4	Adding Details to Large Block	Synthesis of lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Combination and Completion	9
	5	Adding Details to Medium Blocks	Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Combination and Completion	9
	6	Adding Details to Small Blocks	Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Combination and Completion	9
	7	Combining Shapes for Design	Originality, Appropriateness of Titles, Resistance to Premature Closing, Elaboration, Storytelling Articulateness, Movement or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Unusual Uses and Combination	17
	10	Using cut out Shape for Design	Originality, Appropriateness of Titles, Resistance to Premature Closing, Elaboration, Storytelling Articulateness, Movement or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines, Unusual Visualisation, Internal Visualisation,	17

Activity type	Activity number	Activity name	Sub-domain assessed in activity	Number sub-domains assessed in activity
			Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Unusual Uses and Combination	
Object Repetition	8	Adding Details to Cylinders	Originality, Appropriateness of Titles, Resistance to Premature Closing, Elaboration, Movement or Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Unusual Uses and Combination	16
	9	Adding Details to Separate Lines	Originality, Appropriateness of Titles, Elaboration, Movement or Action, Expressiveness of Titles, Resistance to Premature Closing, Synthesis of Incomplete Figures, Synthesis of Lines, Unusual Visualisation, Internal Visualisation, Extending or Breaking Boundaries, Humour, Richness of Imagery, Colourfulness of Imagery, Unusual Uses and Combination	16
Problem Solving	11	Solving Mother Hubbard's problem	Fluency, Flexibility, Originality, Resistance to Premature Closing, Elaboration, Emotional Expressiveness, Humour, Problem-Solving and Identifying Problems	9
	12	Question Activity	Fluency, Flexibility, Originality, Resistance to Premature Closing, Emotional Expressiveness, Humour, Identifying Questions and Overall Observation	8
	13	Reason Activity	Fluency, Flexibility, Originality, Resistance to Premature Closing, Emotional expressiveness, Humour, Identifying causes and Overall observation	8
	14	Consequence Activity 1	Fluency. Flexibility, Originality, Resistance to premature closing, Emotional expressiveness, Humour, Identifying consequences and Overall observation	8
	15	Consequence Activity 2	Fluency, Flexibility, Originality, Resistance to Premature Closing, Elaboration, Unusual Visualisation, Humour and Identifying Consequences	9
	16	List Problems	Fluency, Flexibility, Originality, Resistance to Premature Closing, Elaboration, Emotional Expressiveness, Humour and Identifying Problems	9
	17	Candle Problem	Originality, Resistance to Premature Closing, Unusual Visualisation, Internal Visualisation, Problem-Solving, Overall Observation, Unusual Uses, Combination and Product Improvement	10

5.7 Discussion

The Creativity Test Instrument activities addressed four creativity capability domains. These creativity capability domains were *Diverse Thinking Skills, Creative Strengths, Innovation Skills and Practical Skills.* In total, the four creativity capability domains covered 29 different sub-domains. Several rubrics were developed for each of the 17 activities of the Creativity Test Instrument that belonged to four activity types. The four activity types covered in the Creativity Test Instrument were *Improvisation*, *Image Development*, *Object Repetition* and *Problem Solving*. The rubrics for the activities were constructed using three types rating scale: the Yes/No rating scale, an element counting rating scale and the descriptive instructional rating scale. Most of the rubrics of the activities were constructed using the element counting rating scale and the descriptive instructional rating scale. This Creativity Test, comprising of 17 activities, was presented to all the participating entry level students in Art and Design to determine their level of creativity.

Chapter 6

Student Demographic Information

6.1 Introduction

The 55 participating students were requested to provide demographic information, as well as information about their art experiences prior to becoming a student in the Department of Design and Studio Art at the Central University of Technology, Free State. This information was gathered during the implementation of the Creativity Test when the students were prompted to answer questions before undertaking the test. Demographic information included gender and family structure. The information gathered about art experiences covered their primary and secondary school careers.

6.2 Gender and family structure of student population

Prior to the completion of the Creativity Test, the participating students answered questions about gender, family size and guardianship. Of the 54 participating students, approximately two thirds were male students (Figure 6.1a). Many of the students grew up in relatively small families of up to three children, where approximately 25% of the students grew up in families of more than three children (Figure 6.1b). Most of the students (>90%) had a guardian, of which approximately 50% of the participating students grew up with a single mother (Figure 6.1c and d).

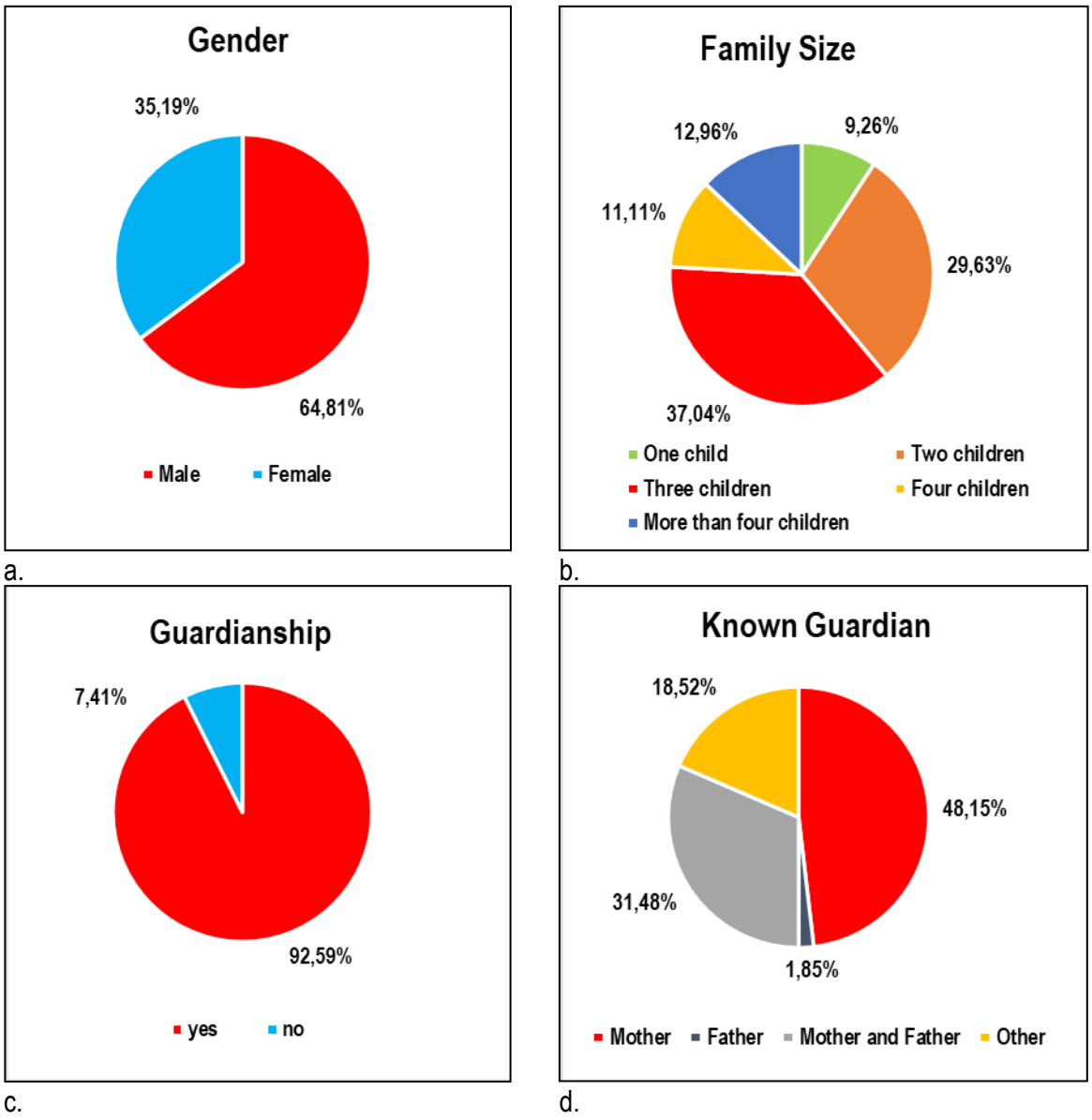
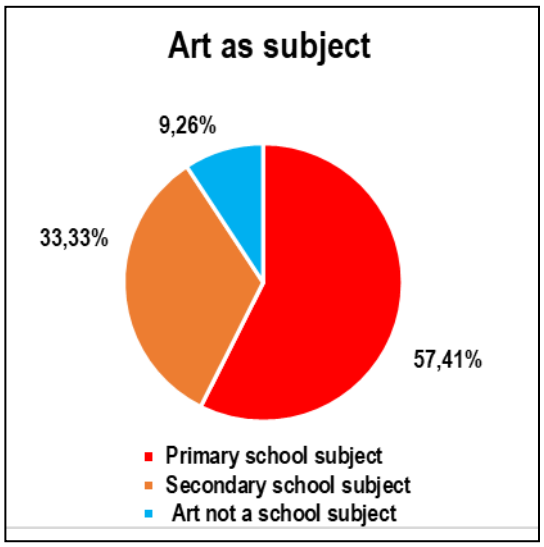


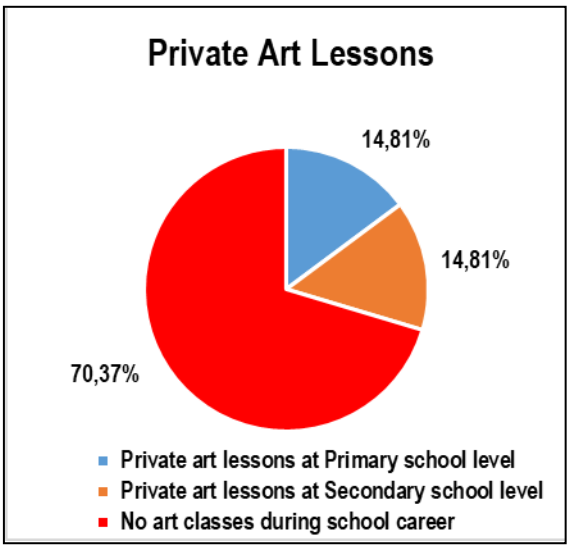
Figure 6.1 **Statistics of gender, family size and guardianship of the participating students. a. Gender b. Family size c. Guardianship d. Known guardian**

6.3 Student artistic studies of student population

The students were prompted to provide information about their art studies prior to their university entrance. More than 90% of the participating students studied art during their school careers, of which more than 50% of the students studied art at primary school level (Figure 6.2a). A relatively small number of students (<10%) did not study art during their schooling careers. Less than 30% of the participating students undertook private art lessons during their school careers (Figure 6.2b).



a.
Primary school art as subject



b.
Private art lessons at school level

Figure 6.2 Statistics of art studies during primary and secondary schooling. a. Art as subject b. Private art lessons

6.4 Discussion

The participating students in this study were from relatively diverse backgrounds. The majority of the entry level students registered in the Department of Design and Studio Art at the Central University of Technology; Free State were male students that grew up with single mother. Although many students studied art as a subject during their school careers, most of these studies were during their primary schooling years.

Chapter 7

Student Responses to Different Activity Types

7.1 Introduction

The success of the Creativity Workshop, implemented to stimulate the emergence of creativity, was then assessed through a Creativity Test. Once the Test group of students had attended the Creativity Workshop, all the participating students of both groups had to complete the Creativity Test. The Creativity Test comprised of 17 activities, covering four activity types: *Improvisation*, *Image Development*, *Object Repetition* and *Problem-Solving*. Each of these activities addressed the four creativity domains, referred to as *Diverse Thinking Skills*, *Creative Strengths*, *Innovation Skills* and *Practical Skills*. It should be noted that the Control group of students attended the same Creativity Workshop after the completion of the Creativity Test, to ensure that no students were disadvantaged by the study.

In this chapter, several examples are provided of student responses to the Creativity Test to demonstrate the variation in student responses; and to show some of the out-of-the-box thinking and unexpected responses. The examples that are provided are both from the Test group and also from the Control group of students. Because the responses were comprehensive and awkward to present in a crisp manner, only a few activities, taken from each activity type, are presented. Table 7.1 provides a list of the examples discussed in this chapter.

Table 7.1 List of activity type, number of activities and number of student responses

Activity type	Number of activity examples	Number of student responses per activity type
Improvisation	2	5
Image Development	5	17
Object Repetition	2	4

Activity type	Number of activity examples	Number of student responses per activity type
Problem-Solving	2	4
Total	11	30

7.2 Examples of student responses for activity type *Improvisation*

Within the activity type, *Improvisation,* three activities were created for the Creativity Test Instrument. Two of the three activities were selected to demonstrate the *variation in the level of detail* in student responses, as well as *unexpected student responses*. Furthermore, these responses also demonstrate two response formats of student responses: a figurative and a word response format. Table 7.2 lists the two activities that were selected to demonstrate responses for the activity type, *Improvisation*.

Table 7.2 List of number of examples of student responses for selected activities of activity type *Improvisation*

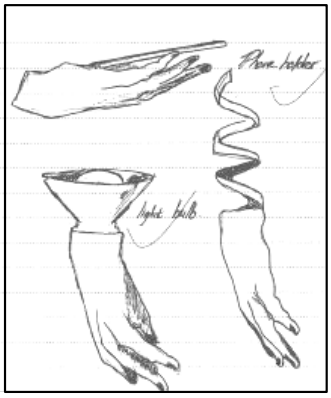
Activity number and name	Example
1. *Unusual Uses for a Doll Hand*	1 example of a student's response in figurative format
3. *Possibilities for Being Invisible*	3 examples of student responses in word format 1 example of a student's response in figurative format
Total number of examples presented	5

7.2.1 Example of student response in figurative format for Activity 1

Activity 1: Unusual Uses for a Doll Hand, required that students presented a list of unusual uses of a doll's hand. The expectation was that a student would present a list of words or phrases stating unusual uses of a doll's hand. Amongst the 54 students, 8% did not present an expected

response, instead presented the unusual uses of a doll's hand in the form of a group of figures (Table 7.3).

Table 7.3 Example of a student's response in figurative format for Activity 1

Student response for Activity: Unusual uses for a doll hand		
Instruction for activity:	In the space below, list the most interesting, cleverest, and most unusual uses that you can think of for the object on the table in front of the class. 	
Student response	**Identified sub-domain**	**Mark-allocation per sub-domain**
	Fluency	3
	Flexibility	2
	Originality	3
	Internal Visualisation	5
	Humour	0
	Imagination	4
	Unusual uses	5
	Score out of 35	**22 (62,9 %)**

7.2.2 Example of student responses in word format for Activity 3

The *Activity 3: Possibilities for Being Invisible* was selected to demonstrate the variation in the level of detail that the students presented in their responses. Students were requested to present a list of possibilities when invisible for a day. Students presented lists containing four to 12

possibilities. In Table 7.4 the responses of three students are presented, showing lists of 12 (high score), 8 (medium score), and 4 (low score), possibilities. The sub-domain scores for *Fluency* are indicative of the level of detail (number of possibilities in the list) presented in the responses of these three students.

Table 7.4 Examples of student responses in word format for Activity 3

Student responses for Activity: Possibilities for being invisible		
Instruction for activity:	In the space below, list as many possibilities for the following day: Suppose you could be invisible for one day; what possible things could happen?	
Student response 1: High score Student listed 12 possibilities	**Identified sub-domain**	**Mark-allocation per sub-domain**
1. Eaves drop on my enemies.	Fluency	5
2. Eaves drop on my mather [mother].	Flexibility	5
3. Go on a trip to Singapore then London then New York.	Originality	3
4. Steal a lot of cash from a bank (obviously).	Resistance to remature closing	2
5. Walk around naked.	Elaboration	5
6. Do experiments like swim to see how it just looks.	Emotional expressiveness	3
7. Drive around in a car and pull up next to people and talk to freak them out.	Storytelling articulateness	3
8. Pretend to be a ghost, visable [visible] with a sheet and invisible.	Movement or action	5
9. Go to a water park like Sun city [City].	Humour	4
10. Paint myself to look like a weird something but only on one side.	Imagination	3
11. Not sleep at all.		
12. Pretend to be dead.		
	Score out of 50	**38 (76.0%)**
Student response 2: Medium score Student listed 8 possibilities	**Identified sub-domain**	**Mark-allocation per sub-domain**
1. Check the security systems and passwords for banks	Fluency	4

Student responses for Activity: Possibilities for being invisible		
or shops and break in.		
2. Get into any airplane and fly to Parase [Paris] or Scottland [Scotland] in first class.	Flexibility	5
3. Pick pocket every one [everyone].	Originality	4
4. Ghost around some one's house for the laughs.	Resistance to premature closing	2
5. Pick fights with bullies.	Elaboration	4
6. Haunt my last school.	Emotional expressiveness	0
7. Gain valuable information.	Storytelling articulateness	3
8. Find out if area 51 exists and what's [what is] in it.	Movement or action	5
	Humour	1
	Imagination	3
	Score out of 50	**31 (62.0%)**

Student response 3: Low score Student listed 4 possibilities	**Identified sub-domain**	**Mark-allocation per sub-domain**
1. Take expensive shoes at the shops.	Fluency	2
2. Take money.	Flexibility	4
3. Eat food in the shops.	Originality	0
4. I would take a taxi for free.	Resistance to premature closing	0
	Elaboration	0
	Emotional expressiveness	0
	Storytelling articulateness	0
	Movement or action	4
	Humour	0
	Imagination	0
	Score out of 50	**10 (20.0%)**

[ ] Words presented in square brackets provide interpretations of student responses.

7.2.3 Example of student's response in figurative format for Activity 3

The second example of *Activity 3: Possibilities for Being Invisible*, was selected to demonstrate an unexpected student response. In this activity, students were requested to present a list of possibilities when invisible for a day in word format. One student of the 54 students presented the list of being invisible for a day in figurative format (Table 7.5)

Table 7.5 Example of student's response in figurative format for Activity 3

Student response for Activity: Possibilities for being invisible		
Instruction for activity:	In the space below, list as many possibilities for the following day: Suppose you could be invisible for one day; what possible things could happen?	
Student response	**Sub-domain**	**Mark-allocation per Sub-domain**
	Fluency	0
	Flexibility	2
	Originality	2
	Resistance to premature closing	5
	Elaboration	5
	Emotional expressiveness	2
	Storytelling articulateness	2
	Movement or action	4
	Humour	3
	Imagination	2
	Score out of 50	**27 (54.0%)**

7.3 Examples of student responses for activity type *Image Development*

Within the activity type *Image Development*, five activities were created within the Creativity Test Instrument. All five of the activities were selected to demonstrate the sub-domain-based responses

in student responses. All these responses demonstrate student response in figurative format. Table 7.6 lists the five activities that were selected to demonstrate student responses for activity type, *Image Development*.

Table 7.6 List of examples of student responses for activity type Image Development

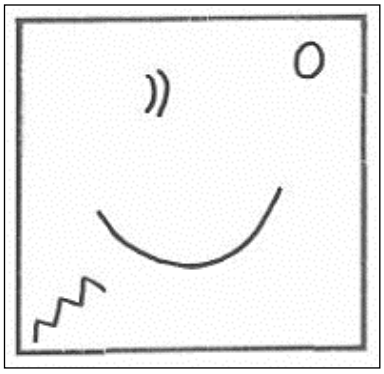
Activity number and name	Example
4. *Adding Details to a Large Block*	5 examples of students' responses in figurative format
5. *Adding Details to Medium Blocks*	1 example of a student's response in figurative format
6. *Adding Details to Small Blocks*	6 examples of students' responses in figurative format
7. *Combining Shapes for Design*	2 examples of students' responses in figurative format
10. *Using cut out Shape for Design*	3 examples of students' responses in figurative format
Total number of examples presented	17

7.3.1 Example of student response in figurative format for Activity 4

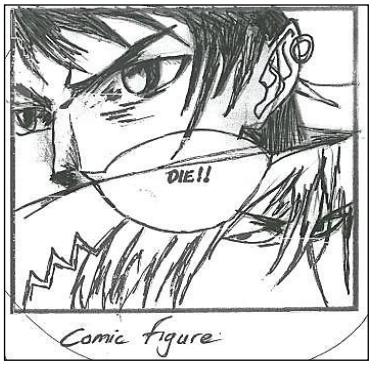
Activity 4: Adding Details to Large Block, required students to create their own picture or pictures by adding additional details to figures in a block. Five students added comical details to the figures in the block, which demonstrated their ability to respond with colourful images, such as fantasy from literature, television, and movies. These students all scored full marks for the sub-domain *Colourfulness of Imagery* (Table 7.7).

Table 7.7 Example of student responses in figurative format for Activity 4

Student responses for Activity: Adding details to large block	
Instruction for activity:	By adding additional details with your pencil to the figures in the box below, create your own picture or pictures.
Student responses:	

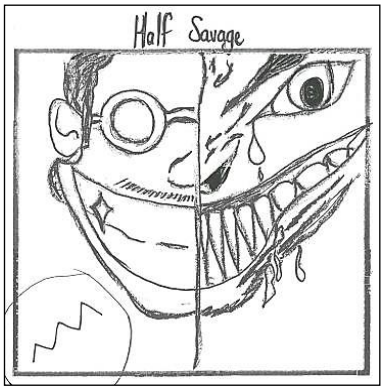


Original



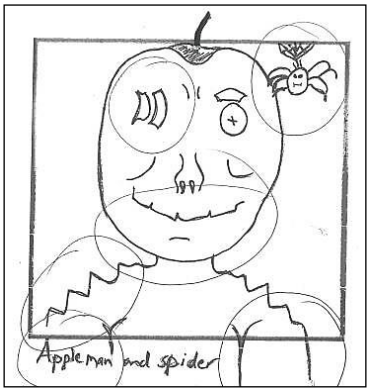
SR 1

SR 2



SR 3

SR 4



SR 5

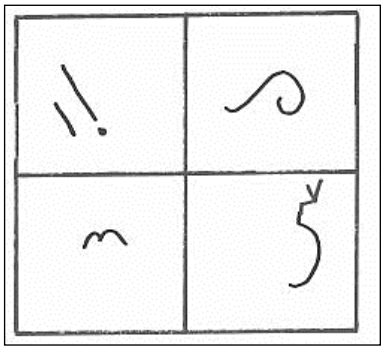
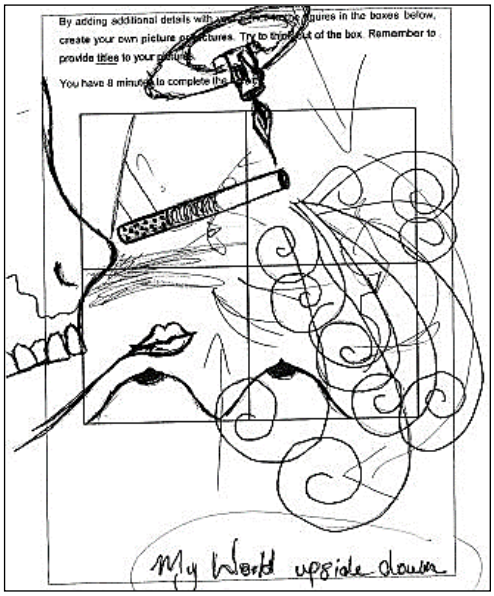
SR = student response

7.3.2 Example of a student's response in figurative format for Activity 5

The *Activity 5: Adding Details to Medium Blocks*, required students to create their own picture or pictures by adding additional details to specific figures in four medium blocks. In the example presented in Table 7.8, the student demonstrated the ability to make mental leaps by moving beyond

the limitations of boundaries of the blocks. This student extended the figures in each of the blocks to create a design that included the negative space beyond the boundaries of the blocks and therefore scored full marks for the sub-domain *Extension or Breaking of Boundaries.*

Table 7.8 Example of student response in figurative format for Activity 5

Student response for Activity: Adding details to medium blocks	
Instruction for activity:	By adding additional details with your pencil to the figures in the boxes below, create your own picture or pictures.
Student response:	
	
Orginal	SR 1

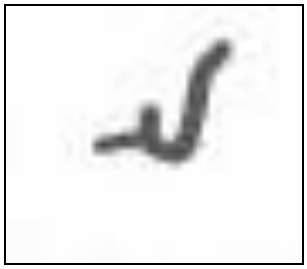
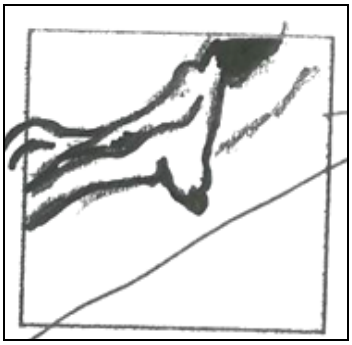
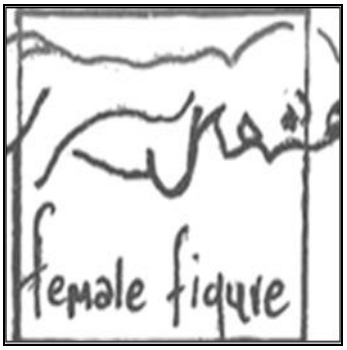
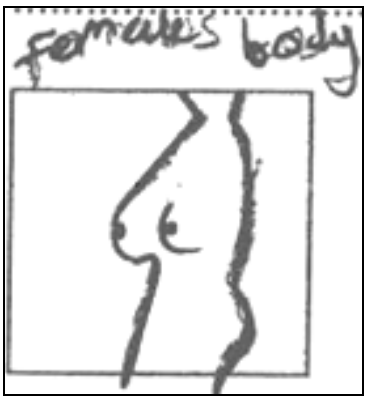
SR = student response

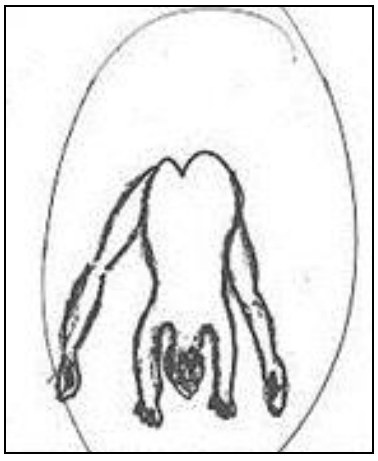
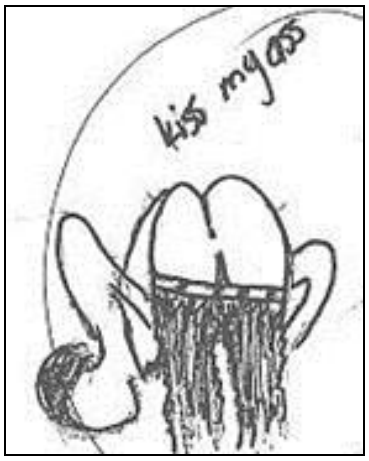
7.3.3 Example of students' responses in figurative format for Activity 6

Activity 6: Adding Details to Small Blocks, required students to create their own picture or pictures by adding additional details to specific figures in 11 small blocks. An overwhelming focus on nudity was a prominent feature in this study. Six students added nudity to the figures in the 11 small

blocks, which demonstrated their ability to respond with colourful images, such as nudity from human nature (Table 7.9). These students all scored full marks for the sub-domain *Colourfulness of Imagery*.

Table 7.9 Example of student responses in figurative format for Activity 6

Student responses for Activity: **Adding details to small blocks**		
Instruction for activity:	By adding additional details with your pencil to the figures in the boxes below, create your own picture or pictures.	
Student responses:		
		
Original	SR 1	SR 2
		
Original	SR 3	

Student responses for Activity: **Adding details to small blocks**	
	
Original	SR 4
	 
Original	SR 5 SR 6

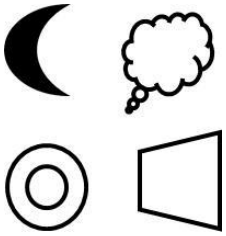
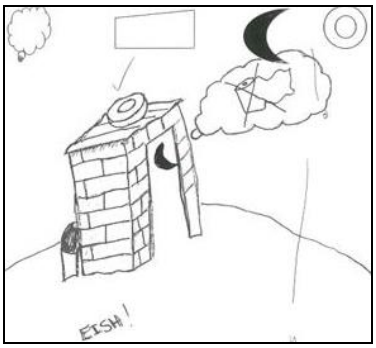
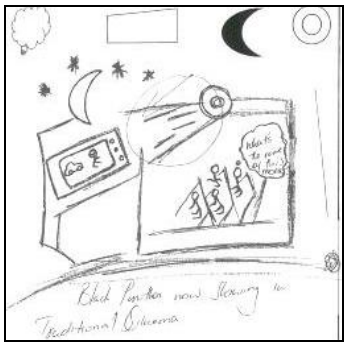
SR = student response

7.3.4 Example of student response in figurative format for Activity 7

The *Activity 7: Combining Shapes for Design*, required students to draw an object or objects, and/or a figure or figures using all or some of the four shapes displayed within the activity space. Two students displayed humour in their designs (Table 7.10). In the sub-domain *Humour*, students are expected to demonstrate the ability to create an element of surprise by adding unusual combinations, fundamental absurdity in human behaviour, hyperbole, satire, opposites, and distortion within the designed response. The design presented by one student (SR 1) showed a

person in a latrine, probably contemplating the dilemma of not having toilet paper. Another student (SR 2) added detail to the four shapes to create a humoristic design of a cinema featuring the movie, *Black Panther*. Both these students scored full marks for the sub-domain *Humour.*

Table 7.10 Examples of students' responses in figurative format for Activity 7

Student responses for Activity: Combining shapes for design		
Instruction for activity: In the open space below, draw object(s) and/or figure(s) using all or some of the following shapes, together with any additional details if you wish. You may also add words.		
Student responses:		
		
Orginal four elements	SR 1	SR 2

SR = student response

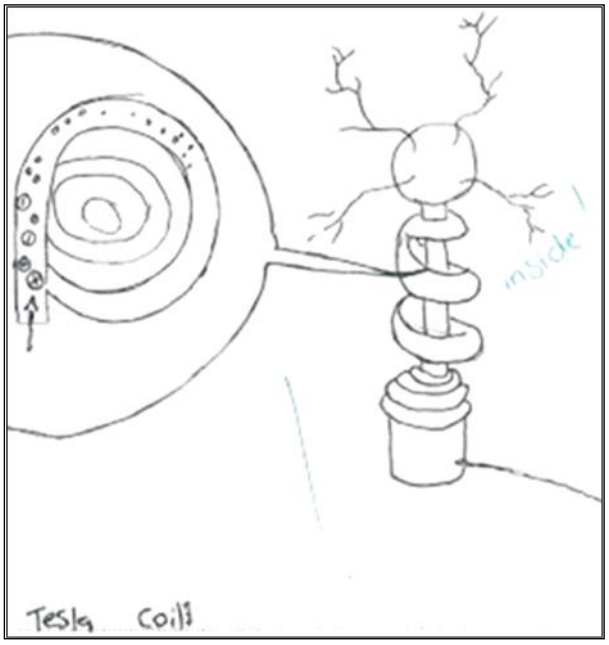
7.3.5 Example of student responses in figurative format for Activity 10

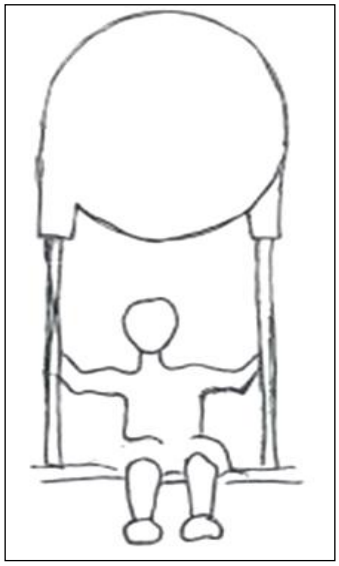
Activity 10: Using cut out Shape for Design was selected to demonstrate the variation in the level of detail presented in student responses. Students were requested to imagine and design a picture, using a cut-out shape, pasted in the activity space. In Table 7.11, the responses of three students are presented showing high, medium, and low scores. For the most, the scores of the three students differed mainly in originality. To obtain a high score for the sub-domain *Originality*, students are expected to present uncommon, unusual, and highly imaginative responses. In

particular, Student response 1 showed a complex design of a Tesla coil linked to an energy generating device using the cut-out shape; and was therefore awarded a high score. Student response 2, although relatively original, was much less complex than Student response 1. In contrast, Student response 3 was awarded a relatively low score because of a lack of originality.

Table 7.11 Examples of students' responses in figurative format for Activity 10

Student responses for Activity: Using cut out shape for design		
Instruction for activity: Cut out the shape from the piece of paper that has been handed out to you. Now, imagine a picture in which this shape is part of. Paste the shape in the blank space below and complete the picture that you had imagined.		
		
Student response 1: High score	**Identified sub-domain**	**Mark-allocation per sub-domain**
	Originality	5
	Appropriateness of titles	5
	Resistance to premature closing	5
	Elaboration	3
	Storytelling articulateness	5
	Movement or action	3
	Expressiveness of titles	5
	Humour	0
	Richness of imagery	5
	Unusual visualization	5
	Unusual uses	5
	Synthesis of incomplete Figures	5

Student responses for Activity: Using cut out shape for design		
	Synthesis of lines	0
	Internal visualization	5
	Extending or breaking boundaries	0
	Colourfulness of imagery	0
	Combination	5
	Score out of 85	**61 (71.8%)**

Student response 2: Medium score	**Identified sub-domain**	**Mark-allocation per sub-domain**
	Originality	4
	Appropriateness of titles	0
	Resistance to premature closing	3
	Elaboration	3
	Storytelling articulateness	3
	Movement or action	0
	Expressiveness of titles	0
	Humour	3
	Richness of imagery	1
	Unusual visualization	5
	Unusual uses	0
	Synthesis of incomplete Figures	5
	Synthesis of lines	5
	Internal visualization	0
	Extending or breaking boundaries	0

Student responses for Activity: Using cut out shape for design		
	Colourfulness of imagery	0
	Combination	5
	Score out of 85	**37 (43.5%)**

Student response 3: Low score	**Identified sub-domain**	**Mark-allocation per sub-domain**
	Originality	0
	Appropriateness of titles	0
	Resistance to premature closing	0
	Elaboration	0
	Storytelling articulateness	0
	Movement or action	0
	Expressiveness of titles	0
	Humour	0
	Richness of imagery	0
	Unusual visualization	5
	Unusual uses	0
	Synthesis of incomplete Figures	0
	Synthesis of lines	0
	Internal visualization	0
	Extending or breaking boundaries	0
	Colourfulness of imagery	0
	Combination	0
	Score out of 85	**5 (5.9%)**

7.4 Examples of student response for activity type *Object Repetition*

Within the activity type, *Object Repetition,* two activities were created for the Creativity Test Instrument. Both activities were selected to demonstrate the variation in the level of detail in student responses, as well as unexpected student responses. These responses also demonstrate the format

of students' response in figurative format. Table 7.12 lists the two activities that were selected to demonstrate responses for the activity type, *Object Repetition*.

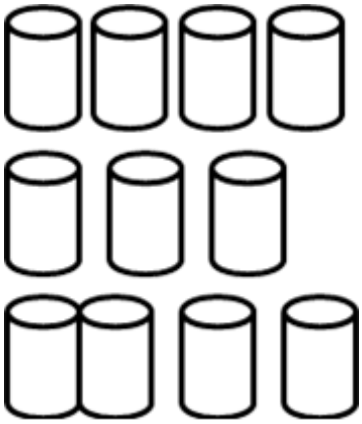
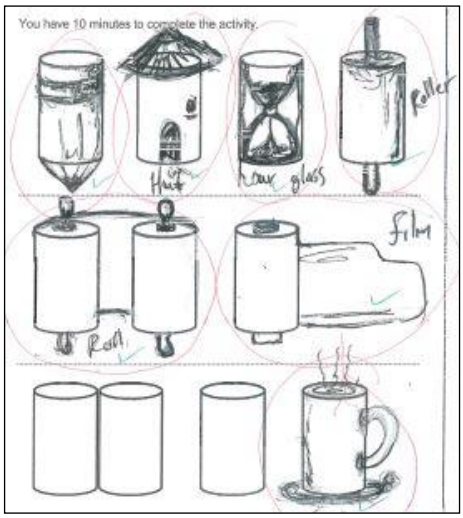
Table 7.12 Examples of student responses for activity type *Object Repetition*

Activity	Example
8. *Adding Details to Cylinders*	3 examples of a student's response in figurative format
9. *Adding Details to Separate Lines*	1 example of a student's response in figurative format
Total number of examples presented	4

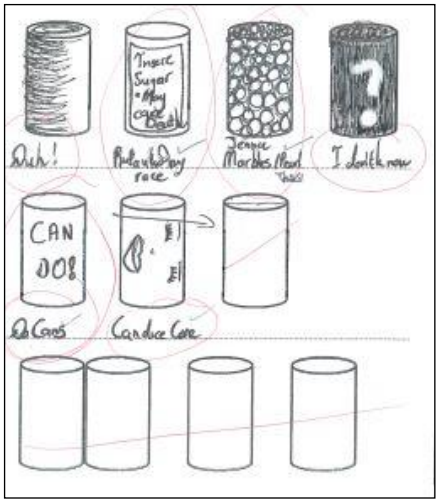
7.4.1 Examples of student responses in figurative format for Activity 8

The *Activity 8: Adding Details to Cylinders,* was selected to demonstrate variation in the level of detail that the students presented in their responses. Students were requested to create a picture or pictures by adding additional details to several cylinders. In Table 7.13, the responses of three students are presented showing high, medium, and low scores. The scores amongst the three responses differed mainly in flexibility. To obtain a high score for the sub-domain *Flexibility*, students are expected to provide detail, which includes the number of different relevant components or aspects in their responses. The responses of the three students differed in the number of components, where Student response 1 presented more components than Student response 2. In contrast, Student response 3 was awarded a relatively low score because of a lack of flexibility.

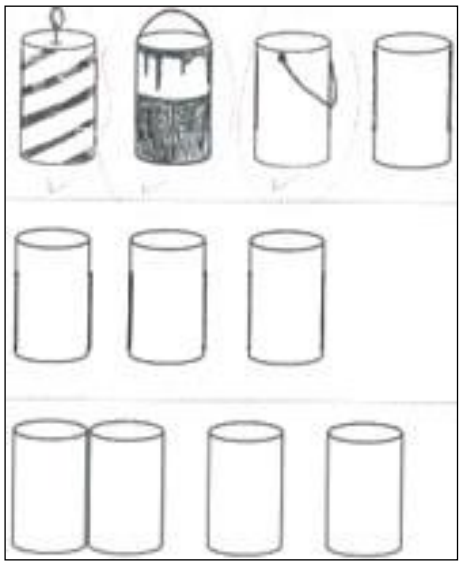
Table 7.13 Examples of student responses in figurative format for Activity 8

Student responses for Activity: Adding details to cylinders		
Instruction for activity: By adding additional details with your pencil to the shapes below, create your own picture or pictures.		
 Orginal 11 cylinders		
Student response 1: High score	**Identified sub-domain**	**Mark-allocation per sub-domain**
	Fluency	4
	Flexibility	5
	Originality	4
	Appropriateness of titles	4
	Resistance to premature closing	1
	Elaboration	4
	Movement or action	3
	Expressiveness of titles	0
	Unusual visualization	0
	Humour	0
	Richness of imagery	2
	Unusual uses	5
	Synthesis of incomplete figures	0
	Synthesis of lines	5

Student responses for Activity: Adding details to cylinders		
	Internal visualization	5
	Extending or breaking boundaries	0
	Colourfulness of imagery	0
	Combination	0
	Score out of 90	**42 (46,7%)**

Student response 2: Medium score	**Identified sub-domain**	**Mark-allocation per sub-domain**
	Fluency	3
	Flexibility	4
	Originality	5
	Appropriateness of titles	5
	Resistance to premature closing	2
	Elaboration	0
	Movement or action	0
	Expressiveness of titles	0
	Unusual visualization	5
	Humour	2
	Richness of imagery	1
	Unusual uses	0
	Synthesis of incomplete figures	0
	Synthesis of lines	0
	Internal visualization	1
	Extending or breaking boundaries	0
	Colourfulness of imagery	0
	Combination	0
	Score out of 90	**28 (31.1%)**

Student response 3: Low score	**Identified sub-domain**	**Mark-allocation per**

Student responses for Activity: Adding details to cylinders		
		sub-domain
	Fluency	2
	Flexibility	3
	Originality	1
	Appropriateness of titles	0
	Resistance to premature closing	0
	Elaboration	3
	Movement or action	0
	Expressiveness of titles	0
	Unusual visualization	0
	Humour	0
	Richness of imagery	1
	Unusual uses	0
	Synthesis of incomplete figures	0
	Synthesis of lines	0
	Internal visualization	0
	Extending or breaking boundaries	2
	Colourfulness of imagery	0
	Combination	0
	Score out of 90	**12 (13.3%)**

7.4.2 Example of student's response in figurative format for Activity 9

Activity 9: Adding Details to Separate Lines, required that students create a picture or pictures by adding additional details to a number of line elements. In the example provided in Table 7.14, the student demonstrated the ability to apply motion by showing a figure climbing over the separate lines. This student scored full marks for the sub-domain *Movement or Action*, which requires the ability to apply motion indicators which show the sense of motion or action within a design.

Table 7.14 Example of student's response in figurative format for Activity 9

Student response for Activity: Adding details to lose lines	
Instruction for activity:	By adding additional details with your pencil to the shapes below, create your own picture or pictures.
Student response:	
 Orginal sewen elements	
 SR 1	

SR = student response

7.5 Examples of student responses for activity type *Problem-Solving*

Within the activity type, *Problem-Solving*, seven activities were created for the Creativity Test Instrument. Two of the seven activities were selected to demonstrate the variation in the level of detail in student responses, as well as unexpected student responses. Furthermore, these responses also demonstrate two student responses, in figurative format. Table 7.15 lists the two activities that were selected to demonstrate responses for activity type, *Problem-Solving*.

Table 7.15 List of examples of student responses for activity type Problem-Solving

Activity	Example
11. *Solving Mother Hubbard's problem*	1 example of a student's response in figurative format
12. *Question Activity*	3 examples of a student's response in figurative format
Total number of examples presented	4

7.5.1 Example of student's response in word format for Activity 11

The *Activity 11: Solving Mother Hubbard's problem*, required that students create a list of solutions to solve Mother Hubbard's problem. In Table 7.16 the student demonstrated an unexpected response by presenting the solution in poem format and not in an expected list of solutions to solve Mother Hubbard's problem.

Table 7.16 Example of student response in word format for Activity 11

Student response for Activity: Solving Mother Hubbard's problem
Instruction for activity: In the space below, list as many solutions you could think of to solve Mother Hubbard's problem in the following nursery rhyme?
Nursery rhyme: Old Mother Hubbard Went to the cupboard To get her poor doggie a bone When she got there The cupboard was bare So, the poor little doggie had none
Student response:
Without hesitation she went to her car Headed to the grocery store very very far Rushed to the shelves to only find one Wad [With] competition but she got the job done Headed home and found her dog al alone With full joy she gives [gave] the dog the bone

[ ] Words presented in square brackets provide interpretations of the student's response.

7.5.2 Examples of student responses in word format for Activity 12

Activity 12: Question Activity, was selected to demonstrate variation in the level of detail that students presented in their responses. Students were requested to present a list of possible questions that they could think of when viewing a specific picture on display. In Table 7.17, the responses of three students are presented showing high, medium, and low scores. The scores amongst the three student responses differed in the number of different questions that they presented. Therefore, to obtain a high score for the sub-domain *Fluency*, a student should present a relatively high number of responses, which were questions in this instance. Student response 1 presented 13 different questions and was thus awarded the highest score.

Table 7.17 Example of student responses in word format for Activity 12

Student responses for Activity: Question activity

Instruction for activity: In the space below, write down all the possible questions that you can think of, when viewing the picture below. Try to think out of the box. Do not be afraid to guess.

Student response 1: High score Student listed 13 questions	**Identified sub-domain**	**Mark-allocation per sub-domain**
1. Why did he not read the sign?	Fluency	5
2. Why was the floor wet?	Flexibility	5
3. Who's [Whose] job was it to clean the floor?	Originality	5
4. Where was he going?	Resistance to premature closing	4
5. What is he [his] job?	Emotional expressiveness	5
6. What is written on the pages?	Humour	5

Student responses for Activity: Question activity		
7. Will the pages get damaged?	Overall observation	5
8. Why is he alone?	Identifying questions	5
9. is [Is] he going to break something?		
10. did [Did] he get hurt?		
11. is [Is] anyone going to help him up?		
12. did [Did] he hid his head?		
13. will [Will] he fall into another dimension???		
	Score out of 40	**39 (97.5%)**

Student response 2: Medium score Student listed nine questions	**Identified sub-domain**	**Mark-allocation per sub-domain**
1. Where is this?	Fluency	5
2. Who is that?	Flexibility	5
3. Where is he going?	Originality	4
4. What is he reading?	Resistance to premature closing	1
5. Is it important?	Emotional expressiveness	2
6. Is he in a rush?	Humour	1
7. Is he worried?	Overall observation	5
8. Is he going to get fired?	Identifying questions	5
9. Can he look infront [in front] of him?		
	Score out of 40	**28 (70.0%)**

Student response 3: Low score Student listed five questions	**Identified sub-domain**	**Mark-allocation per sub-domain**
1. Didnt [Didn't] he see the sign?	Fluency	2
2. Was he bussy [busy] to looke [look] down?	Flexibility	3
3. He did no see that the floor was wet or what?	Originality	1
4. Or what happened after he [his] fall?	Resistance to premature closing	0
5. Did he broke [break] his leg?	Emotional expressiveness	0
	Humour	0
	Overall observation	1
	Identifying questions	5

Student responses for Activity: Question activity		
	Score out of 40	**12 (30.0%)**

[ ] Words presented in square brackets provide interpretations of student responses.

7.6 Discussion

This study revealed several interesting aspects about student responses to the Creativity Test. Through the analysis of the student responses, a wide range of responses could be identified in terms of breadth and depth of the responses. Although some students were able to list several different topics within the *Flexibility* sub-domain, the responses of other students were relatively limited. Similarly, for the sub-domain *Fluency*, the number of responses to some of the activities also varied greatly. Some students were able to present a relatively large number of responses, while others presented a limited number of responses. Many of the activities required that students make metal leaps in their responses. Several students were able to demonstrate such metal leaps by breaking expected boundaries. These students presented interesting imagery of highly imaginative designs, as well as unexpected and uncommon responses with high level of detail. These responses demonstrated aspects such as humour, comical designs, and originality. Students that presented high level of responses were awarded high scores, for example for the sub-domains *Humour*, *Colourfulness of Imagery* and *Originality*.

Chapter 8

Creativity Performances of the Control and Test Groups

8.1 Introduction

The success of the Creativity Workshop that was attended by the Test group of students, was assessed through a Creativity Test. The Creativity Test, comprising of 17 activities, was completed by both groups of students. Thus, to determine if the implementation of a Creativity Workshop has the potential to stimulate creativity amongst entry level students in Art and Design, the following overall hypothesis was tested.

> H_a: *A creativity workshop will enhance creative skills amongst entry level University art and design students*

Several comparisons were executed to determine whether the Creativity Workshop had a positive influence on the Test group of students. The comparisons were made for the four Creativity domains, as well as four activity types. The four Creativity domains that were assessed were *Diverse Thinking*, *Creative Strengths*, *Innovation Skills* and *Practical Skills*. The Creativity domains covered 29 Creativity sub-domains, which were also compared. Furthermore, the four activity types that were compared included *Improvisation*, *Image Development*, *Object Repetition* and *Problem-Solving*.

8.2 Overall creativity performance in Creativity Test

To assess the overall success of the Creativity Workshop the overall hypothesis (H_a) was tested by comparing the total scores of the two groups of students obtained in the Creativity Test. The mean percentage scores revealed that the Test group of students outperformed the Control group of

students; although not significant in a Student's *t*-test at $\alpha = 0.05$. Table 8.1 provides a list of overall student scores, summary statistics and *t*-test results.

Table 8.1 Overall Creativity Test performances of the control and test groups of students

Student	Student group	
	Control $n_c = 24$	Test $n_T = 30$
1	362	462
2	432	337
3	376	435
4	526	595
5	482	633
6	474	283
7	383	542
8	291	305
9	456	355
10	468	419
11	464	272
12	360	494
13	476	385
14	370	551
15	497	470
16	291	387
17	364	265
18	265	473
19	444	339
20	141	357
21	312	329
22	417	379
23	321	571
24	383	328
25		586
26		524
27		466
28		462
29		471
30		407
Total out of	1000	1000
Mean score	389.79	429.40
Mean %	38.98	42.94

Student	Student group	
	Control $n_c = 24$	Test $n_T = 30$
Standard deviation	89.76	102.77
***t*-Statistic**	-1.49	
Df	52	
Probability	0.143 (NS)	

NS = not significant at $\alpha = 0.05$; Df = degrees of freedom;
nc = number of Control group of students; n_T = number of Test group of students

8.3 Creativity performance per Domain in Creativity Test

The performances of the two groups of students were also compared in terms of the four Creativity domains. These Creativity domains were *Diverse Thinking*, *Creative Strengths*, *Innovation Skills* and *Practical Skills*. Therefore, H_1, which states *that the Test group of students performs better than the Control groups of students in the respective Creativity domains*, was tested using the Student's *t*-test. When the mean scores of the two groups of students were compared by the Student's *t*-test, no significant differences could be established between the two groups for the two Creativity domains, *Diverse Thinking* and *Innovation Skills* at $\alpha = 0.05$ (Table 8.2). In contrast, significant differences were found between the groups for the other two domains, *Creative Strengths* and *Practical Skills*.

Table 8.2 **Creativity Test performances of the Control and Test groups of students in terms of the four domains**

	Domain							
	Diverse Thinking		*Creative Strengths*		*Innovation Skills*		*Practical Skills*	
Student	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
1	182	188	107	160	48	59	25	55
2	201	175	144	95	47	47	40	20
3	167	167	109	139	65	62	35	60
4	246	268	198	205	52	67	30	55
5	219	280	167	223	46	60	50	70
6	217	129	165	79	42	40	50	35
7	179	251	152	179	22	57	30	55
8	127	134	67	91	57	50	40	30
9	191	141	163	119	57	50	45	45
10	210	180	189	137	39	57	30	45
11	223	94	141	101	50	37	50	40
12	149	178	133	204	43	62	35	50
13	208	151	165	140	63	49	40	45
14	153	218	111	221	51	52	55	60
15	244	178	148	215	65	42	40	35
16	132	144	79	150	55	48	25	45
17	172	97	115	88	62	45	15	35
18	109	155	89	213	32	45	35	60
19	189	135	162	119	48	45	45	40
20	54	132	40	125	37	45	10	55
21	138	98	111	152	48	19	15	60
22	183	174	135	114	54	51	45	40
23	136	226	102	252	48	48	35	45
24	158	130	139	113	56	45	30	40
25		225		232		49		65

	Domain							
	Diverse Thinking		*Creative Strengths*		*Innovation Skills*		*Practical Skills*	
Student	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
26		191		225		40		55
27		186		188		37		55
28		185		172		50		55
29		182		204		40		45
30		153		157		57		40
Total out of	360	360	480	480	70	70	90	90
Mean score	174.46	171.50	130.46	160.40	49.46	48.50	35.42	47.83
Mean %	48.46	47.64	27.18	33.42	70.66	69.29	39.36	53.14
Standard deviation	45.17	47.07	38.63	50.26	10.40	9.56	11.79	11.27
***t*-Statistic**	0.23		-2.40		0.35		-3.945	
Df	52		52		52		52	
Probability	0.816 (NS)		0.020 **(S)**		0.726 (NS)		0.0002 **(S)**	

NS = not significant at $\alpha = 0.05$; S = significant at $\alpha = 0.05$; Df = degrees of freedom; n_c = number of Control group of students. n_T = number of Test group of students

8.4 Creativity performance per sub-domain in Creativity Test

Several Creativity sub-domains within the respective Creativity domains were analysed in terms of the performances of the students in the Creativity Test. Therefore, the hypothesis, H_2, which states that the Test group of students performs better than the Control groups of students in the respective Creativity sub-domains, was tested for each of the creativity sub-domains. Table 8.3 provides a list of all the Creativity sub-domains of the respective Creativity domains for which the results are presented in this chapter. In total, student performances were assessed for 29 different Creativity sub-domains.

Table 8.3 Creativity domains and Creativity sub-domains

Domain	Sub-domain	Number of sub-domains
1. *Diverse Thinking*	1.1 *Fluency* 1.2 *Flexibility* 1.3 *Originality* 1.4 *Appropriateness of Titles* 1.5 *Resistance to Premature Closing* 1.6 *Elaboration*	6
2. *Creative Strengths*	2.1 *Emotional Expressiveness* 2.2 *Storytelling Articulateness* 2.3 *Movement or Action* 2.4 *Expressiveness of Titles* 2.5 *Synthesis of Incomplete Figures* 2.6 *Synthesis of Lines* 2.7 *Unusual Visualisation* 2.8 *Internal Visualisation* 2.9 *Extending or Breaking Boundaries* 2.10 *Humour* 2.11 *Richness of Imagery* 2.12 *Colourfulness of Imagery*	12
3. *Innovation Skills*	3.1 *Problem-Solving* 3.2 *Identify Problems* 3.3 *Identify Questions* 3.4 *Identifying Causes* 3.5 *Identify Consequences* 3.6 *Imagination* 3.7 *Overall Observation*	7
4. *Practical Skills*	4.1 *Unusual Uses* 4.2 *Combination* 4.3 *Completion* 4.4 *Product Improvement*	4
Total number of sub-domains		**29**

8.4.1 Creativity performance per Creativity sub-domain within *Diverse Thinking* domain

The performances of the two groups of students were further compared in terms of the different Creativity sub-domains within Creativity domain of *Diverse Thinking*. In *Diverse Thinking*, six different Creativity sub-domains were assessed. These Creativity sub-domains were *Fluency*, *Flexibility*, *Originality*, *Appropriateness of Titles*, *Resistance to Premature Closing* and also *Elaboration* (Table 8.4). When the mean scores of the different Creativity sub-domains of the two groups of students were compared in a Student's *t*-test, significant differences were recognised between the two groups of students for the two Creativity sub-domains, *Originality* and *Elaboration* at $\alpha = 0.05$. No significant differences were detected between the two groups of students for the other Creativity sub-domains.

Table 8.4 **Creativity Test performances of the Control and Test groups in terms of the sub-domains of the creativity domain Diverse Thinking**

Domain	*Diverse Thinking*											
Sub - domain	*Fluency*		*Flexibility*		*Originality*		*Appropriateness of Titles*		*Resistance to Premature Closing*		*Elaboration*	
Student	Control $n_c = 24$	Test $n_T = 30$	Control $n_c = 24$	Test $n_T = 30$	Control $n_c = 24$	Test $n_T = 30$	Control $n_c = 24$	Test $n_T = 30$	Control $n_c = 24$	Test $n_T = 30$	Control $n_c = 24$	Test $n_T = 30$
1	32	31	42	43	40	35	25	12	15	22	28	45
2	33	34	41	50	56	33	25	0	14	10	32	48
3	36	34	45	39	33	32	22	9	11	11	20	42
4	42	44	51	51	63	53	30	30	27	50	33	40
5	26	46	41	48	60	57	29	25	34	51	29	53
6	29	24	38	40	58	23	35	16	18	3	39	23
7	24	35	34	49	48	62	10	16	25	42	38	47
8	24	19	40	32	29	30	9	3	9	6	16	44
9	34	16	46	32	45	32	35	9	11	17	20	35
10	36	22	50	41	49	41	13	14	24	15	38	47
11	28	19	45	30	56	13	34	3	27	6	33	23
12	25	26	41	47	37	33	9	9	13	16	24	47
13	32	23	40	38	47	24	25	15	27	11	37	40
14	25	30	39	46	40	50	9	15	18	24	22	53
15	47	19	50	29	44	46	18	17	37	23	48	44
16	19	26	38	38	33	30	16	17	14	7	12	26
17	26	24	33	36	47	14	11	6	30	6	25	11
18	20	25	30	37	22	27	4	24	10	13	23	29
19	27	17	41	32	49	20	6	22	27	6	39	38
20	14	26	25	39	4	19	0	21	0	8	11	19
21	25	11	37	22	32	15	17	15	11	5	16	30

Domain	*Diverse Thinking*											
Sub - domain	***Fluency***		***Flexibility***		***Originality***		***Appropriateness of Titles***		***Resistance to Premature Closing***		***Elaboration***	
Student	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
22	28	32	45	41	38	43	24	23	19	17	29	18
23	24	32	40	47	29	44	13	35	7	21	23	47
24	29	19	38	35	40	20	14	26	15	3	22	27
25		46		53		37		29		19		41
26		23		40		46		32		18		32
27		26		37		44		30		12		37
28		21		39		46		28		14		37
29		20		35		35		28		11		53
30		27		40		25		29		8		24
Total out of	55	55	55	55	80	80	35	35	75	75	60	60
Mean score	28.54	26.57	40.42	39.53	41.63	34.30	18.04	18.60	18.46	15.83	27.38	36.67
Mean %	51.89	48.31	73.49	71.87	52.04	42.88	51.54	53.14	24.61	21.11	45.63	61.12
Standard deviation	7.22	8.60	6.14	7.21	13.36	13.01	10.19	9.57	9.27	12.39	9.53	11.44
***t*-Statistic**	0.90		0.48		2.03		-0.21		0.86		-3.19	
Df	52		52		52		52		52		52	
Probability	0.372 (NS)		0.635 (NS)		0.047 **(S)**		0.837 (NS)		0.393 (NS)		0.002 **(S)**	

NS = not significant at $\alpha = 0.05$; S = significant at $\alpha = 0.05$; Df = degrees of freedom; n_c = number of Control group of students; n_T = number of Test group of students

8.4.2 Creativity performance per *Creative* sub-domain within *Creative Strengths* domain

For the Creativity domain, *Creative Strengths*, the performances of the two groups of students were compared for 12 different Creativity sub-domains. When the mean scores of the two groups of students were compared in a Student's *t*-test at $\alpha = 0.05$, significant differences could be detected between the two groups of students for only three of the Creativity sub-domains (Table 8.5 a and b). These Creativity sub-domains were *Synthesis of Incomplete Figures*, *Internal Visualisation*, as well as *Extending or Breaking Boundaries*. The other nine Creativity sub-domains did not reveal any differences between the two student groups.

Table 8.5 **Creativity Test performances of the Control and Test groups in terms of the sub-domains under/within the creativity domain Creative Strengths**

a.

Domain	*Creative Strengths*											
Sub - domain	***Emotional Expressiveness***		***Storytelling Articulateness***		***Movement or Action***		***Expressiveness of Titles***		***Synthesis of Incomplete Figures***		***Synthesis of Lines***	
Student	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
1	7	29	12	3	10	9	10	17	0	10	0	15
2	20	11	8	4	11	3	22	4	5	5	0	10
3	14	11	2	4	7	5	10	0	10	15	10	15
4	15	16	10	3	10	8	15	15	5	25	5	5
5	29	20	9	13	12	16	19	7	10	25	5	5
6	10	4	9	1	7	4	6	1	20	15	25	10
7	10	21	6	5	14	4	1	15	20	15	10	10
8	6	18	2	4	8	4	0	0	0	10	5	15
9	14	14	10	4	10	5	35	6	10	20	10	10
10	16	15	12	4	20	7	4	13	5	10	15	5
11	12	4	8	3	8	8	25	3	5	20	10	15
12	17	20	8	5	11	14	2	10	5	20	5	15
13	12	12	6	3	7	12	14	14	15	15	20	15
14	4	24	5	8	14	19	3	20	5	15	5	5
15	16	15	7	12	4	14	5	17	15	25	10	0
16	7	22	3	12	9	5	1	7	5	15	10	15
17	18	12	12	5	7	6	8	2	5	0	5	10
18	13	13	1	4	4	12	1	17	0	25	20	25
19	7	12	5	9	10	12	0	0	10	10	25	10
20	7	10	1	6	0	2	0	0	0	5	5	20

Domain	*Creative Strengths*											
Sub - domain	***Emotional Expressiveness***		***Storytelling Articulateness***		***Movement or Action***		***Expressiveness of Titles***		***Synthesis of Incomplete Figures***		***Synthesis of Lines***	
Student	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
21	25	7	1	5	5	9	5	10	0	20	15	25
22	15	11	4	7	5	6	6	4	10	15	10	10
23	6	24	4	12	11	16	7	33	15	15	15	20
24	12	9	6	2	4	7	7	5	5	5	5	10
25		24		10		6		7		20		20
26		17		11		12		30		5		20
27		8		10		13		11		15		20
28		16		11		9		0		20		10
29		28		11		11		14		15		15
30		22		11		10		24		0		15
Total out of	35	35	15	15	40	40	35	35	35	35	35	35
Mean score	13.00	15.63	6.29	6.73	8.67	8.93	8.58	10.20	7.50	14.33	10.21	13.17
Mean %	37.14	44.66	41.93	44.87	21.68	22.33	24.51	29.14	21,43	40.94	29.17	37.63
Standard deviation	6.12	6.67	3.58	3.68	4.17	4.35	9.00	8.90	6.08	7.16	6.99	6.07
***t*-Statistic**	-1.49		-0.44		-0.23		-0.66		-3.72		-1.66	
Df	52				52		52		52		52	
Probability	0.141 (NS)		0.659 (NS)		0.821 (NS)		0.512 (NS)		0.0004**(S)**		0.103 (NS)	

NS = not significant at $\alpha = 0.05$; S = significant at $\alpha = 0.05$; Df = degrees of freedom; nc = number of Control group of students; n_T = number of Test group of students

b.

Domain	*Creative strengths*											
Sub - domain	***Unusual Visualisation***		***Internal Visualisation***		***Extending or Breaking Boundaries***		***Humour***		***Richness of Imagery***		***Colourfulness of Imagery***	
Statistic	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
1	20	15	15	15	5	0	10	37	13	10	5	0
2	25	20	25	20	0	0	15	7	13	11	0	0
3	20	25	10	25	0	15	11	17	10	7	5	0
4	25	30	20	30	5	0	58	52	20	16	10	5
5	15	30	20	25	5	15	24	40	19	27	0	0
6	15	15	15	10	10	5	16	9	27	5	5	0
7	30	24	20	15	5	0	7	56	24	9	5	5
8	20	15	15	10	0	0	2	4	9	11	0	0
9	15	10	25	15	5	0	19	17	10	13	0	5
10	35	20	25	25	5	5	7	9	25	14	20	10
11	20	25	20	15	0	0	14	2	14	6	5	0
12	30	40	20	35	0	10	28	24	7	11	0	0
13	20	30	30	15	0	5	23	13	18	6	0	0
14	20	35	25	25	0	0	14	46	11	19	5	5
15	20	35	35	35	5	5	15	35	16	22	0	0
16	15	15	15	29	5	0	1	12	8	13	0	5
17	20	6	20	20	0	15	8	5	12	7	0	0
18	15	30	20	35	0	25	2	8	13	14	0	5
19	10	10	40	30	0	5	27	5	18	16	10	0

Domain	*Creative strengths*											
Sub - domain	***Unusual Visualisation***		***Internal Visualisation***		***Extending or Breaking Boundaries***		***Humour***		***Richness of Imagery***		***Colourfulness of Imagery***	
Statistic	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
20	10	24	10	45	5	5	1	3	1	5	0	0
21	25	6	10	40	10	15	7	0	3	10	5	5
22	30	20	20	20	0	5	11	8	14	8	10	0
23	15	21	15	35	0	15	6	34	8	17	0	10
24	30	28	20	35	0	5	25	3	10	4	15	0
25		35		50		15		33		12		0
26		20		25		15		55		5		10
27		35		30		15		20		11		0
28		29		30		20		6		21		0
29		28		30		20		11		16		5
30		24		20		0		28		3		0
Total out of	45	45	50	50	35	35	80	80	40	40	35	35
Mean score	20.83	23.33	20.42	26.30	2.71	7.83	14.63	19.97	13.46	11.63	4.17	2.33
Mean %	46.29	51.84	40.84	52.60	7.74	22.37	18.29	24.96	33.65	29.08	11.91	6.66
Standard deviation	6.70	9.03	7.36	9.98	3.29	7.62	12.39	17.32	6.53	5.83	5.45	3.41
***t*-Statistic**	-1.11		-2.41		-3.07		-1.27		1.08		1.51	
Df	52		52		52		52		52		52	
Probability	0.264 (NS)		0.020 **(S)**		0.003 **(S)**		0.209 (NS)		0.283 (NS)		0.137 (NS)	

NS = not significant at $\alpha = 0.05$; S = significant at $\alpha = 0.05$; Df = degrees of freedom; nc = number of Control group of students; n_T = number of Test group of students

8.4.3 Creativity performance per sub-domain within *Innovation Skills* domain

The two groups of students were also compared in terms the respective Creativity sub-domains of the *Innovation Skills* domain. When the mean scores of the two groups of students were compared in a Student's *t*-test, significant differences could be established between the two groups of students for three of the seven Creativity sub-domains at $\alpha = 0.05$ (Table 8.6). These Creativity sub-domains included *Problem-Solving*, *Identifying Causes* and *Identifying Consequences*. For the other four Creativity sub-domains, no significant differences were found.

Table 8.6 **Creativity Test performances of the Control and Test groups in terms of the sub-domains under/within the creativity domain Innovation Skills**

Domain	*Innovation Skills*													
Sub - domain	*Problem-Solving*		*Identifying Problems*		*Identifying Questions*		*Identifying Causes*		*Identifying Consequences*		*Imagination*		*Over-all Observation*	
Student	Control $n_c = 24$	Test $n_T = 30$	Control $n_c = 24$	Test $n_T = 30$	Control $n_c = 24$	Test $n_T = 30$	Control $n_c = 24$	Test $n_T = 30$	Control $n_c = 24$	Test $n_T = 30$	Control $n_c = 24$	Test $n_T = 30$	Control $n_c = 24$	Test $n_T = 30$
1	7	8	10	10	5	5	0	5	5	10	5	6	16	15
2	5	1	10	5	5	5	0	5	5	10	6	6	16	15
3	10	10	10	10	5	5	5	5	10	10	5	7	20	15
4	7	10	10	10	5	5	5	5	10	10	7	9	8	18
5	10	10	10	10	5	5	0	5	5	10	6	10	10	10
6	4	3	5	10	5	5	5	5	10	10	6	1	7	6
7	5	6	0	5	0	5	0	5	0	10	3	7	14	19
8	10	5	10	10	5	5	5	5	10	10	5	3	12	12
9	9	7	10	10	5	5	5	5	10	10	4	3	14	10
10	5	5	10	10	5	5	0	5	5	10	7	6	7	16
11	8	0	10	5	5	5	0	5	5	10	5	4	17	8
12	3	9	10	10	5	5	0	5	5	10	5	5	15	18
13	10	10	10	10	5	5	5	5	10	10	3	2	20	7
14	8	5	10	10	0	5	5	5	10	10	5	6	13	11
15	10	6	10	5	5	5	5	5	10	10	5	2	20	9
16	5	5	10	10	5	5	5	5	10	10	5	2	15	11
17	5	1	10	10	5	5	5	5	10	10	10	3	17	11
18	7	1	0	10	5	5	5	5	5	10	0	2	10	12

Domain	*Innovation Skills*													
Sub - domain	***Problem-Solving***		***Identifying Problems***		***Identifying Questions***		***Identifying Causes***		***Identifying Consequences***		***Imagination***		***Over-all Observation***	
Student	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
19	10	5	10	10	5	5	5	5	5	10	5	3	8	7
20	5	4	10	10	5	5	5	5	5	10	2	0	5	11
21	4	2	10	5	5	5	5	0	10	5	2	0	12	2
22	9	3	5	10	5	5	5	5	10	10	5	4	15	14
23	3	4	10	10	5	5	5	5	10	10	3	6	12	8
24	6	6	10	10	5	5	5	5	10	10	7	2	13	7
25		10		10		5		5		5		5		9
26		4		5		5		5		10		3		8
27		1		5		5		5		10		3		8
28		6		10		5		5		10		4		10
29		0		5		5		5		10		4		11
30		9		10		5		5		10		3		15
Total out of	10	10	10	10	5	5	5	5	10	10	10	10	20	20
Mean score	6.88	5.20	8.75	8.67	4.58	5.00	3.54	4.83	7.71	9.67	4.83	4.03	13.17	11.10
Mean %	68.80	52.00	87.50	86.70	91.60	100.00	70.80	96.60	77.10	96.70	48.30	40.30	65.85	55.50
Standard deviation	2.46	3.25	3.04	2.25	1.41	0.00	2.32	0.91	2.94	1.27	2.04	2.41	4.26	3.99
***t*-Statistic**	2.07		0.12		-1.62		-2.79		-3.29		1.30		1.83	
Df	52		52		52		52		52		52		52	
Probability	0.042 **(S)**		0.908 (NS)		0.111 (NS)		0.007 **(S)**		0.002 **(S)**		0.201 (NS)		0.072 (NS)	

NS = not significant at $\alpha = 0.05$; S = significant at $\alpha = 0.05$; Df = degrees of freedom; nc = number of Control group of students; n_T = number of Test group of students

8.4.4 Creativity performance per sub-domain within *Practical Skills* domain

The two groups of students were compared in terms of the respective Creativity sub-domains of the *Practical Skills* domain. When the mean scores of the two groups of students were compared, no significant differences were found between the two groups of students for all four activities of the *Practical Skills* domain at $\alpha = 0.05$ (Table 8.7). When the mean percentages of the different activities were compared, the data revealed that the Test group of students outperformed the Control group of students in the activity *Combination*.

Table 8.7 Creativity Test performances of the Control and Test groups in terms of the Creativity sub-domains within the Creativity domain Practical Skills

Domain	*Practical skills*							
Sub - domain	*Unusual Uses*		*Combination*		*Completion*		*Product Improvement*	
Student	Control $n_c = 24$	Test $n_T = 30$	Control $n_c = 24$	Test $n_T = 30$	Control $n_c = 24$	Test $n_T = 30$	Control $n_c = 24$	Test $n_T = 30$
1	5	20	10	15	5	10	5	10
2	5	5	15	0	10	10	10	5
3	5	20	10	20	10	10	10	10
4	15	25	5	10	10	10	0	10
5	15	15	20	35	5	10	10	10
6	10	10	25	10	5	10	10	5
7	10	25	10	10	5	15	5	5
8	10	15	10	5	10	5	10	5
9	15	15	15	10	5	15	10	5
10	15	25	15	10	0	5	0	5
11	15	20	20	10	5	0	10	10
12	15	15	5	15	15	10	0	10
13	5	20	20	10	5	5	10	10
14	15	20	15	20	15	10	10	10
15	5	15	10	10	15	5	10	5
16	10	15	5	15	5	10	5	5
17	0	15	5	15	5	0	5	5
18	10	15	15	25	5	15	5	5
19	15	15	15	10	10	5	5	10
20	5	20	5	20	0	5	0	10
21	0	20	5	25	5	5	5	10

22	15	20	10	10	15	5	5	5
23	15	20	10	10	5	10	5	5
24	10	15	5	10	10	5	5	10
25		25		20		15		5
26		25		20		5		5
27		25		20		5		5
28		20		20		10		5
29		25		10		5		5
30		10		15		15		0
Total out of	25	25	40	40	15	15	10	10
Mean score	10.00	18.33	11.67	14.50	7.50	8.17	6.25	6.83
Mean %	40.00	73.32	29.18	36.25	50.00	54.47	62.50	68.30
Standard deviation	5.11	5.14	5.84	6.99	4.42	4.25	3.69	2.78
***t*-Statistic**	-5.94		-1.59		-0.56		-0.66	
Df	52		52		52		52	
Probability	0.243 (NS)		0.118 (NS)		0.576 (NS)		0.510 (NS)	

NS = not significant at α = 0.05; S = significant at α = 0.05; Df = degrees of freedom; nc = number of Control group of students; n_T = number of Test group of students

8.5 Creativity performance per Activity type in Creativity Test

The Creativity Test that was devised in this study comprised of 17 different activities that each student had to complete. These 17 activities were grouped into four main activity types: *Improvisation*, *Image Development*, *Object Repetition* and *Problem-Solving*. Within each of these activity types, several Creativity sub-activities were analysed for each student in the two student groups. Therefore, the hypothesis, H_3, which states that *the Test group of students performs better than the Control groups of students in the respective activity types and their sub-activities*, was tested. Table 8.8 provides a list of all the Creativity sub-activities of the respective activity types for which the results are presented in this section.

Table 8.8 Activity types and sub-activities within activity type

Activity type	Activity number	Sub-activity within activity type	Number of activities per activity type
Improvisation	1.	*Unusual Uses for a Doll Hand*	3
	2.	*Possibilities for Being Invisible*	
	3.	*Product Improvement of Soft Toy*	
Image Development	4.	*Adding Details to Large Block*	5
	5.	*Adding Details to Medium Blocks*	
	6.	*Adding Details to Small Blocks*	
	7.	*Combining Shapes for Design*	
	8.	*Using cut out Shape for Design*	
Object Repetition	9.	*Adding Details to Cylinders*	2
	10.	*Adding Details to Separate Lines*	
Problem-Solving	11.	*Solving Mother Hubbard's problem*	7
	12.	*Question Activity*	
	13.	*Reason Activity*	
	14.	*Consequence Activity 1*	
	15.	*Consequence Activity 2*	
	16.	*List Problems*	
	17.	*Candle Problem*	
Total of activities			**17**

8.5.1 Creativity performance per Activity Type

The performances of the two groups of students were furthermore compared in terms of the four activity types in a Student's *t*-test. When the mean scores of the two groups of students were compared, no significant differences could be established between the two groups of students for two of the activity types at $\alpha = 0.05$ (Table 8.9). In contrast, significant differences were found between the groups of students for the other two activity types, *Image Development* and *Object Repetition*.

Table 8.9 **Creativity Test performances of the Control and Test groups of students in terms of the four activity types**

Statistic	Activity type							
	Improvisation		*Image Development*		*Object Repetition*		*Problem-Solving*	
Student	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
1	63	78	125	154	31	32	143	198
2	91	75	163	75	31	55	147	132
3	63	79	99	133	31	52	183	171
4	91	91	181	198	72	61	182	245
5	75	95	174	242	45	74	188	222
6	91	49	200	101	46	40	137	93
7	49	85	151	165	59	62	124	230
8	73	56	74	110	8	22	136	117
9	79	47	153	177	67	0	157	131
10	65	64	217	145	58	56	128	154
11	69	59	167	76	51	37	177	100
12	67	76	118	178	25	69	150	171
13	61	51	155	129	55	51	205	154
14	66	91	157	215	10	55	137	190
15	85	58	141	203	54	70	217	139
16	60	64	84	178	40	21	107	124
17	79	60	123	84	7	22	155	99
18	35	64	103	256	39	39	88	114
19	70	57	169	145	47	32	158	105
20	28	44	34	142	12	46	67	125
21	64	29	88	164	25	67	135	69
22	64	69	156	119	62	62	135	129
23	58	93	104	250	46	95	113	133
24	65	58	147	123	24	26	147	121
25		93		221		74		198
26		71		228		97		128
27		69		225		70		102
28		55		191		91		125
29		71		204		67		129
30		65		173		19		150
Total out of	125	125	410	410	180	180	258	258
Mean score	67.13	67.20	136.79	166.80	39.38	52.13	146.50	143.27
Mean %	53.70	53.76	33.36	40.68	21.88	28.96	56.78	55.53
Standard deviation	15.53	16.28	42.79	51.59	19.05	23.98	34.77	42.84
***t*-Statistic**	-0.02		-2.29		-2.12		0.30	

Statistic	Activity type							
	Improvisation		*Image Development*		*Object Repetition*		*Problem-Solving*	
Student	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
Df	52		52		52		52	
Probability	0.986 (NS)		0.026 **(S)**		0.038 **(S)**		0.766 (NS)	

NS = not significant at $\alpha = 0.05$; S = significant at $\alpha = 0.05$; Df = degrees of freedom

8.5.2 Creativity performance in sub-activities per *Improvisation* activity type

The two groups of students were compared in terms of the respective activities within the *Improvisation* activity type. When the mean scores of the two groups of students were compared, no significant differences were found between the two groups of students for all three activities of the *Improvisation* activity type at $\alpha = 0.05$ (Table 8.10). When the mean percentages of the different activities were compared, the data revealed that the Test group of students outperformed the Control group of students in two activities: the activity *Unusual Use for Doll Hand*, as well as the activity *Possibilities for Being Invisible*.

Table 8.10 Creativity Test performances of the Control and Test groups of students in terms of the activity type Improvisation

Activity type	*Improvisation*					
Sub-activity within activity type	***Unusual use for Doll Hand***		***Product Improvement of soft Toy***		***Possibilities for Being Invisible***	
Student	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
1	14	5	16	32	33	41
2	25	9	28	23	38	43
3	17	23	18	29	28	27
4	24	24	26	28	41	39
5	15	23	27	23	33	49
6	22	9	30	21	39	19

Activity type	*Improvisation*					
Sub-activity within activity type	***Unusual use for Doll Hand***		***Product Improvement of soft Toy***		***Possibilities for Being Invisible***	
Student	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
7	13	16	17	30	19	39
8	12	13	25	26	36	17
9	20	11	25	24	34	12
10	16	10	13	24	36	30
11	12	10	26	22	31	27
12	9	21	23	27	35	28
13	11	8	23	19	27	24
14	23	15	23	33	20	43
15	16	10	29	23	40	25
16	10	4	25	27	25	33
17	9	4	32	18	38	38
18	4	4	22	29	9	31
19	13	5	24	18	33	34
20	10	10	6	18	12	16
21	10	1	28	18	26	10
22	11	10	28	26	25	33
23	11	22	22	31	25	40
24	17	16	22	26	26	16
25		24		31		38
26		16		23		32
27		19		26		24
28		13		24		18
29		13		25		33
30		18		15		32
Total out of	30	30	40	40	55	55
Mean score	14.33	12.87	23.25	24.63	29.54	29.70
Mean %	47.77	42.90	58.13	61.58	53.71	54.00
Standard deviation	5.36	6.69	5.86	4.68	8.53	10.05
***t*-Statistic**	0.87		-0.97		-0.06	
Df	52		52		52	

Activity type	*Improvisation*					
Sub-activity within activity type	***Unusual use for Doll Hand***		***Product Improvement of soft Toy***		***Possibilities for Being Invisible***	
Student	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
Probability	0.387 (NS)		0.339 (NS)		0.951 (NS)	

NS = not significant at $\alpha = 0.05$; Df = degrees of freedom; n_c = number of Control group of students; n_T = number of Test group of students

8.5.3 Creativity performance in sub-activities per *Image Development* activity type

For the activity type, *Image Development*, the performances of the two groups of students were compared for five different activities. When the mean scores of the Control group and Test group of students were compared, only two of the five activities revealed significant differences between the two groups of students in a Student's *t*-test at $\alpha = 0.05$. The two activities that showed significant differences between the two groups of students were *Adding Details to Medium Blocks*, and also the activity *Using cut out Shape for Design*. Table 8.11 provides a list of overall student scores, summary statistics and *t*-test results within the activity type *Image Development*.

Table 8.11 Creativity Test performances of the Control and Test groups of students in terms of the activity type Image Development

Activity type	*Image Development*									
Sub-activity within activity type	***Adding Details to Large Block***		***Adding Details to Medium Blocks***		***Adding Details to Small Blocks***		***Combining Shapes for Design***		***Using cut out Shape for Design***	
Student	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
1	14	49	22	27	30	26	23	35	36	17
2	39	26	34	18	25	20	36	11	29	0
3	40	46	12	14	22	16	8	31	17	26
4	35	49	46	46	31	42	38	41	31	20

5	46	50	17	62	30	41	40	29	41	60
6	56	21	36	19	29	16	45	19	34	26
7	50	35	20	42	18	23	17	42	46	23
8	21	27	14	14	16	18	23	29	0	22
9	37	44	12	34	28	35	39	25	37	39
10	51	43	16	30	31	32	60	10	59	30
11	50	10	29	10	33	7	24	11	31	38
12	21	33	15	52	24	19	33	37	25	37
13	47	24	14	33	22	19	36	36	36	17
14	37	48	27	44	40	18	35	55	18	50
15	29	49	30	17	34	20	36	50	12	67
16	31	41	14	39	15	16	6	38	18	44
17	4	16	27	7	22	6	35	26	35	29
18	35	59	12	71	5	54	34	35	17	37
19	48	37	40	24	16	19	44	22	21	43
20	11	35	1	19	2	28	20	35	0	25
21	31	23	27	44	12	20	4	63	14	14
22	22	16	29	13	40	14	40	37	25	39
23	46	55	3	41	13	52	19	63	23	39
24	25	25	31	33	30	23	56	13	5	29
25		56		35		27		50		53
26		53		46		47		33		49
27		51		18		33		56		67
28		47		21		27		45		51
29		53		35		21		54		41
30		33		35		27		32		46
Total out of	80	80	80	80	80	80	85	85	85	85
Mean score	34.42	38.47	22.00	31.43	23.67	25.53	31.29	35.43	25.42	35.93
Mean %	43.03	48.09	27.50	39.29	29.59	31.91	36.81	41.68	29.91	42.27
Standard deviation	13.91	13.71	11.36	15.58	10.01	12.01	14.36	14.84	14.28	15.79
***t*-Statistic**	-1.07		-2.48		-0.61		-1.03		-2.54	
Df	52		52		52		52		52	
Probability	0.289 (NS)		0.016 **(S)**		0.544 (NS)		0.306 (NS)		0.014 **(S)**	

NS = not significant at $\alpha = 0.05$; S = significant at $\alpha = 0.05$; Df = degrees of freedom; n_c = number of Control group of students; n_T = number of Test group of students

8.5.4 Creativity performance in sub-activities per *Object Repetition* activity type

The two groups of students were also compared in terms of the two activities within the *Object Repetition* activity type. When the mean scores of the two groups of students were compared in a Student's *t*-test at α = 0.05, significant differences could be detected between the two groups of students for one of the two activities; which was *Adding Details to Separate Lines* (Table 8.12).

Table 8.12 Creativity Test performances of the Control and Test groups of students in terms of the activity type Object Repetition

Activity type	*Object Repetition*			
Activity	*Adding Details to Cylinders*		*Adding Details to Separate Lines*	
Student	Control n_c = 24	Test n_T = 30	Control n_c = 24	Test n_T = 30
1	21	13	10	19
2	23	23	8	32
3	23	31	8	21
4	31	35	41	26
5	23	40	22	34
6	23	26	23	14
7	21	28	38	34
8	6	10	2	12
9	32	0	35	0
10	26	40	32	16
11	24	24	27	13
12	19	32	6	37
13	34	27	21	24
14	1	28	9	27
15	34	29	20	41
16	25	11	15	10
17	2	11	5	11
18	11	16	28	23
19	41	18	6	14
20	2	23	10	23
21	20	48	5	19
22	34	35	28	27
23	28	47	18	48
24	15	21	9	5

25		35		39
26		56		41
27		34		36
28		51		40
29		30		37
30		1		18
Total out of	90	90	90	90
Mean score	21.63	27.43	17.75	24.70
Mean %	24.03	30.48	19.72	27.44
Standard deviation	10.88	13.86	11.66	12.10
***t*-Statistic**	-1,679652083		-2,120944612	
Df	52		52	
Probability	0,099 (NS)		0.039 **(S)**	

NS = not significant at $\alpha = 0.05$; S = significant at $\alpha = 0.05$; Df = degrees of freedom; n_c = number of Control group of students; n_T = number of Test group of students

8.5.5 Creativity performance in sub-activities per Problem-Solving activity type

The performances of the two groups of students were further compared in terms of the different activities within the activity type *Problem-Solving*. Within the *Problem-Solving* activity type, seven different activities were assessed. When a Student's *t*-test was performed on the mean scores to compare the performances of the two groups of students in *Problem-Solving*, no significant differences were recognised between the two groups of students at $\alpha = 0.05$ (Table 8.13).

Table 8.13 Creativity Test performances of the Control and Test groups of students in terms of the activity type Problem-Solving

Activity type	*Problem-Solving*													
Sub-activity within activity type	***Solving Mother Hubbard's problem***		***Questions***		***Causes***		***Consequences no 1***		***Consequences no 2***		***Problem Identification***		***Candle Problem***	
Student	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$	**Control** $n_c = 24$	**Test** $n_T = 30$
1	12	18	19	28	18	29	19	34	24	31	19	25	32	33
2	25	6	22	22	20	22	18	24	24	31	17	27	21	0
3	29	26	27	23	21	14	20	23	27	28	19	25	40	32
4	37	41	34	39	21	34	29	29	29	33	21	29	11	40
5	30	36	33	35	19	33	14	35	32	27	20	23	40	33
6	17	19	19	12	12	20	25	13	28	23	9	5	27	1
7	30	33	22	37	19	38	17	34	26	35	4	33	6	20
8	21	20	17	18	20	17	21	28	13	18	14	15	30	1
9	17	27	24	20	23	16	17	21	31	30	14	9	31	8
10	33	25	19	18	15	22	13	30	28	27	14	19	6	13
11	33	7	16	14	26	12	20	12	27	17	15	12	40	26
12	31	22	30	17	18	18	19	24	31	28	16	24	5	38
13	34	31	29	17	25	15	28	14	29	19	21	23	39	35
14	25	28	3	36	20	18	21	30	21	28	16	22	31	28
15	43	13	29	25	28	9	23	27	36	26	19	1	39	38
16	17	16	15	22	17	17	22	24	21	18	15	17	0	10
17	31	8	25	17	20	17	30	18	26	16	16	9	7	14
18	10	13	18	25	18	11	14	15	5	24	9	17	14	9
19	19	7	25	16	25	11	25	9	19	13	26	16	19	33

20	15	11	13	17	11	16	11	14	4	14	8	19	5	34
21	22	10	24	6	16	4	24	4	22	7	21	16	6	22
22	19	26	30	21	16	19	23	17	27	24	3	20	17	2
23	14	20	18	22	17	13	22	19	23	23	18	26	1	10
24	19	16	27	16	22	13	27	14	30	20	13	19	9	23
25		31		23		31		32		26		15		40
26		24		20		12		18		16		13		25
27		0		9		12		16		28		13		24
28		16		18		17		26		23		18		7
29		12		23		21		19		23		21		10
30		34		22		20		32		18		11		13
Total out of	45	45	40	40	40	40	40	40	40	40	40	40	40	40
Mean score	24.29	19.87	22.42	21.27	19.46	18.37	20.92	21.83	24.29	23.13	15.29	18.07	19.83	20.73
Mean %	53.98	44.16	56.05	53.18	48.65	45.93	52.30	54.58	60.73	57.83	38.23	45.18	49.58	51.83
Standard deviation	8.71	10.18	7.14	7.74	4.13	7.85	5.08	8.20	7.77	6.55	5.55	7.17	14.25	13.09
***t*-Statistic**	1.69		0.56		0.62		-0.48		0.59		-1.55		-0.24	
Df	52		52		52		52		52		52		52	
Probability	0.097 (NS)		0.577 (NS)		0.541 (NS)		0.634 (NS)		0.555 (NS)		0.125 (NS)		0.810 (NS)	

NS = not significant at $\alpha = 0.05$; Df = degrees of freedom; n_c = number of Control group of students; n_T = number of Test group of students

8.6 Discussion

The potential to stimulate creativity through the implementation of a Creativity Workshop amongst entry level students in Art and Design was investigated by comparing the performance of the Control group of students with those of the Test group of students. A Student's *t*-test revealed that the overall performances of the two groups of students were the same, indicating that the Creativity Workshop did not make a significant difference to the overall performances of the Test group of students. However, the mean score of the Test group of students was notably better than that of the Control group of students. It could therefore be concluded from the comparison of the overall performances of the students that the results did not support the overall hypothesis at $\alpha = 0.05$. Although the overall performances of the two groups of students were similar and not influenced by the Creativity Workshop, Student's *t*-tests revealed that the Creativity Workshop had an impact on the performances of the Test group of students in several of the Creativity domains, Creativity sub-domains, activity types and the individual activities. The Test group of students outperformed the Control group of students in the two Creativity domains: *Creative Strengths* and *Practical-Skills*. However, when considering the individual Creativity sub-domains, significant differences were detected between the Test group of students and the Control group of students for a number of the sub-domains, which belonged to the Creativity domains: *Diverse Thinking*, *Creative Strengths* and *Innovation Skills*. Although the Creativity domain *Practical-Skills*, as a whole, demonstrated significant differences between the two groups of students, none of the creativity sub-domains of this domain produced significant outcomes. Notably, the *Innovation Skills* Creativity sub-domains, *Problem-Solving*, *Identification of Causes* and *Consequences* are indicative of particular interest because they required higher order cognitive processing. The Creativity Workshop thus stimulated the Test group of students to think outside the box and to bring new original ideas to their art production. The Test group of students also showed improved practical skills in art production when compared to the Control group of students, who did not attend the Workshop. The impact of

the Creativity Workshop could also be recognised in two of the four activity types. The Test group of students outperformed the Control group of students in the activities, *Image Development* and *Object Repetition*. The Test group of students thus demonstrated their improved ability to create and develop images using their visual art skills, as well as using repeated shapes and objects in image development.

Chapter 9

Discussion and Conclusions

9.1 Introduction

The Fourth Industrial Revolution represents a fundamental change in the way of living, working, and how people relate to one another. This revolution is bringing about extraordinary technological advancements and sophisticated products, and also changes in the world-of-work to such an extent that both creative thinking and creative problem-solving skills will become a necessity. Future civilisations hinge upon the creative capabilities of young people, therefore creativity should be fostered from a young age (Richardson and Mishra, 2018). Creative people have the ability to experiment, to think in unconventional ways, to challenge conventional thinking, and to solve complex problems (Gundry, Ofstein and Monllor, 2016). All these skills allow creative people to make significant contributions to the Fourth Industrial Revolution (Andiliou and Murphy, 2010). Through education, creativity can be developed and enhanced, thereby expanding students' creative potential, attitudes, and abilities (Runco, Acar and Cayirdag, 2017; Castillo-Vergara *et al.*, 2018). Because of the social, environmental, and educational experiences, people have different degrees of creativity (Fazelian and Azimi, 2013). It is thus widely accepted that there exists a "creativity gap" between student expectations of creativity and the reality of classroom practice (Gralewski, 2019). The diverse nature and backgrounds of students studying at South African Universities have resulted in great variation in creativity amongst students. In particular, because creativity varies extensively amongst Design and Studio Art students at the Central University of Technology, Free State (CUT), this study was undertaken. A Creative Workshop was developed and tested amongst first year students in the Department of Design and Studio Art at CUT to establish if such a workshop could enhance students' creative skills and abilities. Thus, for this study the following overall hypothesis was tested:

Ha: *A creativity workshop will enhance creative skills amongst entry level University art and design students.*

9.2 Important findings of the study

In this study, the 54 participating students were from relatively diverse backgrounds. The majority of the students were male, growing up in a single-mother household. Many of the students were exposed to art as a subject during their primary schooling years. A Student's t-test was conducted to compare the creativity performances of a Test group of students, who had attended a Creativity Workshop, to the creativity performances of a Control group of students, who did not attend the workshop. The Student's t-test revealed that the Creativity Workshop developed for this investigation did not enhance the overall creativity performances of the Test group of students, thus the overall results do not support the overall hypothesis at $\alpha = 0.05$. On the other hand, the mean scores of the Test group of students (±430) were notably better than that of the Control group of students (±390). Although the overall performances of the two groups of students were similar and not influenced by the Creativity Workshop, Student's t-tests revealed that the Creativity Workshop had an impact on the performances of the Test group of students in several of the Creativity domains, Creativity sub-domains, activity types and the individual activities developed for this study.

When Student's t-tests were performed on student performances in the four Creativity domains, the Test group of students significantly outperformed the Control group of students in two of the Creativity domains. Significant differences were recorded for the two Creativity domains: *Creative Strengths* and *Practical-Skills* at $\alpha = 0.05$. The Creativity domain, *Creative Strengths* strongly focuses on the ability to use imagination to generate new ideas from a unique perspective in image development. (Rogie, no date; Sumners, 2011; Costa, Machado and Siqueira, 2019). In this study, this domain covered twelve Creativity sub-domains. The outcome of the Student's t-test indicated that the Creativity Workshop enhanced the overall performance of the Test group of students in this

domain. When the respective sub-domains were considered, it was found that the Creativity Workshop specifically enhanced the students' creativity performances in three of the twelve sub-domains; *Synthesis of Incomplete Figures* (Torrance, 2018), *Internal Visualisation* (Torrance, 2018) and *Extending or Breaking of Boundaries* (Rogie, no date; Torrance, 2018). This workshop thus improved students' abilities to combine two or more incomplete figures to visualise beyond exteriors and focus on the internal, as well as to extend lines beyond boundaries. This result strongly indicated that students that were exposed to the Creativity Workshop were able to make mental leaps away from the obvious and the commonplace (Rogie, no date). Although the overall performance of the Test group of students was significantly better than the Control group of students for *Practical-Skills*, no significant differences could be established for any to the individual sub-domains with Student's t-tests.

Besides the three sub-domains of the domain *Creative Strengths*, five other sub-domains also demonstrated significant differences between the Test group of students and the Control group of students. The significant Student's t-test for the sub-domain, *Originality* of the domain *Diverse Thinking*, illustrated that the Creativity Workshop enhanced the Test group of students' abilities to produce uncommon and/or unique ideas that may lead to new knowledge that challenges conventional thinking (Krumm, Lemos and Filippetti, 2015; Torrance, 2018; Acar *et al.*, 2019). The other significant sub-domain, *Elaboration* of *Diverse Thinking*, demonstrated that the Creativity Workshop improved the Test group of students' abilities to develop, embroider and to embellish complex interrelating ideas and concepts (Krumm, Lemos and Filippetti, 2015; Torrance, 2018; Acar *et al.*, 2019).

Three of the sub-domains of the domain *Innovation Skills* also returned significant differences between the Test group of students and the Control group of students. *Innovation skills* relate to an individual's ability to practice basic skills such as reading and numeracy, to think creatively and

critically; to solve problems and manage risk; and to execute technical activates at high level (Spinoglio, 2015). For the sub-domain *Problem-solving*, the Creativity Workshop enhanced students' ability to determine the source of a problem and to devise a suitable solution (Dostál, 2015; Stoeffler *et al.*, 2020). For the sub-domain of *Identify Causes*, the Creativity Workshop improved students' skills to identify the cause(s) that results in an action, phenomenon, or condition (Cambridge, no date; Merriam-Webster Dictionary, no date). Finally, the significant outcome for the sub-domain of *Identify Consequences* provided the students with an improved ability to identify the consequence of an action or condition.

When considering the different activity types of the Creativity Test Instrument, two of the four activity types demonstrated significant differences between the Test group of students and the Control group of students. For the activity type, *Image Development*, the Creativity Workshop improved students' skills to develop an image by applying various techniques. These techniques include for example, distortion, elaboration, magnification, multiplication, reversal, and rotation (Grandstaff, 2012). For the other significant activity type, *Object Repetition*, students' ability to employ repetitions of objects or shapes or to combine repeated objects or shapes in creative activities were enhanced through the Creativity Workshop (Getty, 2011).

For two of the 17 activities of the Creativity Test Instrument, significant differences were established between the Test group of students and the Control group of students. In the activity *Adding Details to Medium Blocks*, the Test group of students outperformed the Control group by adding additional details to the figures in the boxes, thereby creating unique pictures. Similarly, the Test group of students outperformed the Control group of students in the activity of *Using cut out Shape for Design*, by pasting a cut-out shape into a blank space and then completing an imagined picture where the cut-out is part of.

In conclusion, the Creativity Workshop tested in this study made a substantial contribution to the enhancement of creative and innovative abilities in the student group studying Art and Design. In particular, imagination came to the forefront. Students demonstrated their ability to apply imaginary thoughts when conceiving and developing images, an important skill for successful artists (Møller, 2015). Imagination, as a 21st century skill, will facilitate graduates to be successful in the world-of-work by enabling them to answer complex questions and devising creative steps to answer such questions (Judson, Jackson and Willis, 2018). This study further showed that imagination and creativity should be placed at the centre of the Higher Education learning experience (Jackson and Willes, 2019). By enhancing students' abilities in creativity, they obtain a more flexible understanding of knowledge; is able to make knowledge memorable; and to create meaning that is more embedded in their memories. The results of this study are supported by two similar studies that showed that training in creativity could enhance creativity. At an American University, 89 fashion students were exposed to several creativity exercises. When their creative skills were measured after the implementation of the creativity exercises and compared to before the creativity exercises, the results showed that the students produced many more original ideas after the exercises (Karpova, Marcketti and Barker, 2011). In another study, 25 second- and third-year students from the Department of Electrical, Electronics and System Engineering, Faculty of Engineering and Built Environment and Faculty of Information Science and Technology, of the University Kebangsaan Malaysia, attended the ROBOCON 2010 annual robotic contest (Ayob *et al.*, 2011). Because contestants had to create robots using their creativity and technical abilities, their creativity dimensions were nurtured and enhanced as a result of the problem-solving process involved in the contest.

9.3 Concluding remarks

The Creativity Workshop implemented in this study was the first of its kind as far as could be established. Although the Creativity Workshop did not enhance all creativity skills that were addressed in the Workshop, it was successful in enhancing students' ability to produce original and innovative ideas, to perform problem-solving activities, and to identify causes and consequences in particular situations. Such a Creativity Workshop could play a major role in enhancing creativity and creative learning amongst students if included in a Higher Education curriculum. Imaginative and creative graduates have the potential of making significant contributions to the fast-evolving world-of-work of the 21st century and will also have the skills of a lifelong learner. The success of the implementation of such a workshop in curricula of Higher Education lies in circumventing the rigid management practices in Higher Education Institutions.

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Appendix A

Rubric for the three Improvisation Activities

Activity 1: Unusual uses of doll hand		**Rating scale**					
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient) <25 >50%**	**2 (Average) <50 >75%**	**3 (Above average) <75 >50%**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**
FLU	Number off Response	1/0	3/2	5/4	7/6	8/9	›9
FLE	Number off categories	0	1	2	3	4	5 and more
ORI	Number of Original elements	Response is common and familiar. Originality is absent	Response demonstrated <25% >50% novel and unusual elements	Image demonstrated <50% >25% novel and unusual elements	Image demonstrated <75% >50% novel and unusual elements	Image demonstrated <100% >75% novel and unusual elements	Image demonstrated 100% novel and unusual elements
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add	Minimal humour elements added.	Humour elements average, but not	Humour elements extensive but not	Humour elements extensive and

			humour elements.		extensive nor well-developed	well-developed	well-developed.
AU	Number of unusual purposes used	0/3	4	5	6	7	8 and more
IMM	Degree of imagination present within the response	Imagination absent.	Indication of imagination present	Degree of imagination minimal	Degree of imagination average, but not extensive nor well-developed	Degree of imagination extensive but not well developed.	Degree of imagination extensive and well developed.
Rating scale (For rest of sub – domains)		**0**			**5**		
IN/VISU	Paying attention to the internal, or not at all	0 no			5 yes		
Activity 2: Product improvement of soft toy							
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient) <25 >50%**	**2 (Average) <50 >75%**	**3 (Above average) <75 >50%**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**
FLU	Number off Response	1/0	3/2	5/4	7/6	8/9	›9
FLE	Number off categories	0	1	2	3	4	5 and more
ORI	Number of Original elements	Response is common and familiar. Originality is absent	Response demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements

ELA	Degree of elaboration	Detail absent.	Indication of an attempt to add detail.	Detail Minimal	Detail average, but not extensive nor well-developed	Detail extensive but not well-developed	Detail extensive and developed.
E/EX	Number of nonverbal/verbal emotional indicators	0/1	2	3	4/5	6/7	8 and more
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour elements.	Minimal humour elements added.	Humour elements average, but not extensive nor well-developed	Humour elements extensive but not well-developed	Humour elements extensive and well-developed.
P/IM (specific for activity)	Number improvements	0/1	2	3	4	5/6	7 and more
Rating scale (For rest of sub – domains)		**0**			**5**		
IN/VISU	Paying attention to the internal, or not at all	0 no			0 yes		
Activity 3: Possibilities for being invisible							
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient) <25 >50%**	**2 (Average) <50 >75%**	**3 (Above average) <75 >50%**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**
FLU	Number off Response	1/0	3/2	5/4	7/6	8/9	›9
FLE	Number off categories	0	1	2	3	4	5 and more

ORI	Number of Original elements	Response is common and familiar. Originality is absent	Response demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way	Presents only the most logical and expected way to solve the problem or to complete the figure	Presents some degree of openness, but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to complete the figure	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.
ELA	Degree of elaboration	Detail absent.	Indication of an attempt to add detail.	Detail Minimal	Detail average, but not extensive nor well-developed	Detail extensive but not well-developed	Detail extensive and developed.
E/EX	Number of nonverbal/verbal emotional indicators	0/1	2	3	4/5	6/7	8 and more
S/AR	Number of figural and/or verbal indicators	Figural and/or verbal indicators absent.	Indication of an attempt of figural and/or verbal indicators to create a (hi)story for the object	Figural and/or verbal indicators to minimal to create a (hi)story for the object	Figural and/or verbal indicators average, but not enough to create a (hi)story for the object	Figural and/or verbal indicators broad but not well-developed to create a (hi)story for the object.	Figural and/or verbal indicators extensive and developed to create a (hi)story for the object.

M/A	Number of figural and/or verbal indicators	0	1	2	3	4	5
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour elements.	Minimal humour elements added.	Humour elements average, but not extensive nor well-developed	Humour elements extensive but not well-developed	Humour elements extensive and well-developed.
IMM	Degree of imagination present within the response	Imagination absent.	Indication of imagination present	Degree of imagination minimal	Degree of imagination average, but not extensive nor well-developed	Degree of imagination extensive but not well developed	Degree of imagination extensive and well developed.

Mark allocation for the rubric of the three Improvisation Activities

Activities	Sub–domains applicable to Improvisation activities											
	Diverse thinking skills domain					Creative strengths domain					Innovation skills domain	Practical skills domain
	FLU	FLE	ORI	RPC	ELA	E/EX	S/AR	M/A	IN/VISI	HU	IMM	PIM
1.Unusual uses for a doll hand	0 = 0 or 1 1 = 2 or 3 2 = 4 or 5 3 = 6 or 7 4 = 8 or 9 5 = 9 and more	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%						0 = no 5 = yes	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	
2. Product	0 = 0 or 1	0 = 0	0 = 0		0 = 0	0 = 0 or			0 = no	0 = 0		0 = 0 or 1

improvement of soft toy	1 = 2 or 3 2 = 4 or 5 3 = 6 or 7 4 = 8 or 9 5 = 9 and more	1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100%>75% 5 = 100%		1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100%>75% 5 = 100%	1 1 = 2 2 = 3 3 = 4 or 5 4 = 6 or 7 5 = 8 and more			5 = yes	1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100%>75% 5 = 100%		1 = 2 2 = 3 3 = 4 4 = 5 or 6 5 = 7 and more
3. Possibilities for being invisible	0 = 0 or 1 1 = 2 or 3 2 = 4 or 5 3 = 6 or 7 4 = 8 or 9 5 = 9 and more	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100%>75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100>75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100%>75% 5 = 100%	0 = 0 or 1 1 = 2 2 = 3 3 = 4 or 5 4 = 6 or 7 5 = 8 and more	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100%>75% 5 = 100%	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more		0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100%>75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100%>75% 5 = 100%	

Rubric for the Image Development Activities

Activity 4: Adding details to large block		**RATING SCALE**					
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient) <25 >50%**	**2 (Average) <50 >75%**	**3 (Above average) <75 >50%**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**
ORI	Number of Original	Response is common and	Response demonstrated	Image demonstrated	Image demonstrated	Image demonstrated	Image demonstrated

	elements	familiar. Originality is absent	novel and unusual elements	novel and unusual elements	novel and unusual elements	novel and unusual elements	novel and unusual elements
AP/TS	Appropriateness of title	Title is absent	Title is inappropriate	Title is appropriate, but contains inappropriate elements	Title is partially appropriate	Title is appropriate but incomplete	Title is appropriate and complete
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way	Presents only the most logical and expected way to solve the problem or to complete the figure	Presents some degree of openness, but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to complete the figure	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.
ELA	Degree of elaboration	Detail absent.	Indication of an attempt to add detail.	Detail Minimal	Detail average, but not extensive nor well-developed.	Detail extensive but not well-developed.	Detail extensive and developed.
M/A	Number of figural and/or verbal indicators	0	1	2	3	4	5
EX/TS	Number of verbal emotional indicators.	0/1	2	3	4	5	6 and more
UN/VISI	Number of	0	1	2	3	4	5 and more

	unusual views						
IN/VISU	Paying attention to the internal, or not at all	0 no	5 yes				
EX/BRA/BO	Were boundaries broken?	0 no	5 yes				
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour elements.	Minimal humour elements added.	Humour elements average, but not extensive nor well-developed.	Humour elements extensive but not well-developed.	Humour elements extensive and well-developed.
R/IM	Degree of developing the richness of imagery	Richness of imagery is absent.	Indication of an attempt to develop richness of imagery.	Indication of some develop of richness of imagery, but minimal.	Development of richness of imagery is narrow.	Development of richness of imagery is relatively extensive or under-developed.	Development of richness of imagery is extensive and well-developed.
Rating scale (for rest of sub – domains)		**0 no**			**5 yes**		
SYN/INC/FIG	The presence of fusing incomplete figure/object together	0 no			5 yes		
SYN/L	The fusing of incomplete lines together	0 no			5 yes		
CIM	The presence of fantasy and/or human nature	0 no			5 yes		

	within the response						
COMB	Is the skill to combine present?	0 no			5 yes		
COMP	Is the response complete?	0 no			5 yes		
Activity 5: *Adding details to medium blocks*		**RATING SCALE**					
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient) <25 >50%**	**2 (Average) <50 >75%**	**3 (Above average) <75 >50%**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**
ORI	Number of Original elements	Response is common and familiar. Originality is absent	Response demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements
AP/TS	Appropriateness of title	Title is absent	Title is inappropriate	Title is appropriate, but contains inappropriate elements	Title is partially appropriate	Title is appropriate but incomplete	Title is appropriate and complete
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and	Presents only the most logical and expected way to solve the problem or to complete the figure	Presents some degree of openness, but shows narrow-minded resistance to go beyond the most	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the	Presents a solution to the problem or competes the figure that goes beyond the most logical

		expected way		logical way to solve the problem or to complete the figure	solve a problem or to complete a figure	most logical expectation.	expectation.
ELA	Degree of elaboration	Detail absent.	Indication of an attempt to add detail.	Detail Minimal	Detail average, but not extensive nor well-developed.	Detail extensive but not well-developed.	Detail extensive and developed.
M/A	Number of figural and/or verbal indicators	0	1	2	3	4	5
EX/TS	Number of verbal emotional indicators.	0/1	2	3	4	5	6 and more
UN/VISI	Number of unusual views	0	1	2	3	4	5 and more
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour elements.	Minimal humour elements added.	Humour elements average, but not extensive nor well-developed.	Humour elements extensive but not well-developed.	Humour elements extensive and well-developed.
R/IM	Degree of developing the richness of imagery	Richness of imagery is absent.	Indication of an attempt to develop richness of imagery	Indication of some develop of richness of imagery, but minimal.	Development of richness of imagery is narrow.	Development of richness of imagery is relatively extensive or under-developed.	Development of richness of imagery is extensive and well-developed.
Rating scale (for rest of sub – domains)		**0 no**			**5 yes**		

SYN/INC/FIG	The presence of fusing incomplete figure/object together	0 no			5 yes		
SYN/L	The fusing of incomplete lines together	0 no			5 yes		
IN/VISU	Paying attention to the internal, or not at all	0 no			5 yes		
EX/BRA/BO	Were boundaries broken?	0 no			5 yes		
CIM	The presence of fantasy and/or human nature within the response	0 no			5 yes		
COMB	Is the skill to combine present?	0 no			5 yes		
COMP	Is the response complete?	0 no			5 yes		
Activity 6: Adding details to small blocks		**Rating scale**					
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient) <25 >50%**	**2 (Average) <50 >75%**	**3 (Above average) <75 >50%**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**

ORI	Number of Original elements	Response is common and familiar. Originality is absent	Response demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements
AP/TS	Appropriateness of title	Title is absent	Title is inappropriate	Title is appropriate, but contains inappropriate elements	Title is partially appropriate	Title is appropriate but incomplete	Title is appropriate and complete
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way	Presents only the most logical and expected way to solve the problem or to complete the figure	Presents some degree of openness, but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to complete the figure	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.
ELA	Degree of elaboration	Detail absent	Indication of an attempt to add detail.	Detail Minimal	Detail average, but not extensive nor well-developed.	Detail extensive but not well-developed.	Detail extensive and developed.
M/A	Number of figural and/or verbal indicators	0	1	2	3	4	5
EX/TS	Number of verbal emotional	0/1	2	3	4	5	6 and more

	indicators.						
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour elements.	Minimal humour elements added.	Humour elements average, but not extensive nor well-developed.	Humour elements extensive but not well-developed.	Humour elements extensive and well-developed.
R/IM	Degree of developing the richness of imagery	Richness of imagery is absent.	Indication of an attempt to develop richness of imagery	Indication of some develop of richness of imagery, but minimal.	Development of richness of imagery is narrow.	Development of richness of imagery is relatively extensive or under-developed.	Development of richness of imagery is extensive and well-developed.
UN/VISI	Number of unusual views	0	1	2	3	4	5 and more
Rating scale (for rest of sub – domains)		**0 no**			**5 yes**		
SYN/INC/FIG	The presence of fusing incomplete figure/object together	0 no			5 yes		
SYN/L	The fusing of incomplete lines together	0 no			5 yes		
IN/VISU	Paying attention to the internal, or not at all	0 no			5 yes		
EX/BRA/BO	Were boundaries broken?	0 no			5 yes		
CIM	The presence of	0 no			5 yes		

	fantasy and/or human nature within the response						
COMB	Is the skill to combine present?	0 no			5 yes		
COMP	Is the response complete?	0 no			5 yes		
Activity 7: Combining shapes for design		**Rating scale**					
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient) <25 >50%**	**2 (Average) <50 >75%**	**3 (Above average) <75 >50%**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**
ORI	Number of Original elements	Response is common and familiar. Originality is absent	Response demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements
AP/TS	Appropriateness of title	Title is absent	Title is inappropriate	Title is appropriate, but contains inappropriate elements	Title is partially appropriate	Title is appropriate but incomplete	Title is appropriate and complete
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure	Presents only the most logical and expected way to solve the problem or to	Presents some degree of openness, but shows narrow-minded	Presents some degree of openness, that is visible but not enough to go	Presents an incomplete solution to the problem or an incomplete the	Presents a solution to the problem or competes the figure that goes

		using the most logical and expected way	complete the figure	resistance to go beyond the most logical way to solve the problem or to complete the figure	beyond the most logical way to solve a problem or to complete a figure	figure, but does go beyond the most logical expectation.	beyond the most logical expectation.
ELA	Degree of elaboration	Detail absent.	Indication of an attempt to add detail.	Detail Minimal	Detail average, but not extensive nor well-developed.	Detail extensive but not well-developed.	Detail extensive and developed.
S/AB	Number of figural and/or verbal indicators	Figural and/or verbal indicators absent.	Indication of an attempt of figural and/or verbal indicators to create a (hi)story for the object	Figural and/or verbal indicators to minimal to create a (hi)story for the object	Figural and/or verbal indicators average, but not enough to create a (hi)story for the object	Figural and/or verbal indicators broad but not well-developed to create a (hi)story for the object.	Figural and/or verbal indicators extensive and developed to create a (hi)story for the object.
M/A	Number of figural and/or verbal indicators	0	1	2	3	4	5
EX/TS	Number of verbal emotional indicators.	0/1	2	3	4	5	6 and more
UN/VISI	Number of unusual views	0	1	2	3	4	5 and more
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour elements.	Minimal humour elements added.	Humour elements average, but not extensive nor well-developed.	Humour elements extensive but not well-developed.	Humour elements extensive and well-developed.

R/IM	Degree of developing the richness of imagery	Richness of imagery is absent.	Indication of an attempt to develop richness of imagery.	Indication of some develop of richness of imagery, but minimal	Development of richness of imagery is narrow.	Development of richness of imagery is relatively extensive or under-developed.	Development of richness of imagery is extensive and well-developed.
Rating scale (for sub – domain below) 0			**1**	**2**	**3**	**4**	**5**
AU	The specific object is used for an unusual purpose		0 objects used	1 out of 4 objects used	2 out of 4 objects used	3 out of 4 objects used	4 objects used
Rating scale (for rest of sub – domains)		**0 no**			**5 yes**		
SYN/INC/FIG	The presence of fusing incomplete figure/object together	0 no			5 yes		
SYN/L	The fusing of incomplete lines together	0 no			5 yes		
IN/VISU	Paying attention to the internal, or not at all	0 no			5 yes		
EX/BRA/BO	Were boundaries broken?	0 no			5 yes		
CIM	The presence of fantasy and/or human nature within the	0 no			5 yes		

	response						
COMB	Is the skill to combine present?	0 no			5 yes		
Activity 8: Using cut out shape for design		**Rating scale**					
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient) <25 >50%**	**2 (Average) <50 >75%**	**3 (Above average) <75 >50%**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**
ORI	Number of Original elements	Response is common and familiar. Originality is absent	Response demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements
AP/TS	Appropriateness of title	Title is absent	Title is inappropriate	Title is appropriate, but contains inappropriate elements	Title is partially appropriate	Title is appropriate but incomplete	Title is appropriate and complete
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way	Presents only the most logical and expected way to solve the problem or to complete the figure	Presents some degree of openness, but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.

				complete the figure			
ELA	Degree of elaboration	Detail absent.	Indication of an attempt to add detail.	Detail Minimal	Detail average, but not extensive nor well-developed.	Detail extensive but not well-developed.	Detail extensive and developed.
S/AB	Number of figural and/or verbal indicators	Figural and/or verbal indicators absent.	Indication of an attempt of figural and/or verbal indicators to create a (hi)story for the object	Figural and/or verbal indicators to minimal to create a (hi)story for the object	Figural and/or verbal indicators average, but not enough to create a (hi)story for the object	Figural and/or verbal indicators broad but not well-developed to create a (hi)story for the object.	Figural and/or verbal indicators extensive and developed to create a (hi)story for the object.
M/A	Number of figural and/or verbal indicators	0	1	2	3	4	5
EX/TS	Number of verbal emotional indicators.	0/1	2	3	4	5	6 and more
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour elements.	Minimal humour elements added.	Humour elements average, but not extensive nor well-developed.	Humour elements extensive but not well-developed.	Humour elements extensive and well-developed.
R/IM	Degree of developing the richness of imagery	Richness of imagery is absent.	Indication of an attempt to develop richness of imagery.	Indication of some develop of richness of imagery, but minimal.	Development of richness of imagery is narrow.	Development of richness of imagery is relatively extensive or under-developed.	Development of richness of imagery is extensive and well-developed.

UN/VISI	Number of unusual views	0	1	2	3	4	5 and more
Rating scale (for rest of sub – domains)		**0 no**			**5 yes**		
AU	The specific object is used for an unusual purpose	0 no			0yes		
SYN/INC/FIG	The presence of fusing incomplete figure/object together	0 no			5 yes		
SYN/L	The fusing of incomplete lines together	0 no			5 yes		
IN/VISU	Paying attention to the internal, or not at all	0 no			5 yes		
EX/BRA/BO	Were boundaries broken?	0 no			5 yes		
CIM	The presence of fantasy and/or human nature within the response	0 no			5 yes		
COMB	Is the skill to combine present?	0 no			5 yes		

Mark allocation for the rubric of the eight Image Development Activities

Activities	Diverse thinking skills				Practical skills		
	ORI	AB/TS	RPC	ELA	AU	COMB	COMP
4. Adding details to large block	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%		0 = no 5 = yes	0 = no 5 = yes
5. Adding details to medium blocks	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%		0 = no 5 = yes	0 = no 5 = yes
6. Adding details to small blocks	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%		0 = no 5 = yes	0 = no 5 = yes
7. Using shapes for design	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5	0 = no 5 = yes	0 = no 5 = yes
8. Using cut out shape for	0 = 0 1 = <25% >50% 2 = <50% >25%	0 = 0 1 = <25% >50% 2 = <50% >25%	0 = 0 1 = <25% >50% 2 = <50% >25%	0 = 0 1 = <25% >50% 2 = <50% >25%	0 = 0 1 = 1 2 = 2	0 = no 5 = yes	0 = no 5 = yes

design	3 = <75% >50% 4 = <100% >75% 5 = 100%		3 = <75% >50% 4 = <100% >75% 5 = 100%		3 = <75% >50% 4 = <100% >75% 5 = 100%		3 = <75% >50% 4 = <100% >75% 5 = 100%		3 = 3 4 = 4 5 = 5		
	Creative strengths										
	S/AR	**M/A**	**EX/TS**	**SYN/INC/FIG**	**SYN/L**	**UN/VISI**	**IN/VISI**	**EX/BR/BO**	**HU**	**R/IM**	**C/IM**
4. Adding details to large block		0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	0 = 0 or 1 1 = 2 2 = 3 3 = 4 4 = 5 5 = 6 and more	0 = no 5 = yes	0 = no 5 = yes	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	0 = no 5 = yes	0 = no 5 = yes	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = no 5 = yes
5. Adding details to medium blocks		0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	0 = 0 or 1 1 = 2 2 = 3 3 = 4 4 = 5 5 = 6 and more	0 = no 5 = yes	0 = no 5 = yes	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	0 = no 5 = yes	0 = no 5 = yes	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = no 5 = yes
6. Adding details to small blocks		0 = 0 1 = 1 2 = 2 3 = 3	0 = 0 or 1 1 = 2 2 = 3 3 = 4	0 = no 5 = yes	0 = no 5 = yes	0 = 0 1 = 1 2 = 2 3 = 3	0 = no 5 = yes	0 = no 5 = yes	0 = 0 1 = <25% >50% 2 = <50%	0 = 0 1 = <25% >50% 2 = <50%	0 = no 5 = yes

		4 = 4 5 = 5 and more	4 = 5 5 = 6 and more			4 = 4 5 = 5 and more			>25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	>25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	
7. Using shapes for design	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	0 = 0 or 1 1 = 2 2 = 3 3 = 4 4 = 5 5 = 6 and more	0 = no 5 = yes	0 = no 5 = yes	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	0 = no 5 = yes	0 = no 5 = yes	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = no 5 = yes
8. Using cut out shape for design	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	0 = 0 or 1 1 = 2 2 = 3 3 = 4 4 = 5 5 = 6 and more	0 = no 5 = yes	0 = no 5 = yes	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	0 = no 5 = yes	0 = no 5 = yes	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = no 5 = yes

Mark allocation for the rubric of Object repetition

Activity 9: Adding details to cylinders	**Rating scale**

Subdomain	Count	0 (Insufficient) 0%	1 (Partially sufficient) <25 >50%	2 (Average) <50 >75%	3 (Above average) <75 >50%	4 (Satisfactory) <100 >75%	5 (Outstanding) 100%
FLU	Number off Response	1/0	3/2	5/4	7/6	8/9	›9
FLE	Number off categories	0	1	2	3	4	5 and more
ORI	Number of Original elements	Response is common and familiar. Originality is absent	Response demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements
AP/TS	Appropriateness of title	Title is absent	Title is inappropriate	Title is appropriate, but contains inappropriate elements	Title is partially appropriate	Title is appropriate but incomplete	Title is appropriate and complete
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way	Presents only the most logical and expected way to solve the problem or to complete the figure	Presents some degree of openness, but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to complete the figure	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.

ELA	Degree of elaboration	Detail absent.	Indication of an attempt to add detail.	Detail Minimal	Detail average, but not extensive nor well-developed	Detail extensive but not well-developed.	Detail extensive and developed.
M/A	Number of figural and/or verbal indicators	0	1	2	3	4	5
EX/TS	Number of verbal emotional indicators.	0/1	2	3	4	5	6 and more
UN/VISI	Number of unusual views	0	1	2	3	4	5 and more
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour elements.	Minimal humour elements added.	Humour elements average, but not extensive nor well-developed	Humour elements extensive but not well-developed.	Humour elements extensive and well-developed.
R/IM	Degree of developing the richness of imagery	Richness of imagery is absent.	Indication of an attempt to develop richness of imagery.	Indication of some develop of richness of imagery, but minimal.	Development of richness of imagery is narrow.	Development of richness of imagery is relatively extensive or under-developed.	Development of richness of imagery is extensive and well-developed.
AU	Number of unusual purposes used	0/3	4	5	6	7	8 and more
Rating scale (for rest of sub – domains)		0 no			5 yes		
SYN/INC/FIG	The presence of fusing	0 no			5 yes		

	incomplete figure/object together						
SYN/L	The fusing of incomplete lines together	0 no			5 yes		
IN/VISU	Paying attention to the internal, or not at all	0 no			5 yes		
EX/BR/BO	Were boundaries broken?	0 no			5 yes		
C/IM	The presence of fantasy and/or human nature within the response	0 no			5 yes		
COMB	Is the skill to combine present?	0 no			5 yes		
Activity 10: *Adding details to lose lines*		**Rating scale**					
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient) <25 >50%**	**2 (Average) <50 >75%**	**3 (Above average) <75 >50%**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**
FLU	Number off Response	1/0	3/2	5/4	7/6	8/9	›9
FLE	Number off categories	0	1	2	3	4	5 and more

ORI	Number of Original elements	Response is common and familiar. Originality is absent	Response demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements
AP/TS	Appropriateness of title	Title is absent	Title is inappropriate	Title is appropriate, but contains inappropriate elements	Title is partially appropriate	Title is appropriate but incomplete	Title is appropriate and complete
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way	Presents only the most logical and expected way to solve the problem or to complete the figure	Presents some degree of openness, but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to complete the figure	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.
ELA	Degree of elaboration	Detail absent.	Indication of an attempt to add detail.	Detail Minimal	Detail average, but not extensive nor well-developed	Detail extensive but not well-developed.	Detail extensive and developed.
M/A	Number of figural and/or verbal indicators	0	1	2	3	4	5
EX/TS	Number of verbal emotional	0/1	2	3	4	5	6 and more

	indicators.						
UN/VISI	Number of unusual views	0	1	2	3	4	5 and more
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour elements.	Minimal humour elements added.	Humour elements average, but not extensive nor well-developed	Humour elements extensive but not well-developed.	Humour elements extensive and well-developed.
R/IM	Degree of developing the richness of imagery	Richness of imagery is absent.	Indication of an attempt to develop richness of imagery.	Indication of some develop of richness of imagery, but minimal.	Development of richness of imagery is narrow	Development of richness of imagery is relatively extensive or under-developed.	Development of richness of imagery is extensive and well-developed.
AU	Number of unusual purposes used	0/3	4	5	6	7	8 and more
Rating scale (for rest of sub – domains)		0 no			5 yes		
SYN/INC/FIG	The presence of fusing incomplete figure/object together	0 no			5 yes		
SYN/L	The fusing of incomplete lines together	0 no			5 yes		
IN/VISU	Paying attention to the internal, or not at all	0 no			5 yes		

EX/BR/BO	Were boundaries broken?	0 no	5 yes
C/IM	The presence of fantasy and/or human nature within the response	0 no	5 yes
COMB	Is the skill to combine present?	0 no	5 yes

Mark allocation for the rubric of Object repetition Activities

Activities	Diverse thinking skills						Practical skills	
	FLU	FLE	ORI	AB/TS	RPC	ELA	AU	COMB
9. Adding details to cylinders	0 = 0 or 1 1 = 2 or 3 2 = 4 or 5 3 = 6 or 7 4 = 8 or 9 5 = 9 and more	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 to 3 1 = 4 2 = 5 3 = 6 4 = 7 5 = 8 and more	0 = no 5 = yes
10. Adding details to lose lines	0 = 0 or 1 1 = 2 or 3 2 = 4 or 5 3 = 6 or 7 4 = 8 or 9	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4	0 = 0 1 = <25% >50% 2 = <50% >25%	0 = 0 1 = <25% >50% 2 = <50% >25%	0 = 0 1 = <25% >50% 2 = <50% >25%	0 = 0 1 = <25% >50% 2 = <50% >25%	0 = 0 to 3 1 = 4 2 = 5 3 = 6 4 = 7	0 = no 5 = yes

	5 = 9 and more	5 = 5 and more	3 = <75% >50% 4 = <100% >75% 5 = 100%	3 = <75% >50% 4 = <100% >75% 5 = 100%	3 = <75% >50% 4 = <100% >75% 5 = 100%	3 = <75% >50% 4 = <100% >75% 5 = 100%	5 = 8 and more	

Mark allocation for the rubric of Object repetition

	Creative strengths									
	M/A	EX/TS	SYN/INC/FIG	SYN/L	UN/VISI	IN/VISI	EX/BR/BO	HU	R/IM	C/IM
9. Adding details to cylinders	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	0 = 0 or 1 1 = 2 2 = 3 3 = 4 4 = 5 5 = 6 and more	0 = no 5 = yes	0 = no 5 = yes	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	0 = no 5 = yes	0 = no 5 = yes	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = no 5 = yes
10. Adding details to	0 = 0 1 = 1 2 = 2	0 = 0 or 1 1 = 2 2 = 3	0 = no 5 = yes	0 = no 5 = yes	0 = 0 1 = 1 2 = 2	0 = no 5 = yes	0 = no 5 = yes	0 = 0 1 = <25% >50%	0 = 0 1 = <25% >50%	0 = no 5 =

lose lines	3 = 3 4 = 4 5 = 5 and more	3 = 4 4 = 5 5 = 6 and more			3 = 3 4 = 4 5 = 5 and more			2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	yes

Rubrics for activity type: Problem-solving

Activity 11: Solving Mother Hubbard's problem		**Rating scale**					
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient) <25 >50%**	**2 (Average) <50 >75%**	**3 (Above average) <75 >50%**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**
FLU	Number off Response	1/0	3/2	5/4	7/6	8/9	›9
FLE	Number off categories	0	1	2	3	4	5 and more
ORI	Number of Original elements	Response is common and familiar. Originality is	Response demonstrated novel and unusual	Image demonstrated novel and unusual	Image demonstrated novel and unusual	Image demonstrated novel and unusual	Image demonstrated novel and unusual

		absent	elements	elements	elements	elements	elements
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way	Presents only the most logical and expected way to solve the problem or to complete the figure	Presents some degree of openness, but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to complete the figure	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.
ELA	Degree of elaboration	Detail absent.	Indication of an attempt to add detail.	Detail Minimal	Detail average, but not extensive nor well-developed	Detail extensive but not well-developed.	Detail extensive and developed.
E/EX	Number of nonverbal/verbal emotional indicators	0/1	2	3	4/5	6/7	8 and more
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour elements.	Minimal humour elements added.	Humour elements average, but not extensive nor well-developed	Humour elements extensive but not well-developed.	Humour elements extensive and well-developed.
PS	Degree of breaking the logical possibilities to solve the specific	Problem solving absent.	Indication of an attempt to solve the problem.	Degree of problem solving minimal	Degree of problem solving average, but not well revealed.	Degree of problem solving extensive but not well revealed.	Degree of problem solving extensive and developed.

	problem						
Rating scale (for rest of sub – domains)		0 no			5 yes		
ID/P	Is identification of problems present?	0 no			5 yes		
Activity 12: Question activity		**Rating scale**					
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient) <25 >50%**	**2 (Average) <50 >75%**	**3 (Above average) <75 >50%**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**
FLU	Number off Response	1/0	3/2	5/4	7/6	8/9	›9
FLE	Number off categories	0	1	2	3	4	5 and more
ORI	Number of Original elements	Response is common and familiar. Originality is absent	Response demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way	Presents only the most logical and expected way to solve the problem or to complete the figure	Presents some degree of openness, but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.

				complete the figure			
E/EX	Number of nonverbal/verbal emotional indicators	0/1	2	3	4/5	6/7	8 and more
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour elements.	Minimal humour elements added.	Humour elements average, but not extensive nor well-developed	Humour elements extensive but not well-developed.	Humour elements extensive and well-developed.
O/R	Degree of Overall observation present within the response	Overall observation is absent.	Indication of Overall observation present.	Degree of Overall observation minimal.	Degree of Overall observation average, but not extensive nor well-developed.	Degree of Overall observation extensive but not well developed.	Degree of Overall observation extensive and well developed.
Rating scale (for rest of sub – domains)		0 no			5 yes		
ID/Q	Is identification of question present?	0 no			5 yes		
Activity 13: Reason activity		**Rating scale**					
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient) <25 >50%**	**2 (Average) <50 >75%**	**3 (Above average) <75 >50%**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**
FLU	Number off Response	1/0	3/2	5/4	7/6	8/9	›9

FLE	Number off categories	0	1	2	3	4	5 and more
ORI	Number of Original elements	Response is common and familiar. Originality is absent	Response demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way	Presents only the most logical and expected way to solve the problem or to complete the figure	Presents some degree of openness, but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to complete the figure	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.
E/EX	Number of nonverbal/verbal emotional indicators	0/1	2	3	4/5	6/7	8 and more
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour elements.	Minimal humour elements added	Humour elements average, but not extensive nor well-developed	Humour elements extensive but not well-developed	Humour elements extensive and well-developed.
O/R	Degree of Overall observation	Overall observation is absent.	Indication of Overall observation	Degree of Overall observation	Degree of Overall observation	Degree of Overall observation	Degree of Overall observation

	present within the response		present.	minimal.	average, but not extensive nor well-developed	extensive but not well developed.	extensive and well developed.
Rating scale (for rest of sub – domains)		0 no			5 yes		
ID/CA	Is the identification of causes present?	0 no			5 yes		
Activity 14: Consequence: Figural activity		**Rating scale**					
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient) <25 >50%**	**2 (Average) <50 >75%**	**3 (Above average) <75 >50%**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**
FLU	Number off Response	1/0	3/2	5/4	7/6	8/9	›9
FLE	Number off categories	0	1	2	3	4	5 and more
ORI	Number of Original elements	Response is common and familiar. Originality is absent	Response demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and	Presents only the most logical and expected way to solve the problem or to complete the figure	Presents some degree of openness, but shows narrow-minded resistance to go beyond the most	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the	Presents a solution to the problem or competes the figure that goes beyond the most logical

		expected way		logical way to solve the problem or to complete the figure	solve a problem or to complete a figure	most logical expectation.	expectation.
E/EX	Number of nonverbal/verbal emotional indicators	0/1	2	3	4/5	6/7	8 and more
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour elements.	Minimal humour elements added.	Humour elements average, but not extensive nor well-developed	Humour elements extensive but not well-developed.	Humour elements extensive and well-developed.
O/R	Degree of Overall observation present within the response	Overall observation is absent.	Indication of Overall observation present.	Degree of Overall observation minimal.	Degree of Overall observation average, but not extensive nor well-developed.	Degree of Overall observation extensive but not well developed.	Degree of Overall observation extensive and well developed.
Rating scale (for rest of sub – domains)		0 no			5 yes		
ID/CO	Is forecasting of consequences present?	0 no			5 yes		
Activity 15: Consequence: Verbal activity		**Rating scale**					
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient)**	**2 (Average) <50 >75%**	**3 (Above average)**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**

			<25 >50%		<75 >50%		
FLU	Number off Response	1/0	3/2	5/4	7/6	8/9	›9
FLE	Number off categories	0	1	2	3	4	5 and more
ORI	Number of Original elements	Response is common and familiar. Originality is absent	Response demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way	Presents only the most logical and expected way to solve the problem or to complete the figure	Presents some degree of openness, but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to complete the figure	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.
ELA	Degree of elaboration	Detail absent.	Indication of an attempt to add detail.	Detail Minimal	Detail average, but not extensive nor well-developed	Detail extensive but not well-developed.	Detail extensive and developed.
UN/VISI	Number of unusual views	0	1	2	3	4	5 and more
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour	Minimal humour elements added.	Humour elements average, but not	Humour elements extensive but not	Humour elements extensive and

			elements.		extensive nor well-developed	well-developed.	well-developed.
Rating scale (for rest of sub – domains)		0 no			5 yes		
ID/CO	Is forecasting of consequences present?	0 no			5 yes		
Activity 16: List problems		**Rating scale**					
Subdomain	**Count**	**0 (Insufficient) 0%**	**1 (Partially sufficient) <25 >50%**	**2 (Average) <50 >75%**	**3 (Above average) <75 >50%**	**4 (Satisfactory) <100 >75%**	**5 (Outstanding) 100%**
FLU	Number off Response	1/0	3/2	5/4	7/6	8/9	›9
FLE	Number off categories	0	1	2	3	4	5 and more
ORI	Number of Original elements	Response is common and familiar. Originality is absent	Response demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements	Image demonstrated novel and unusual elements
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way	Presents only the most logical and expected way to solve the problem or to complete the figure	Presents some degree of openness, but shows narrow-minded resistance to go beyond the most logical way to solve the	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.

				problem or to complete the figure	figure		
E/EX	Number of nonverbal/verbal emotional indicators	0/1	2	3	4/5	6/7	8 and more
ELA	Degree of elaboration	Detail absent.	Indication of an attempt to add detail.	Detail Minimal	Detail average, but not extensive nor well-developed	Detail extensive but not well-developed.	Detail extensive and developed.
UN/VISI	Number of unusual views .	0	1	2	3	4	5 and more
HU	Presence of humour elements	Humour elements are absent	Indication of an attempt to add humour elements.	Minimal humour elements added.	Humour elements average, but not extensive nor well-developed	Humour elements extensive but not well-developed.	Humour elements extensive and well-developed.
Rating scale (for rest of sub – domains)		0 no			5 yes		
ID/CO	Is forecasting of consequences present?	0 no			5 yes		
ID/P	Is identification of problems present?	0 no			5 yes		
Activity 17: Candle problem		**Rating scale**					
Subdomain	**Count**	**0 (Insufficient)**	**1 (Partially**	**2 (Average)**	**3 (Above**	**4 (Satisfactory)**	**5 (Outstanding)**

		0%	sufficient) <25 >50%	<50 >75%	average) <75 >50%	<100 >75%	100%
RPC	Degree of open-minded ness . .	Presents an incomplete solution to the problem or incomplete figure using the most logical and expected way	Presents only the most logical and expected way to solve the problem or to complete the figure	Presents some degree of openness, but shows narrow-minded resistance to go beyond the most logical way to solve the problem or to complete the figure	Presents some degree of openness, that is visible but not enough to go beyond the most logical way to solve a problem or to complete a figure	Presents an incomplete solution to the problem or an incomplete the figure, but does go beyond the most logical expectation.	Presents a solution to the problem or competes the figure that goes beyond the most logical expectation.
UN/VISI	Number of unusual views.	0	1	2	3	4	5 and more
IN/VISU	Paying attention to the internal, or not at all	0 no	5 yes				
PS	Number of solutions	Problem solving absent.	Indication of an attempt to solve the problem.	Degree of problem solving minimal	Degree of problem solving average, but not well revealed.	Degree of problem solving extensive but not well revealed.	Degree of problem solving extensive and developed.
O/R	Degree of Overall observation present within the response	Overall observation is absent.	Indication of Overall observation present.	Degree of Overall observation minimal.	Degree of Overall observation average, but not extensive nor well-developed.	Degree of Overall observation extensive but not well developed.	Degree of Overall observation extensive and well developed.
Rating scale (for sub – domain below)		**0 no**			**5 yes**		

AU	The specific object is used for an unusual purpose	0 no	5 yes
Rating scale (for rest of sub – domains)		**0 no**	**5 yes**
COMB	Is the skill to combine present?	0 no	5 yes
P/IM ACC 18	Any improvements visible	0 no	5 yes

Mark allocations for activity type: Problem solving activity

Domains	**Sub-domain**	**Problem solving activity**						
		11	**12**	**13**	**14**	**15**	**16**	**17**
		Solving Mother Hubbard's problem	**Question activity**	**Reason activity**	**Consequence: Figural activity**	**Consequence: Verbal activity**	**List problems**	**Candle problem**
Diverse thinking skills	**FLU**	0 = 0 or 1 1 = 2 or 3 2 = 4 or 5 3 = 6 or 7 4 = 8 or 9 5 = 9 and more	0 = 0 or 1 1 = 2 or 3 2 = 4 or 5 3 = 6 or 7 4 = 8 or 9 5 = 9 and more	0 = 0 or 1 1 = 2 or 3 2 = 4 or 5 3 = 6 or 7 4 = 8 or 9 5 = 9 and more	0 = 0 or 1 1 = 2 or 3 2 = 4 or 5 3 = 6 or 7 4 = 8 or 9 5 = 9 and more	0 = 0 or 1 1 = 2 or 3 2 = 4 or 5 3 = 6 or 7 4 = 8 or 9 5 = 9 and more	0 = 0 or 1 1 = 2 or 3 2 = 4 or 5 3 = 6 or 7 4 = 8 or 9 5 = 9 and more	
	FLE	0 = 0	0 = 0	0 = 0	0 = 0	0 = 0	0 = 0	

		1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more	
	ORI	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	
	RPC	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%
	ELA	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75%				0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75%	

		>50% 4 = <100% >75% 5 = 100%				>50% 4 = <100% >75% 5 = 100%	>50% 4 = <100% >75% 5 = 100%	
Creative strengths	**E/EX**	0 = 0 or 1 1 = 2 2 = 3 3 = 4 or 5 4 = 6 or 7 5 = 8 and more	0 = 0 or 1 1 = 2 2 = 3 3 = 4 or 5 4 = 6 or 7 5 = 8 and more	0 = 0 or 1 1 = 2 2 = 3 3 = 4 or 5 4 = 6 or 7 5 = 8 and more	0 = 0 or 1 1 = 2 2 = 3 3 = 4 or 5 4 = 6 or 7 5 = 8 and more		0 = 0 or 1 1 = 2 2 = 3 3 = 4 or 5 4 = 6 or 7 5 = 8 and more	
	UN/VISI					0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more		0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 and more
	IN/VISI							0 = no 5 = yes
	HU	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	
Innovation skills	**PS**	0 = 0 1 = <25% >50%						0 = 0 1 = <25% >50%

		2 = <50% >25% 3 = <75% >50% 4 = <100% >75%						2 = <50% >25% 3 = <75% >50% 4 = <100% >75%
	ID/P	0 = no 5 = yes					0 = no 5 = yes	
	ID/Q		0 = no 5 = yes					
	ID/CA			0 = no 5 = yes				
	ID/CO				0 = no 5 = yes	0 = no 5 = yes		
	O/R		0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%	0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%			0 = 0 1 = <25% >50% 2 = <50% >25% 3 = <75% >50% 4 = <100% >75% 5 = 100%
Practical skills	AU							0 = no 5 = yes
	COMB							0 = no 5 = yes
	P/IM							0 = no 5 = yes