THE RELATIONSHIP BETWEEN CREATIVE THINKING, METACOGNITIVE THINKING AND ACADEMIC PERFORMANCE AMONG SECONDARY SCHOOL STUDENTS IN TANZANIA

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A THESIS SUBMITTED IN FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY OF THE OPEN UNIVERSITY OF TANZANIA

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CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by The Open University of Tanzania a Thesis entitled: "**The Relationship between Creative Thinking, Metacognitive Thinking, and Academic Performance among Secondary School Students in Tanzania"** in fulfilment of the requirements for the Degree of Doctor of Philosophy (Education) of The Open University of Tanzania

……..

Prof. Issa Mchollo Omari

(Supervisor)

……..…

Date

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DECLARATION

I, **Joel Matiku Joshua**, the undersigned, do hereby declare to the Senate of The Open University of Tanzania that this Thesis for the Degree of Doctor of Philosophy is my own original work and it has not been and will not be submitted to any other University for a similar award.

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Signature

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Date

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ABSTRACT

The purpose of this study was to investigate the relationship between creative thinking, metacognitive thinking, and academic performance among secondary school students in Tanzania. The independent variables investigated were divergent thinking, convergent thinking, metacognitive thinking and teachers' ability to foster creative and metacognitive thinking. These were studied against academic performance as the dependent variable. A total of 444 secondary school students, of whom 217 were males and 227 were females responded to the Guilford's Alternate Uses Task (AUT, 1967), the Assessment of Convergent Thinking Test Using Insight Problems (ACTT), and the Metacognitive Awareness of Reading Strategies Inventory (MARSI) for measuring divergent, convergent, and metacognitive thinking respectively. The study found moderate but positive and significant correlations (*r=0.36* and *r=0.48)* between divergent and convergent thinking respectively; and academic performance. There was low positive correlation *(r=0.14)* between metacognitive thinking and academic performance, all at $p \leq .01$. The performances on the key independent variables were M=54.32 out of the maximum score of 134 mentioned uses, M=4.67 at the maximum of 12 score out of 15, and m=106.88 at a maximum score of 150 out of 150. Convergent thinking uniquely explained academic performance than divergent and metacognitive thinking, suggesting the independence and suffering of divergent and metacognitive thinking in schooling. Recommendations for the practice of teaching and learning and for future research are provided.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

1.0 BACKGROUND AND STATEMENT OF THE RESEARCH PROBLEM

The present study sought to investigate the relationship between creative thinking, metacognitive thinking, and academic performance among secondary school pupils. The intention of the study was triggered by four major motives. First, the fact that academic underperformance in secondary schools in Tanzania has been clearly manifesting itself as a serious educational problem. Secondly, the existing theoretical explanations of academic performance are not thoroughly substantiated in the context of Tanzania. Thirdly, lack of clear understanding of how academic underperformance is related to the core independent cognitive processes such as creative and metacognitive thinking. Fourthly, to replicate in Tanzania, the ongoing research findings indicating that creative and metacognitive thinking correlate to academic performance (Reese, Lee, Cohen, & Puckett, 2001; Naderi, Abdullah, Aizan, Shrrir, & Kumar, 2009; 2010).

1.1 Academic Underperformance in Tanzania

Academic underperformance in Tanzania was the central motive behind this study. The underperformance is particularly acute in mathematics, science subjects, English language and geography (Omari, 2008; 2011; Joshua, 2008, 2011). For the period between 2006 and 2012, about 66 percent of secondary school pupils got the lowest grades in final national examinations as indicated in Table 1.1. This level of performance could not be tolerated, hence, the formation of a national Prime Minister's Committee to investigate the phenomenon.

Table 1.1: The Trend of Form Four Academic Performances 2006 – 2012

	Distribution of candidates by pass levels in percentage					
Year	*Candidates Examined*	*Divisions I-III (%ge)*	*Divisions IV- 0 (%ge)*	*Form Five Enrolment* Govt. Schools *(%ge)*	Non Govt. Schools	– Total *(%ge)*
2006	85,865	35.7	64.3	25	13	39
2007	125,288	35.6	64.4	20	10	30
2008	163,855	26.7	73.2	19	7	26
2009	248,336	17.9	82.0	10.5	4.9	15.4
2010	352,840	11.4	88.5	8.6	3.1	11.7
2011	339,330	10.0	90.0	9.2	2.9	12.1
2012a	-	6.4	93.6	-	-	-
2012b	397,222	9.5	90.5	8.2	2.3	10.6

Source: URT, (2012)

At secondary school level, one is usually labeled as pass when one has performed in Divisions One, Two, Three, and Four. Yet a pass in Division Four does not allow one to be selected to join Form Five in government secondary schools in Tanzania. For a student to be classified and labeled in one of the divisions, specific marks are scored and graded as follows: A = 81 -100; B = 60 -80; C = 41 -59; D = 30 – 40; F = 0 -29 (Omari, 2011). The grades are then assigned points such as A = 5; B = 4; C = 3, and D = 2. A ‘D’ grade is then regarded as a pass mark, so that any grade from ‘E’ is labeled as ‘FAIL’ and any grade from ‘D’ up to ‘A’ are labeled as PASS. The points are then counted from any seven passed subjects starting with the highest grade obtained.

The total points are then subjected to the divisions as follows: Division I = points 7 – 17; Division II = points 18 – 22; Division III = points 23 – 25; Division IV = point 26 – 32; and Division 0 = points 33 – 35. In practice, students are usually selected to join form five when they pass at divisions I - III. Close observation of form four

examination results at secondary school levels, has shown that academic performance trend has remained low and declining. Academic underperformance in secondary schools is a crisis and a question of concern to education stakeholders; and it seems, it reached beyond tolerance by political authorities in the year 2012 though the trend has been obvious for six years consecutively as illustrated in Table 1.1.

In the 2012a results, 93.6 percent of the candidates scored divisions four and zero and only 6.4 percent of the candidates scored at divisions I – III. This resulted in the formation of a special team to investigate what caused the massive failure in the examinations. Among other recommendations, the team demanded that the results be cancelled and re-graded or standardized basing on the grading system used in the year 2011. The government was forced to cancel the examination results and in June 2013 the examination results were re-issued. Table 1.1 shows the results both for the year 2012a and 2012b. The results in 2012a are the results first issued by the NECTA, and the results in 2012b are those issued after revision of the results.

The performance in divisions I – III only marginally improved from 6.4 percent in 2012a to 9.5 percent in 2012b. Thus, despite the re-grading or standardization, the results still remained low suggesting that the students failed fairly putting the nation at risk as this leads to apathy among parents and students and greatly demoralize the teachers.

Another concern with regard to academic underperformance in Tanzania is the consistent appearance of some schools among the group of high performing schools

while on the other hand some schools have consistently appeared among the group of low performing schools. The term *school ranking* in this study has been used to mean this distinctive pattern of school performance positioning in form four national examinations. This pattern raises curiosity as to what makes difference in terms of students' cognitive processes and the teaching-learning practices within the classroom between high performing and low performing schools.

The ramifications of this declining trend of academic performance in the recruitment for tertiary education are starting to manifest as A-level schools fail to get enough competent candidates and the long term effects in the economy of the nation. The questions that arise include: What could explain such uncomfortable state of academic underperformance in Tanzania? What could be the correlates of academic performance in the country? Which cognitive processes are not active when education outcomes are so low? Which cognitive theories of learning explain such academic underperformance? Review of past studies in Tanzania found that the problem of academic underperformance had been associated with variables such as insufficient schools and teachers, unmanageable teacher-student ratio, laboratories, libraries, equipment, poor teaching strategies, lack of exercise and practice among pupils, poor teaching and learning of key concepts, and misinterpretation of information (Idama & Ndabi, 1996; Chonjo & Welford, 2001).

Nevertheless, a critical observation of the factors put forward by previous studies, called for more curiosity because despite the efforts to increase the number of qualified teachers, schools, and equipment, alongside the improvement of the pupil

teacher ratio; data consistently indicated the declining trend of academic performance. Information in Table 1.2 illustrates in a much clear perspective that efforts to improve some of the factors associated with academic underperformance for about four consecutive years could not improve academic performance.

Table 1.2: Increasing Teaching Staff but Declining Academic Performance

Item	2008	2009	2010	2011	2012
Total teaching staff	32,835	33,954	40,517	52,146	65,086
Total number of schools	3,798	4,102	4,266	4,367	4,528
Pupil Teacher Ratio	1:37	1:43	1:40	1:34	1:29
Form four passing rates in Div. I – III	26.7%	17.9%	11.4%	10.0%	6.4% 9.5%
Form four passing rates in Div. IV & 0	73.2%	82.0%	88.%	90.0%	93.6% 90.5%

Source: Adopted from URT (2012)

1.2 Theoretical Perspectives

This study was guided by two theories, namely: the Item Response Theory and the Bloom's (1976) theory of school learning.

1.2.1 The Item Response Theory

According to the Item Response Theory, both item parameters and learners' latent traits predict one's academic performance, and that people at the higher levels of latent traits have higher probability of responding correctly to an item (Sternberg & Thissen, 1995). On one hand, item parameters refer to important features of the items

in a test such as item difficulty, discrimination indices, and the role of pseudo-guessing when items are too difficult. But latent traits refer to underlying variables of interest, which are usually intuitively understood, such as intelligence and creativity. It is the scholastic ability and its attributes, including getting good grades, learning new material easily, relating various sources of information, using study time effectively, reading ability, and arithmetic ability (Baker, 2001). Latent traits were found relevant here because determinant variables in this study such as creative and metacognitive thinking can be subsumed under which, three traits can be derived, and these are divergent thinking, convergent thinking and metacognitive thinking.

Stevens (2000) defines creative thinking as intelligent, goal-directed attempts at finding novel solutions to more or less well-defined problems within a specified domain that result in novel products. Creative thinking was adopted to mean specific measures of divergent and convergent thinking. Divergent thinking is a characteristic of creativity which allows one to produce as many plausible answers as possible to a given problem (Santrock, 2004). It is the ability to form many possible original ideas to a given situation with fluency and speed. For instance, one can be asked to list as many uses of a drum, a piece of empty land, a knife, a piece of paper, a stick or a tree. The more novel a suggestion is the higher is one rewarded in creative thinking.

Convergent thinking on the other hand, refers to the ability to come up with a single but correct solution to a given potential or actual problem (Santrock, 2004). It means one's ability to produce correct solution to the mathematical insight tasks, verbal insight tasks and spatial insight tasks. Metacognitive thinking on the other hand

refers to thinking about thinking itself (Santrock, 2006). It is one's knowledge and control of one's cognitive processes (Matlin, 2005, 2009). It refers to one's awareness of thinking processes and reading strategies one uses as one continues to understand texts materials.

1.2.2 The School Learning Theory

Bloom's (1976) theory of school learning was an approach that proposed some variables that account for much of the variations in school learning. The theory states that the cognitive entry behaviors, affective entry characteristics, and the quality of instruction determine the nature and type of learning outcomes. The two basic assumptions underlying this theory include the history of the learner which becomes the core of school learning, and secondly, the possibility to modify the characteristics of the learner through designed instructions. Thus, the theory of school learning deals with students' characteristics, the quality of instruction, and learning outcomes.

According to Bloom (1976), two major student's characteristics that determine student learning are cognitive entry behaviors and affective entry parameters. Cognitive entry behaviors refer to the prerequisite learning required for the school learning tasks on which instruction should be designed for the best match. Affective characteristics refer to the student's motivation to learn the new school learning tasks. Instruction variables are defined in the theory as those pertaining to the quality of teaching itself. This is "the extent to which the cues, practice, and reinforcements of the learning are appropriate to the needs of the learner (p.11)". The situation of academic underperformance in Tanzania raises the questions such as: How are these

school's learning theoretical variables applied in school settings? Can the current stock of teachers apply the theory and promote creative and metacognitive thinking among secondary school students? Two basic assumptions underlying this theory are first, the history of the learner is at the core of school learning; and second, it is possible to modify the characteristics of the learner during the instruction.

The theory of school learning deals with three major variables. These are students' characteristics, instruction, and learning outcomes. According to Bloom, two major levels of student's characteristics that determine student learning are cognitive entry behaviors and affective entry characteristics. Cognitive entry behaviors refer to the prerequisite learning required for the learning tasks on which instruction is to be provided. Affective characteristics refer to the student's motivation to learn the new learning tasks. The instruction variables are defined in the theory as the quality of instruction. This is the extent to which the cues, practice, and reinforcements of the learning process are appropriate to the needs of the learner.

The theory states that the cognitive entry behaviors, affective entry characteristics, and the quality of instruction determine the nature of learning outcomes, which are the level and type of achievement, rate of learning, and affective outcomes. This means that, given favorable learner's entry characteristics and quality of instruction, all learning outcomes are likely to be at a high or positive level, and little variation in the learning outcomes such as in academic performance. Figure 2.2 illustrates the constructs of the theory of school learning.

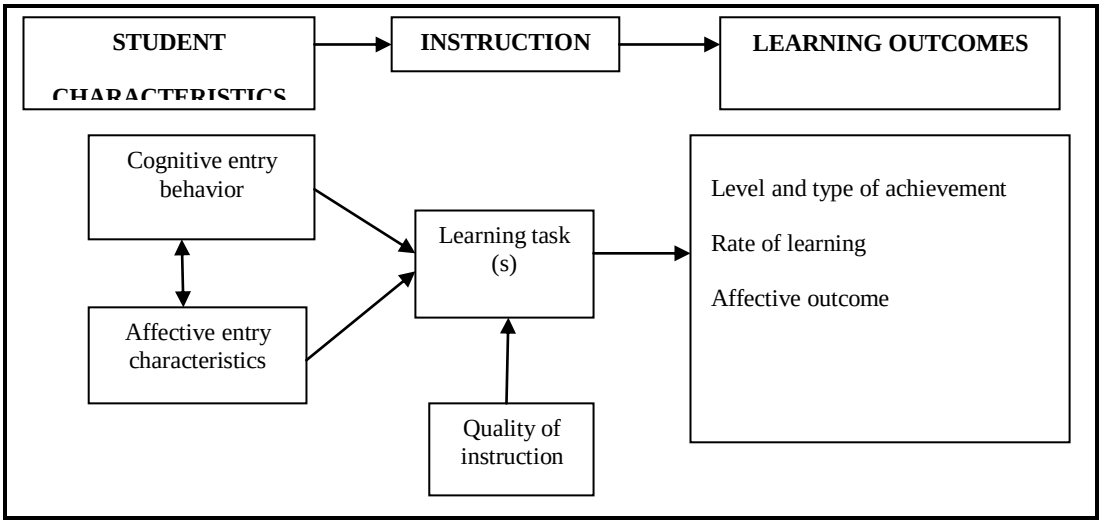


Figure 1. 1: Major Variables in the Theory of School Learning

Source: Bloom (1976)

1.3 Statement of the Research Problem

The problem of academic underperformance among secondary school pupils in Tanzania is now evident. Addressing the problem of underperformance, previous studies have associated it with variables such as insufficient school equipment, laboratories, libraries, poor teaching strategies, lack of exercise and practice among pupils, poor teaching and learning of key concepts, and misinterpretation of information (Idama & Ndabi, 1996; Chonjo & Welford, 2001). However, a critical observation of the factors put forward by previous studies, raised more curiosity because despite the efforts to increase the number of qualified teachers, schools' equipment, alongside the improvement of the pupil teacher ratio; data has consistently shown a declining trend in academic performance.

Yet, despite the presence of studies addressing underperformance using the item response theory and school learning theory to study the relationships between

creative thinking, metacognitive thinking, and academic performance outside Tanzania, there was a lack of studies focusing on such associations in Tanzania. It is unclear thus, as to how children are doing on these cognitive processes which are partly independent of schooling.

In addition, it is not self-evident as to which mental processes are made passive in the process of teaching and learning when education outcomes are so poor. It is also unclear as to why some schools do better than others consistently in national examinations. It is for these reasons that the present study sought to investigate further on the association between creative thinking variables such as divergent and convergent thinking; and metacognitive thinking; and between these and academic performance.

1.4 The Purpose of the Study

It is conceptually compelling that there should be a relationship between measures of creative thinking such as divergent thinking, convergent thinking; and metacognitive thinking, and between these and academic performance. Thus, this study was intended to explore the relationships between creative thinking, metacognition, and academic performance among secondary school learners in Tanzania.

1.4.1 The Specific Objectives of the Study

To fulfill the aforementioned purpose, the study was guided by the following five specific objectives:

i) Investigate the relationship between divergent thinking and academic

performance;

ii) Examine the relationship between convergent thinking and academic performance;

iii) Investigate the relationship between metacognitive thinking and academic performance.

iv) Find out the relationship between measures of divergent, convergent, and metacognitive thinking and school ranking.

v) Investigate the difference in teacher's ability to foster creative and metacognitive thinking in classrooms by school ranking.

1.5 The Research Hypotheses

Based on the specific objectives of the study, the hypotheses below guided the process of investigating the specific objectives of the study.

i) There is a significant relationship between divergent thinking and academic performance;

ii) There is a significant relationship between convergent thinking and academic performance;

iii) There is a significant relationship between metacognitive thinking and academic performance;

iv) There is a significant relationship between measures of divergent, convergent, and metacognitive thinking and school ranking.

v) There is a significant difference in teacher's ability to foster creative and metacognitive thinking in the classrooms by school ranking.

1.6 Conceptual Framework

A conceptual framework represents the system of concepts, assumptions, expectations, beliefs, and theories that supports and informs the research; hence, it is a key part of the researcher's design (Miles & Huberman, 1994). Understanding the nature of academic underperformance compels studying individual's cognitive traits, and how the traits might have influenced individual's academic performance. The conceptual framework that guided this study gained its strength from the contribution of the School Learning Theory, the Item Response Theory and empirical studies on the cognitive variables and academic performance. The variables creative thinking and metacognitive thinking were derived from the *cognitive characteristics of the learner* construct from the theory of school learning as expounded in Bloom (1976). It was thus, assumed these cognitive processes of the learner would account for much of the variations in academic performance and in school ranking. On the other hand, the variable quality of instruction is in one way or another related to both what teachers can do to help students succeed in school learning and to the teachers' ability to foster creative and metacognitive thinking in the classroom. According to the theory of school learning, quality of instruction mediates the relationship between learners' cognitive entry behavior and academic performance. The theory defines the construct *quality of instruction* as being comprising of cues, reinforcements, participation, feedback, and correctives of the mistakes done by the learners (Bloom, 1976). Second, one variable in some specific objectives of this study which is teachers' ability to foster creative and metacognitive thinking, is considered analogous to the *quality of instruction* construct in the theory of school learning. The term school ranking in this study refers to the school's position in the category of

whether high or low performing school in the list of academic performance in both national and regional ranking. As such, school ranking variable in this study carried two levels as to whether the school was ranked as high performing school or low performing school.

It was postulated that one may perform high or low in academic subjects depending on the extent to which one's ability to apply one's creative and metacognitive thinking. The assumption is illustrated in Figure 1.1. The framework is comprised of the contextual, predictor, mediating and outcome variables. It is assumed that the reciprocal relationship exists between creative and metacognitive thinking, and academic performance. It was expected that relative to their counterparts with low performance in creative and metacognitive thinking, students with high performance in creative and metacognitive thinking would demonstrate high academic performance in terms of both test scores and school ranking. It was also thought that other mediating variables such as sex, age, location of the school, education level of the family members, and teachers' ability to foster creative and metacognitive thinking might act as the variables mediating the relationships between the predictor variables and academic performance, which was the outcome variable. All these might be confined to a given nature of education system, curriculum, and culture. For example, in a culture where students are socialized to remain silent when teachers or adults are discussing matters, where students expect punishment when they have been asked a why question by a teacher or parent; development of metacognitive and divergent thinking might be kept in a minimum in comparison to the cultures where children are allowed to discuss their thoughts in the presence of adults and where self

explanations are encouraged through why questions. So in the present study, given the nature of examination structures and the nature of questions that are usually asked to demand for the reproduction of what teachers taught, convergent thinking was expected to dominate students thinking and this could positively correlate to students' academic performance. The arrows illustrate the possible relationships among the variables of the study rather than causation.

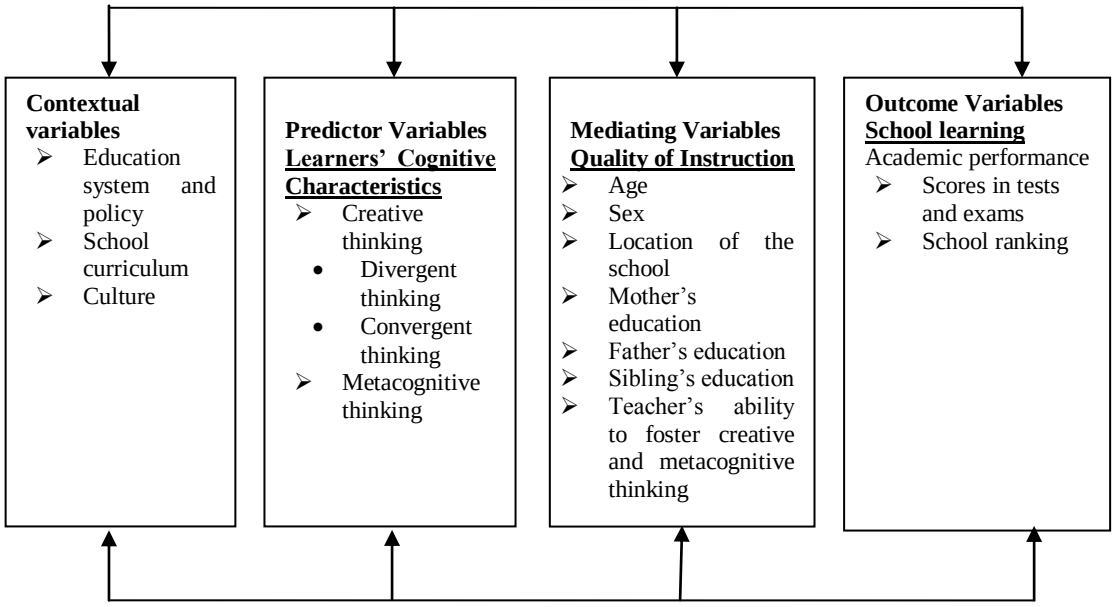


Figure 1.2: Conceptual Framework for the Study (Adopted from Bloom, 1976; Omari, 2011)

CHAPTER TWO

2.0 LITERATURE REVIEW

This chapter is devoted to a review of related literature with the purpose to position the study in both theoretical and empirical frameworks. The review is made under specific themes all of which are conceptually and logically related to the specific objectives of the study. The themes are divided into two major parts. The first part reviews theoretical works explaining the development of divergent thinking, convergent thinking, metacognitive thinking and academic performance. The second part reviews empirical works on the relationship between divergent thinking, convergent thinking, and metacognitive thinking; and between these and academic performance.

2.1 Development of Creative Thinking

Several theories explaining the development of creative thinking are in place. In this study however, the development of creative thinking has been discussed using theories like creative learning model and representational theory of mind. In creative learning model, the views by Torrance and Myers (1970), Treffinger (1980) and Torrance (1987) are specifically cited. In representational theory of mind, the works by Suddendorf and Fletcher-Flinn, (1999) are cited in this work. Other theoretical explanations on the development of creative thinking cited are the domain–general cognitive skills approach and the structure mapping theory.

2.1.1 The Creative Learning Model

The creative learning model of creative development holds that creative thinking among children develops through teaching and learning process (Torrance, 1987). Torrance and Myers (1970) have described the creative learning process as being sensitive to or aware of problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; bringing together available information; defining the difficulty or identifying the missing element, searching for solutions, making hypotheses, and modifying and restating them; perfecting them; and finally communicating the results. Torrance (1987) assumes that for children to function very creatively there should be highly interesting and valued activities that should not be interrupted by testing or other activity.

Apart from teaching children to think creatively, children should be taught and consciously use the emotional and irrational processes to formulate and apply criteria for evaluating alternative solutions. Torrance (1987) further argues that in teaching creative learning among children, the most successful approaches seem to be those that involve both cognitive and emotional functioning, provide adequate structure and motivation, and give opportunity for involvement, practice, and interaction with teachers and other children. Motivating and facilitating conditions certainly make a difference in creative functioning but differences seem to be greatest and most predictable when deliberate teaching is involved.

Treffinger (1980) emphasizes on this approach by proposing a practical model for describing levels of creative learning. According to Treffinger, there are three levels

of creative learning. Each level has cognitive and affective dimensions. The levels are labeled as divergent functions, complex thinking and feeling processes, and involvement in real challenges as illustrated in Figure 2.1.

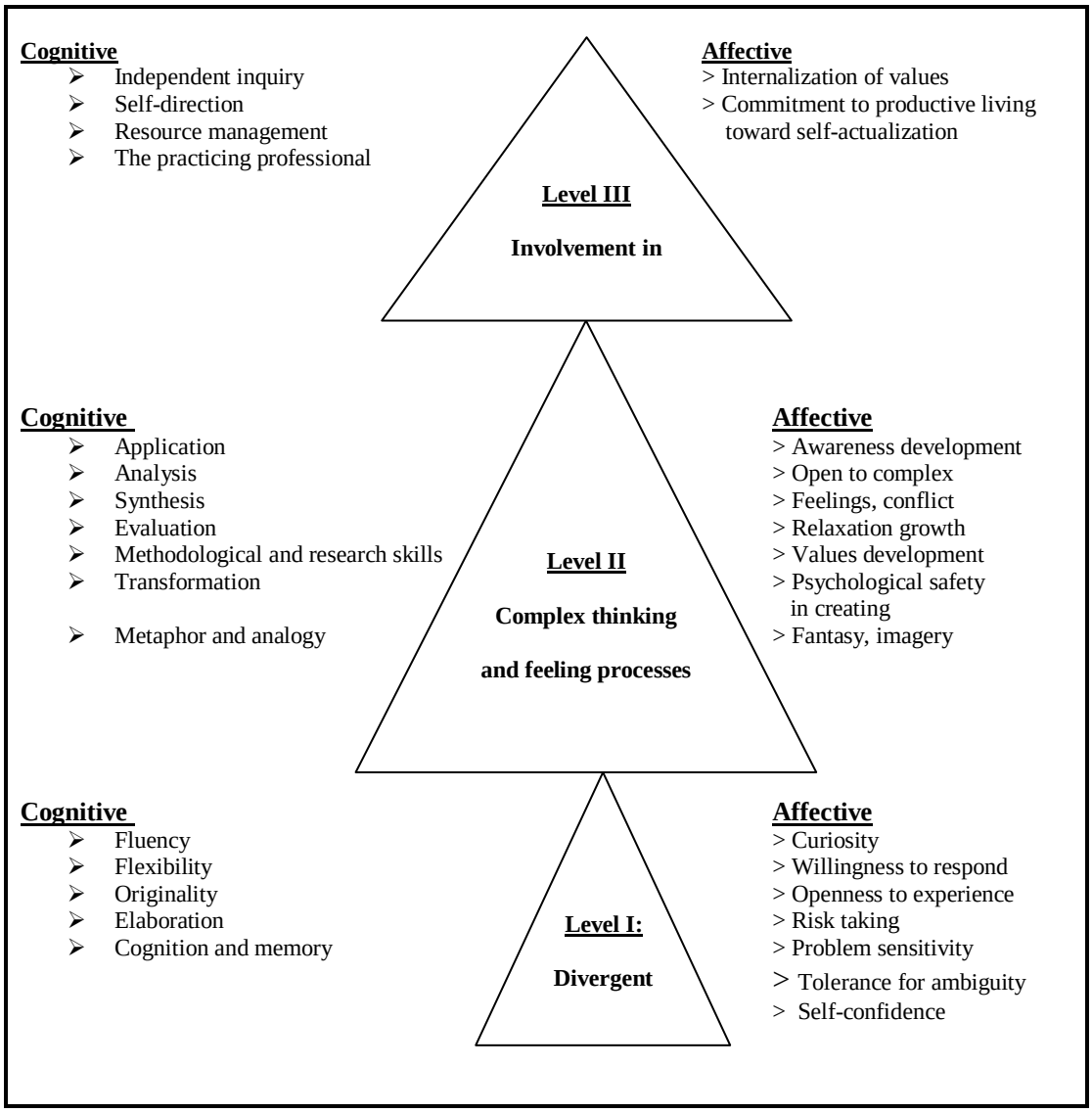


Figure 2.1: The Creative Learning Model (Treffinger, 1980)

Divergent functions. This is the level at which parents and teachers start to engage children in creative learning. Cognitively, the child is led to master the abilities to cognize and store information in their memory before they fully engage in divergent thinking components which are fluency, flexibility, originality, and elaboration.

Affectively, parents and teachers guide the children to become self – confident, tolerant for ambiguity, sensitive to problems and develop risk taking behavior. At this level children thus, become open to experience as they develop readiness to participate in several exposures, willing to respond and become curious.

Complex thinking and feeling processes. At this level the foundation is laid upon which creative learning develops by involving various important techniques basic to creative learning. The basic cognitive and affective factors from level I are extended. Cognitively, higher level and more complex thinking skills such application, analysis, synthesis, evaluation are employed. The child is expected to develop and master analogies and metaphors, methodological and inquiry skills are supposed to apply. Affectively, dealing with complex feelings and tensions, imagery, and the development of psychological freedom and safety are expected.

Involvement in real challenges. This is level III of creative learning where the person is involved in the real problems and challenges. Cognitively, one is involved in independent inquiry, self-direction, resource management, and product development. Affectively, one has reached internalization of values and feels and engages oneself in personal commitment to productive living and toward self-actualization. Figure 2.1 summarizes the model.

2.1.2 The Representational Theory of the Mind

The representational theory of the mind holds that mental states are attitudinal representations of the world, rather than attitudes to direct copies of reality (Dennett, 1978; Wimmer & Perrier, 1983). According to this approach, divergent thinking

arises from the understanding of false beliefs when children reach around four years of age, the age at which children have developed representational and executive skills underlying their ability to handle false belief tasks (Suddendorf, 1999). From their early age in life, children are confronted with problems that require novel solutions. Adults actively encourage children to make connections between previously independent aspects of knowledge, pointing out relation between different aspects of reality. Shared features of objects or events are emphasized in educational toys and teacher-child conversations. This helps children to structure their semantic networks flexibly, providing the basis for the generation of novel problem solutions.

The generation of creative problem solutions might also be arising from the ability to disengage from immediate perception and close associations in order to assume more novel ideas. In sum, the generation of many creative ideas and assessment of whether they fit the problem criteria might be facilitated by the ability to disengage from current mental content and by meta-representational reflection (Suddendorf & Fletcher-Flinn, 1999).

2.1.3 The Domain-General Cognitive Skills Approach

The domain-general cognitive skill approach argues that like any other cognitive skill, creative thinking develops with domain-general structural changes in children's reasoning abilities. This means that the development of creative thinking should be understood alongside a more general account of the development of logical reasoning. Some renowned advocates of this approach are Piaget (1979); Sternberg and Rifkin (1979). For example, Piaget (1979) tested 5-12 year-old children on

picture-based analogies and found occasional and uncertain evidence of analogical reasoning. Similarly, Sternberg used children's reaction time data to argue that there was an age-modulated shift from solving analogies using largely associative strategies to using more genuine analogical reasoning strategies (Sternberg & Nigro, 1980; Sternberg & Rifkin 1979). Though the domain-general approach has been an important of young children's emerging analogical reasoning abilities, both Piaget's and Sternberg's theoretical positions, have been criticized on the grounds that they failed to take into account the children's knowledge of the relations underlying the analogies and thus, underestimated children's analogical reasoning abilities (Leach, *et al*, 2008).

Other theorists supporting the domain-general approach (Andrews, *et al*, 1998) have focused on the development of capacity for active memory instead of structural changes in the underlying reasoning mechanisms. For example, according to Halford *et al*. (1998), one of the most fundamental constraints acting on cognitive development is the maximum relational complexity that can be processed in parallel in the working memory. They define complexity as the number of related dimensions or sources of variations. They also argue that, unlike tasks with relational complexity, tasks involving one source of variation start to be processed around the first birthday.

2.1.4 The Structure-Mapping Theory

The Structure-Mapping Theory describes analogical creative thinking, and specifically, how people use analogies to draw inferences. The theory assumes that

mental representations are highly structured and composed of predicates made of particular point of view. According to the theory, in mental representations, the actual attributes of objects such as color and size are normally irrelevant compared to the relational inference between objects. Given this assumption, the theory distinguishes between object attributes and relations between objects, at a purely syntactic level, with no regard for semantic content. Analogical reasoning, under this account, involves first selecting a base domain from memory using surface similarity as a criterion, and then a structural mapping between base and target is created. An example of analogical reasoning item is given below:

i. In the following question, a related pair of words or phrases is followed by five pairs of words or phrases. Select by encircling around the letter of the pair that best expresses a relationship similar to that expressed to the original pair.

Hospital: Healing

a) Closet : clothes
b) Court : justice
c) Mill : machinery
d) Symphony : instruments
e) Legislature : representatives

In the sets of words in a given example, there is a relationship between the term hospital, which is a place and the term healing which is a function. This set is a base domain which should exist in one's mind before one seeks for another set of words

with similar functional relationship in the given sets of words in the options. That second set of words, which the reader chooses in reference to the first set of words is the target domain referred to in the theory. The theory thus, suggests that the reader maps the relationship basing on the similarity in the structure of the phrases or sentences than the similarity in the meaning of the phrases or sentences.

In this process, mental activity is engaged in matching objects in the base in a one-to-one correspondence with objects in the target. Predicates between target objects are then matched with identical predicates in the base domain. The selection of the relations to be mapped from base to target is governed by a preference for systematicity among the relations, that is, a preference for higher order relations between relations. This preference determines what inferences will result from an analogy (Leach *et al.*, 2008).

With regard to the development of creativity through analogical thought, the theory suggests that, at least, the precursors of analogical reasoning are present from before the first birthday. Some studies based on this approach have demonstrated that 17-36 month olds and 2-4 year-olds benefit from analogical transfer in simple problem solving paradigms (Crisafi & Brown, 1986; Brown, 1989). In addition, other studies have shown that children from 3 to 4 years of age can solve analogies of more complex type such as ‘a’ is to ‘b’ as ‘c’ is to what (Goswami & Brown 1989; 1990; Rattermann & Gentner 1998).

The authors have, however, argued that the crucial constraint on analogical

development is the knowledge that the child possesses, and not some kind of general structural change (Goswami, 1992). As children's knowledge about the world becomes richer, they use this knowledge to form and understand analogies. It is worth noting that there is no inherent contradiction between domain-general changes in processing relational complexity and knowledge accretion. Indeed, domain-general accounts also acknowledge a strong role for knowledge accretion as a driving force in the development of analogical and creative thinking. However, a substantial difference between the positions of the domain-general accounts and that of the structure-mapping theory is that the latter places a far greater importance on the development of relational representations and downplays the importance of maturational change in the working memory capacity.

2.2 Development of Metacognitive Thinking

Metacognition is a relatively new area in both educational and cognitive psychology. However, some theoretical explanations on how it develops are in place in psychological literature. The discussion on how metacognition develops in this work is thus presented basing on two major theoretical works. These are the Vygotsky's (1978, 1986) and the Flavell's (2000) views on the development of metacognition.

2.2.1 The Vygotsky's Theory Cognitive Development

The Vygotsky's (1978, 1986) theory of cognitive development puts forward three major arguments. First, the understanding of children's cognitive skills is subject to the developmental analysis and interpretations of such cognitive skills. Second, children's cognitive skills are mediated by words, language, and forms of discourse,

which serves as psychological tools for facilitating and transforming mental activity. Third, cognitive skills originate in social relations and are embedded in a sociocultural background. For Vygotsky, developmental analysis and interpretations of cognitive skills means examining the origins and transformations of child's cognitive functioning from earlier to later forms. Therefore, any mental act such as using inner speech or understanding the strategies one uses to overcome one's weakness in learning a paragraph in academic text cannot be viewed accurately in isolation but should be evaluated as a step in a gradual developmental process (Santrock, 2004).

Vygotsky believed that the development of cognitive functions such as memory, attention, reasoning, and metacognitive thinking involved learning to use the inventions of society such as language, mathematical systems, and memory strategies. Thus, to Vygotsky, since knowledge is distributed among people and environments, which include objects, artifacts, tools, books, and the communities in which people live, knowing can best be advanced through interaction with others in cooperative activities.

Vygotsky's theory of cognitive development has explained the development of metacognitive control through its three major constructs such as transference from other-regulation to self-regulation, scaffolding, and the zone of proximal development. Vygotsky assumes that social interaction plays a major role in the origin and development of higher mental functions such as metacognition. Such

higher mental functions appear first on the interpsychological level and only later on the intrapsychological level. Vygotsky (1978) states:

> *Every function in the child's cultural development appears twice: first, between people (interpsychological) and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of ideas. All the higher functions originate as actual relationships between individuals (Pp.57).*

This means that, to the large part, significant others must play role to and foster both learning and creative thinking of the child. According to Papaleontiou-Louca (2008), most cognitive acts are at first 'experienced in social settings, but with time, the results of such experiences become internalized. Initially, parents, teachers, peers, and other significant others, act as interrogators, leading the child to more powerful rules and generalizations, starting from simple to complex, familiar to unfamiliar, and guiding the child learner to become a master; and there seems to be a systematic regularity in how this guidance works. The whole process, however, becomes internalized during the process of development and children become able to accomplish some of higher mental functions for themselves through self-regulation and self-interrogation.

Papaleontiou-Louca (2008) relates development of metacognitive control to the notion of scaffolding, which, according to Bruner, refers to interactional support, often in the form of adult-child dialogue that is structured by the adult to maximize the growth of the child's intrapsychological functioning (Clay & Cazden, 1990). Such gradual withdrawal of adult control and support as a function of children's increasing mastery of a given task gives the child a room for self-regulation and

independence in approaching problem-solving situations and thus, partly accounts for effective development of higher mental functions including metacognitive thinking.

Vygotsky's theory also poses the idea that the potential for cognitive development is limited to a certain time span, referred to as zone of proximal development, which refers to the gap between what a given child can achieve alone, their potential development as determined by independent problem solving', and what they can achieve through problem solving under adult guidance or in collaboration with more capable peers (Wood, 1997). Concluding the discussion on the contribution of Vygotsky's theory on the development of metacognitive thinking, Papaleontiou-Louca (2003) provides a summary that;

> *In time, children become mature thinkers who provide conflict trials for themselves, question their own basic assumptions, provide counterexamples to their own rules etc. In short, although a great deal of thinking and leading may remain a social activity, through the process of internalization children become capable of providing the supportive other role for themselves. In this way, progressively, children learn not only how to get a particular task done independently, but also how to set about learning new problems (Pp. 9-11).*

2.2.2 The Flavell's Theory

According to Flavell (1976) children gradually acquire three 'metas' in the context of information storage and retrieval. First, the child identifies situations in which intentional, conscious storage of certain information may be useful at some time in the future; second, the child learns to keep current any information which may be related to active problem-solving, and have it ready to retrieve as needed; and third, the child learns how to make deliberate systematic searches for information which

may be helpful in solving a problem, even when the need for it has not been foreseen. Flavell (1979) proposed a formal model of metacognitive monitoring which included four components of metacognition. These were metacognitive knowledge, metacognitive experiences, tasks or goals, and strategies or activities.

According to the model, these components can be intentionally activated as it happens, when one conducts a memory search for the purpose of retrieving specific information; or unintentionally, such as by cues in a task situation. Metacognitive processes can operate consciously or unconsciously and they can be accurate or inaccurate. They can also fail to be activated when needed, and can fail to have adaptive or beneficial effect. Metacognition can lead to selection, evaluation, revision or deletion of cognitive tasks, goals, and strategies. They can also help the individual make meaning and discover behavioral implications of metacognitive experiences.

Flavell (1979) defined metacognitive knowledge as one's awareness about the factors that affect one's cognitive activities. Making distinction between cognitive and metacognitive knowledge, Flavell clarifies that metacognitive activity usually precedes and follows cognitive activity. The two are closely interrelated and mutually dependent. One with metacognitive knowledge can engage in or abandon a particular cognitive activity based on its relationship to one's interests, abilities and goals.

For Flavell, three categories of metacognitive knowledge were person variables, task

variables, and strategy variables. The person category of knowledge includes the individual's knowledge and beliefs about oneself as a thinker or learner, and what one believes about other people's thinking processes. For example, one's beliefs about oneself as a learner may facilitate or impede performance in one’s learning situation, unless intervention takes place early.

The task category of metacognitive knowledge refers to information available to the person about a task that one proposes to perform at a particular time (Flavell, 1979). Task knowledge informs the person of the range of possible acceptable outcomes of the cognitive activity and the goals related to its completion. This category includes also knowledge about task difficulty, mental efforts, and tangible resources one requires for the accomplishment of the task in question. The strategy category of metacognitive knowledge involves identifying goals and sub-goals and selection of cognitive processes to use in their achievement.

The second category in the Flavell’s model is metacognitive experience, refers to one’s subjective internal responses to one’s metacognitive knowledge, goals, or strategies. As monitoring phenomena, metacognitive experiences provide feedback about current progress, future expectations of progress, degree of comprehension, and connecting new to old information. The third category, metacognitive goals and tasks, refers to the preferred outcomes or objectives of a cognitive undertaking.

Goals and tasks include comprehension, committing facts to memory, or producing a written document or an answer to a math problem, or of simply improving one's

knowledge about something. Achievement of a goal draws heavily on both metacognitive knowledge and metacognitive experience for its successful completion. Lastly, metacognitive strategies involve ordered processes used to control one's cognitive activities and to ensure that a cognitive goal is achieved.

Flavell's (1979) theoretical view has been expanded by Presseley, Borkowski, and Schneider (1989) so as to consider both procedural and declarative metacognitive knowledge. They also linked these concepts to other features of successful information processing. According to this expanded model, sophisticated metacognition is closely related to the learner's use of strategy, motivational orientation, general knowledge about the world, and automated use of efficient learning procedures. The model assumes that there are interactions among these components as for example, the adequate application of metacognitive strategies is influenced by specific strategy knowledge. Such application not only affect knowledge but are also monitored and evaluated, leading to expansion and refinement of specific strategy knowledge.

The expanded model of metacognition has linked findings from "the theory of mind" (ToM) research and metacognitive knowledge in an attempt to explain development of metacognitive monitoring (Figure 1.1). According to this view, by the second year of life, children engage in a pretend-play, which involves a form of mental representation, entailing the suspension of reality (Kuhn, 2000). However, at this time, children are still unwilling to accept that anyone could hold a belief that deviates what they themselves take to be a true state of affairs. Between age four and

five, children recognizes the assertions as the expansion as someone's belief. This is a milestone in children's cognitive development that lay the way for the latter achievement of metacognition. Accordingly, the child becomes to recognize that as expressions of humans' representational capacity, assertions do not necessarily correspond to reality.

Children also realize that if assertions do not necessarily correspond to reality, they become susceptible to evaluations in comparison with a reality from which they are now distinguished. Such evaluation is a critical step in the development of metacognitive knowing and the origin of what will become scientific and critical thinking (Kuhn, 1999). Schneider (2008) has argued that "some declarative metamemory is already there in preschool children and develops steadily over the elementary school years" and that though knowledge of most fact about memory does exist by 11 or 12 years of age, declarative metamemory is not complete by the end of childhood.

With regard to metacognitive judgments and their accuracy, Schneider (2008) argues that the same are inferential in nature, based on various heuristics and cues with some degrees of validity in predicting memory performance. However, given that even among adults, the contribution of one's theories and knowledge to monitoring and control seems to be quite limited, Schneider assumes that children's metacognitive judgments are predominantly guided by online implicit utilization of subtle experiential cues.

2.3 Reviews of the Relevant Studies on Creative, Metacognitive Thinking and Academic Performance

This section presents reviews of the past studies done in the themes such as creative thinking and metacognitive thinking, divergent thinking and academic performance, metacognitive thinking and academic achievement, and the prediction of academic performance from creative and metacognitive thinking. Lastly, the review is made to discuss how the problem of academic underperformance has been addressed in Tanzania.

2.3.1 The Relationship between Creative and Metacognitive Thinking

Focusing on the conceptual relationship between creative thinking and metacognition, Flavell (2000) describes that metacognition involves the ability to think about one's own thinking, and to control, alter, and flexibly adjust strategies on the basis of new information and changing contexts, and that metacognition involves the ability to understand core ideas or underlying meanings in concepts and to transfer that understanding to other situations or domains of knowledge in a fluid, creative way. The ability to see similarities and differences in the same objects, ideas, people or situations is the basis of creative thought, discovery, invention, analogy, metaphor, simile and empathy.

Zanetti (2006) argues that meaningful learning is the result of an intentional process, which should involve perseverance in reaching one’s goals in general and choosing learning objectives in particular, and that this should often be accompanied by a generally increased ability in the use of divergent thinking, which is also connected

to metacognitive abilities. In combining learning techniques that put emphasis on both creative thinking and metacognitive thinking in a software known as ADDZIANARIO, the authors found a general increase in the children's knowledge about the town of Pavia in terms of both pieces of information acquired and children's ability to make links between data and organize them in a hierarchical form (schemata-driven knowledge).

Chua, Morris, and Mor (2011) used a multirater survey among 43 middle-level managers attending an executive MBA course at a large west coast U.S. university. They assessed managers' intercultural collaboration from the perspective of work colleagues from different cultures to test the relationship between managers' cultural metacognition and their creative collaboration in their intercultural relationships. Participants rated themselves on the cultural metacognition and international experience measures.

Researchers found that cultural metacognition had a positive effect (b = 0.19, $p < 0.05$) on observers' ratings of participants' ability to engage in intercultural creativity-related work, controlling for prior multicultural experience and foreign language ability. However, the author found that with the addition of affect-based trust into the model, the positive affect between cultural metacognition and intercultural creative behavior disappeared (b = 0.06, $p > 0.10$) suggesting a mediation effect of affect-based trust variable.

2.3.2 The Relationship between Divergent Thinking and Academic Performance

Chamorro-Premuzic (2006) conducted a study among 307 British university students who completed the Alternate Uses Test. Academic achievement was assessed throughout a four year period via written examinations, continuous assessment and supervised dissertations in the final year. It was found that creative thinking and specifically divergent thinking was more related to final dissertation marks than to examinations and continuous assessment performance. Likewise, Cohen (2001) conducted an experimental study among 92 sixth and 97 seventh graders to find out the relationship between convergent and divergent thinking in science subjects. The author found a strong relationship between convergent and divergent thinking in science for sixth graders but not for seventh graders.

In the same line, Reese *et al* (2001) investigated the effects of intelligence tests, age, and gender on divergent thinking in adulthood among 400 adults. Their intelligence test battery included inductive reasoning, memory span, intellectual speediness, vocabulary, depression, and education. Employing hierarchical multiple regression in their analysis, they found that divergent thinking was significantly, linearly, positively, and moderately related to all intelligence tests except depression, which was not significantly related to divergent thinking at $p < .05$.

Similar findings were reported by Naderi *et al* (2009) who conducted a study to examine creativity, age and gender as predictors of academic achievement among 153 Iranian undergraduate students in Malaysian Universities. They found a significant but low correlation (r =.16) between divergent thinking and academic

achievement. In their study on relationship between creativity and academic achievement focusing on gender differences Naderi *et al.,* (2010), however, found low to moderate but significant correlations between divergent thinking and academic achievement.

In Greece, Danili and Reid (2006) conducted a study among 476 public upper secondary schools pupils to investigate the cognitive factors that could potentially affect pupils' test performance. Among the cognitive factors studied was the divergent thinking in relation to three assessment formats such as multiple choice tests, short answer, and structural communication grid items in five classroom tests. The authors found that divergent thinking positively correlated with pupils' performance in assessment formats where language was an important factor, but not in algorithmic types of questions or in questions where there was a greater use of symbols and less use of words.

In Pakistan, Anwar *et al.* (2012) used the Torrance Tests of Creative Thinking to measure creative potential on fluency, flexibility, elaboration and originality among 256 students with the purpose of exploring the relationship between creative thinking and academic achievements of secondary school students. A Pearson correlation and one-way ANOVA analyses indicated a statistically significant relationship between creative thinking and students' academic achievements.

2.3.3 The Relationship between Convergent Thinking and Academic Performance

Bandura (2000) suggests that past success gives rise to a single-minded persistence that may be beneficial when people must overcome obstacles. On the other hand, past success might be harmful when individuals must face changes in the environment that need novel strategies necessary for survival (Audia, Locke, & Smith, 2000). The opinion that past academic performance predicts rigid strategies applied in the face of novel problem solving requirement has led to the rise of a debate among scholars as to whether such rigidity may be viewed as resilience and therefore necessary for future academic performance, or whether such rigidity may stagnate and eventually lead to academic underperformance (Whyte, 1998). Despite this debate, research tend to indicate that past academic performance narrows people's focus of attention, an issue commonly conceptualized as convergent thinking (Mayer, 1992). It would then seem past experience success in academic performance may indeed lead to convergent thinking, but there might be a reciprocal relationship where convergent thinking might also predict academic performance in the future.

Gongalo (2004) conducted an experimental study among 160 students at a large North-American university. Participants were assigned to groups on the basis of voluntary sign ups. All participants were put in the same-sex groups of four, which resulted in a total of 40 groups. The aim of the study was to explore if the relationship between group success and convergent thought would depend on the

attributions generated to explain their performance. The researcher found a positive and significant relationship between past success and convergent thinking, and the relationship depended on the attributions generated to explain the performance. The researcher concluded that the results suggested not only that group-focused attribution for success gives rise to convergent thought, but also that individual-focused attributions may stimulate groups to think convergently.

On the other hand, Sak and Maker (2005) examined the relationship between performance in mathematics problems and performance in convergent thinking tasks among 857 grades one to six students using a DISCOVERER Assessment technique. The researchers found moderate and positive correlations between convergent thinking and achievement in mathematical tasks. In another study, Sak and Maker (2003) used a DISCOVERER Assessment again to investigate the relationship between convergent thinking and convergent thinking of kindergarten students. These researchers found that mathematical reasoning tasks accounted for 29 percent of the overall variance in the tasks ($p = .003$). Generally, they found that convergent thinking correlated positively and significantly with performance in science subjects among grade six students.

Nezhad and Shokpour (2013) administered convergent versus divergent thinking task types among 93 Iranian students aged between 18 and 26 to explore the influence of the convergent and divergent thinking on reading comprehension performance. Students were given the Torrance Divergent Thinking Test and were assigned to two groups so that there were roughly equal numbers of divergent and convergent

thinkers in each. Next, the two groups took the Nelson's reading comprehension test to ensure initial reading ability homogeneity.

The experimental and the control groups then received treatment in the form of task-based instruction through either divergent or convergent tasks respectively over a period of one semester. To assess the reading comprehension gains of the participants at the end of the treatment, four types of reading multiple choice items, i.e., simple factual, referential, inferential, and multiple-response items were used. Multivariate ANOVA indicated that the best results were achieved when divergent thinkers of the divergent task type group answer referential, and multiple-response items whereas the worst results were obtained when convergent thinkers in the convergent task group's performance on multiple-response items was used as the criterion for reading assessment. The researchers further found that a task-based course of instruction through convergent or divergent tasks cause the participants to have respectively lower or higher gains on the divergent thinking test respectively.

2.3.4 The Relationship between Metacognitive Thinking and Academic Performance

According to Schraw and Dennison (1994) metacognitive thinking, which refers to thinking about thinking (Santrock, 2006), involves two main categories, namely cognition of knowledge and regulation of cognition. Knowledge of cognition involves declarative knowledge, procedural knowledge, and conditional knowledge. Declarative knowledge is the knowledge about one's skills, intellectual resources, and abilities as a learner. Procedural knowledge is the knowledge about how to

implement learning procedures such as the strategies to employ in learning. Conditional knowledge refers to the knowledge about when and why to use certain learning procedures.

On the other hand, regulation of cognition involves planning, information management, monitoring, debugging, and evaluation. Planning involves goal setting and allocating resources prior to learning. Information management refers to skills, strategies and sequences used to process information more efficiently such as organizing, summarizing, and selective focusing. While monitoring refers to assessment of one's learning or strategy use, debugging refers to strategies used to correct comprehension and performance errors such as notes taking or use of mnemonics. Lastly, evaluation means analysis of performance and strategy effectiveness after a learning episode. Both theoretical and empirical literature has discussed the relationship between measures of metacognition and those of academic achievement at all levels of education.

Zimmerman (1990) describes such relationship by observing characteristics of learners with metacognitive monitoring ability. According to that scholar, self-regulated learners approach educational tasks with confidence, diligence, and resourcefulness; are aware when they know a fact or possess a skill and when they do not; proactively seek out information when needed and take the necessary steps to master it; find a way to succeed even when they encounter obstructions; view learning as a systematic and controllable process; accept responsibility for their

achievement outcomes; and monitor the effectiveness of their learning methods or strategies.

In addition, self-regulated learning strategies include self-evaluation, organization and transformation, goal setting and planning, information seeking, record keeping, self-monitoring, environmental structuring, giving self-feedback, rehearsing and memorizing, seeking social assistance, and reviewing. Similarly, when students monitor their learning, they can become aware of potential problems, including errors in encoding, operations, and goals. (Como, 1986; Ghatala, 1986; Borkowski & Thorpe, 1994; Schloemer & Brenan, 2006).

Errors in encoding include missing important data or not separating relevant from irrelevant data. Errors in operations include failing to select the right sub-skills to apply or failing to divide a task into subparts. For example, some math students will jump right to what they think is the final calculation to get the desired answer. Errors in goal seeking include misrepresenting the task and not understanding the criteria to apply. Problems with cognitive load include being unable to handle the number of sub-skills necessary to do a task, or not having enough automatic, internalized sub-skills.

In the same line of thought, Stevens, Gould, and Isken (2007) conducted a study among 335 elementary students in California. The students belonged to classrooms whose teachers participated in a Contemporary Art Start program for professional development. Students took the Torrance Test of Creative Thinking (Non-Verbal)

and a Written Response to Visual Art Test created by the research team before and after completing an academic year in the program. The researchers found on average, a statistically significant relationship between creative, metacognitive skills and achievement in writing scores on the written response to visual art test after controlling for demographic differences between the students and varying amounts of experience between the teachers.

Cubukcu (2008) investigated a sample of 130 third year university students in Turkey to determine whether instruction incorporating metacognitive strategies led to an increase in the reading comprehension of expository texts, and to determine the impact of the metacognitive strategies on vocabulary development. The students in the experimental group received 45 minutes of reading comprehension instruction per week for 5 weeks. In each class hour they were taught two metacognitive strategies and they applied them to the passages. The analysis with ANCOVA indicated a significant difference (p = 0.003) between control and experimental groups regarding vocabulary and reading comprehension tests.

In 1,201 surveys from students studying at a large public university in the U.S., Schleifer and Dull (2009) used data collected over the course of a decade between 1995 and 2004 to examine the association between metacognition and students' performance in accounting classes. Students completed the Metacognitive Awareness Inventory (Schraw & Dennison, 1994), a 52-item questionnaire which the authors designed to include eight attributes of metacognition classified into two broad categories, which were metacognitive knowledge and regulation of cognition. The

survey results supported the conclusion that metacognitive attributes were associated with accounting course achievement.

Plants (2000) used a Metacognitive Awareness Inventory to investigate the relationship between academic performance and goal orientation, metacognition, gender, and prior performance of advanced learners among 98 graduate medical education students. The results of the study revealed that there was an influence of metacognitive skills on in-training percentile scores but when prior knowledge was not accounted for.

Similarly, Zabrucky and Lin-Miao (2009) examined Taiwanese students' ability to assess their comprehension of passages following reading as well as their ability to predict the number of questions they would be able to answer about passage content. Following an actual test on the material, students were asked to assess how many questions they felt they answered correctly about a passage. Students were able to predict comprehension and test performance at better than chance levels and were more accurate at postdiction than prediction. The study further found that students with better performance, as measured by comprehension test scores, were better at both prediction and postdiction of comprehension performance. However, students' self-assessments of general calibration ability did not relate to their test performance.

Legg and Locker (2009) used a 20 item scale of *State Metacognitive Inventory* among fifty-six Georgia Southern University undergraduates to assess whether metacognitive skills moderated the effects of mathematics anxiety on performance,

reaction time, and confidence on a mathematics task. The researchers found that metacognition moderated mathematical anxiety and predicted that performance would decrease as anxiety increased, except at much higher metacognition levels. Further, metacognition predicted confidence in accuracy such that individuals higher in metacognitive processing were more confident in their ability to correctly answer the problems.

Vrugt and Oort (2008) conducted a study among 952 first-year psychology students with the purpose of developing and testing a model of effective self-regulated learning. Their model comprised of achievement goals (mastery, performance-approach and -avoidance goals), metacognition (metacognitive knowledge, regulation and experience); study strategies (metacognitive, deep cognitive, surface cognitive and resource management strategies); and academic achievement. The relationships in the model were tested after controlling for intellectual ability, gender and age. These researchers found a positive relationship of mastery goals and a negative relationship of performance-avoidance goals with metacognition. Metacognition also positively affected the use of the four study strategies. The strategy pathway involved positive effects of mastery and performance-approach goals on the use of metacognitive and deep cognitive strategies. Further, performance-approach goals positively affected the use of surface cognitive and resource management strategies. The use of metacognitive and resource management strategies had positive effects and the use of surface cognitive strategies had a negative effect on exam scores.

Koch (2001) conducted an experimental study with the purpose to investigate whether training in self-awareness significantly improves student reading comprehension. The sample consisted of 64 students aged 21-28 years, all enrolled in a one-year introductory physics course. The researcher randomly assigned students of similar educational background to one of two groups, an experimental group with 30 students and a control group with 32 students. Having pre-tested both groups in reading comprehension ability at the beginning of the second semester, the researcher exposed students in both groups to a two hour sessions weekly in which they performed reading-comprehension exercises for a period of 3 months.

In addition, the experimental group performed the metacognitive tasks. The outcomes of each exercise were discussed with each group to clarify the correct solutions. Students in the experimental group performed the self-evaluation and self-awareness tasks by themselves, the teacher acting only as a moderator. In the control group, critical judgment of students' reading-comprehension level was performed by the teacher.

These teacher's critical observations on students' reading-comprehension level assisted students in the control group. Hence, the control group was subjected to "external" judgment-that of the teacher, whereas the experimental group was subjected to "internal" judgment-the student's metacognitive self-awareness. Results obtained for the control group acted as a base line for outcomes obtained for the experimental group. After the 3 months, the physics reading comprehension of both groups was assessed by the same posttest of physics material familiar to the students. Pre and posttest scores in both the experimental and control group were recorded and

group comparisons were analyzed. Koch found that improvement in test scores was greater in the experimental group than in the control group and that decreased variability in both groups between the pre- and the post-test was more pronounced in the experimental group than in the control group.

2.3.5 Predicting Academic Performance from Creative and Metacognitive Thinking

Schneider (2008) reports a number of studies that focused on the relationship between measures of metacognitive knowledge, monitoring and control; and children's school performance in both young and older children. Generally, the reported studies confirm the view that metacognitive knowledge, monitoring, and control predict academic performance, and specifically, mathematics and reading comprehension in secondary school settings even after differences in intellectual abilities have been controlled for.

Chamorro-premuzic (2006) performed a series of hierarchical regressions to test the extent to which the Big Five personality traits and creative thinking scores could predict each measure of academic performance. Results indicated that personality traits were significant predictors of academic performance, in particular overall exam and final dissertation grades, accounting for 19% of the variance in each of these measures. The percentage of explained variance in continuous assessment was much lower but significant. Conscientiousness was a significant predictor of the three measures of academic performance, whilst neuroticism was a significant predictor of overall examination and continuous assessment grades. Openness to experience was

a significant predictor of final dissertation grades, but not examinations or continuous assessment.

When creative thinking scores were added to the model, the amount of variance explained only nine percent increase in the case of final dissertation grades. Thus, results indicated that creative thinking was a better predictor of final dissertation grades than the other academic performance tasks. Naderi *et al* (2009) conducted a study to examine creativity, age and gender as predictors of academic achievement among 153 Iranian undergraduate students in Malaysian Universities. Their multiple regression analysis revealed that creativity, age and gender explained 14.3 percent of the variance in academic achievement. In their study on relationship between creativity and academic achievement focusing on gender differences Naderi *et al.* (2010) found that creativity factors explained 27.9 percent of the variance in academic achievement ($F = 2.67$, $p < 0.01$).

2.3.6 Mediating variables and Academic Performance

The conceptual framework for the present study has placed location of the school (being in rural or urban), age, and sex as mediating variables. This has been drawn from some research findings indicating the role of these variables in explaining academic performance. For example, though developmental studies and their implications on sex differences in academic achievement were very popular in 1980's (Arap-Maritim, 1986), in recent years, the magnitude, consistency, and stability across time of cognitive sex differences have been questioned (Voyer and Bryden, 1995). In western cultures, Maccoby (1966) and Maccoby and Jacklin

(1974) indicate that girls perform better than boys on school tasks during the first four or five years of elementary school. In Kenya, Arap-Martim (1986) explored sex differences in class rank among 2,300 in Grades 1, 2, 3, 4, 5, 6, 7, and 8; and found that while more girls than boys were in the first top five class positions in Grades 1, 2, and 3, there were no sex differences in grades 4 and 5. On the other hand he found that more boys than girls were in the top five positions in Grades 6, 7 and 8. The inconsistent results regarding sex difference in academic performance has been making sex as an important mediation variable to check in the studies placing academic performance as dependent variable.

2.3.7 Addressing School Underperformance Problem in Tanzania

Though there were no studies found in Tanzania using the item response theory and the theory of school learning to study creative and metacognitive thinking in relation to academic performance, some studies have been found to address academic under performance problem in the country. For instance, previous studies have associated underperformance in secondary schools with such variables as insufficient schools and laboratories, libraries, and equipment; poor teaching strategies, lack of exercise and practice among students, poor teaching and learning of key concepts, and misinterpretation of information (Idama & Ndabi, 1996; Chonjo & Welford, 2001).

In the study analyzing a situation of human resource in education sector in Tanzania, Omari and Heather (2010) found that 70 percent of the 4,883 teachers in the 312 schools responding to the in-depth school analysis were between age 21 and 50 years with a retirement age of 60 years. The researcher interpreted the finding that more

than 70 percent had less than 25 years of teaching experience, which was an important factor in determining learning outcomes (Scheerens, 2000).

Apart from the role of age and teaching experience discussed by Omari, the same study found that there was a well record of teachers' qualification in secondary schools, since 88% of teachers with master's degrees and 92.6% of those with bachelor's degrees were teaching in secondary schools. However, the researchers did not show the extent to which these factors correlated to academic performance in secondary schools. It is then surprising to note that despite such good report with regard to high qualified teaching staff with healthy teaching experience in secondary schools, academic performance in secondary schools has not been doing such much good.

Magina (2010) found that in-service training was another important variable to think about in a study addressing academic underperformance in Tanzania. In a small sample of 77 secondary school teachers in Serengeti district, Magina found that 20 (26.7 %) reported to have attended in-service training; while 55 (73.3%) reported that they had not attended in-service training. Though the researcher indicated the relationship existing between in-service training and teacher performance, the study did not analyze the relationship between teachers' in-service training attendance or teachers' performance and students' academic performance.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

This chapter presents a systematic way of which research was conducted. The chapter is organized in sub-titles such as; the study area, the study approach and design, subjects of the study, instrumentation for the study, validity and reliability of the instruments, and ethical consideration. The chapter also explains the way data were coded and analyzed.

3.1 The Study Location

This study was conducted in Dodoma municipality and Mpwapwa district in Dodoma region. The Region lies at 4^{o} to 7^{o} latitudes South and 35^{o} to 37^{o} longitude East. It is a region centrally positioned in Tanzania and is bordered by four regions namely: Manyara in the North, Morogoro in the East, Iringa in the South and Singida in the West. Much of the region is a plateau rising gradually from some 830 metres in Bahi Swamps to 2000 metres above sea level in the highlands north of Kondoa.

Administratively, the region was established in 1963 consisting of three rural districts and one Township Authority. To date, Dodoma region has five rural districts; which are Mpwapwa, Kondoa, Kongwa, Chamwino, and Bahi; and one urban district, which is Dodoma Urban. The region is the 12th largest in the country and covers an area of 41,310 sq. km equivalent to 5 percent of the total area of Tanzania Mainland. The region is almost entirely dependent on agriculture and livestock production, which are locally practiced, largely at household level. There is

small-scale processing of agricultural and livestock products. Agriculture is characterized by low productivity resulting from low and erratic rainfall, high evapo-transpiration and low moisture holding capacity. These conditions compounded by poor farming practice and overgrazing make the region susceptible to extensive soil erosion. The main staples grown in the region include sorghum, bulrush millet, cassava and maize, while major cash crops are groundnuts, sunflower, simsim and to a lesser extent castor, and pigeon peas. In the late 1970s and early 1980s, grapes and paddy emerged as important cash and food crops respectively.

Livestock is the second contributor to the region's economy. The region ranks third in the country in terms of livestock number including cattle, goats and sheep. Poultry and piggery farming for commercial purposes are mainly confined to urban and trading centres. Besides, local chickens abound in the region, which is in high demand in the Dar es Salaam market. Natural resources, which include forestry, wildlife, beekeeping, fishing and mining, are other sectors which people are engaged in for their livelihood. Products such as timber, logs, poles, wildlife, honey beeswax, fish, salt and gold are locally harvested.

There a few small scale processing industries such as oil extraction, carpentry, pottery, blacksmith, wood carving**,** whose operation are mostly confined to urban and trading centers. The region is one of the homes of higher learning institutions such as the Dodoma Regional Center of the Open University of Tanzania, the University of Dodoma, Saint John's University of Tanzania, Mipango College, College of Business Education, and Hombollo College. The presence of many higher learning

institutions which bring many young people in the town from almost each region in Tanzania, has recently been making the region one of the education centers in the country.

Dodoma region was purposively selected first, because it had the highest decline in passes in Divisions I-III of 3,822 pupils from 4,728 in 2010 to 906 in 2011 (URT, 2012). Second, the region was selected given its heterogeneous nature and location, which could be a prototype representative of other regions of Tanzania. Within the region, Dodoma municipality and Mpwapwa districts were purposefully selected so as to obtain one urban district and one rural district. Figures 5, 6, and 7 show the location of Dodoma region in Tanzania, location of schools in Dodoma municipality, and location of schools in Mwapwa district respectively, where research took place.

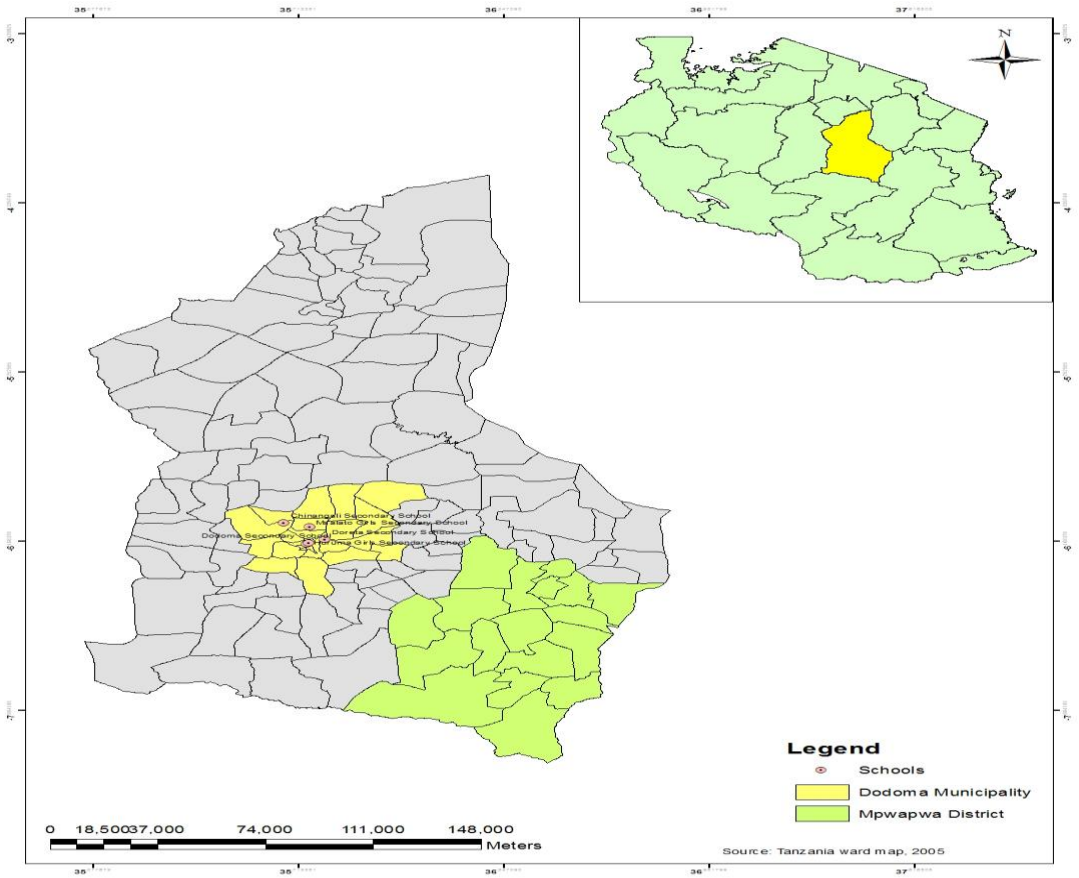


Figure 3.1: Location of Dodoma Region in Tanzania and the Districts Studied

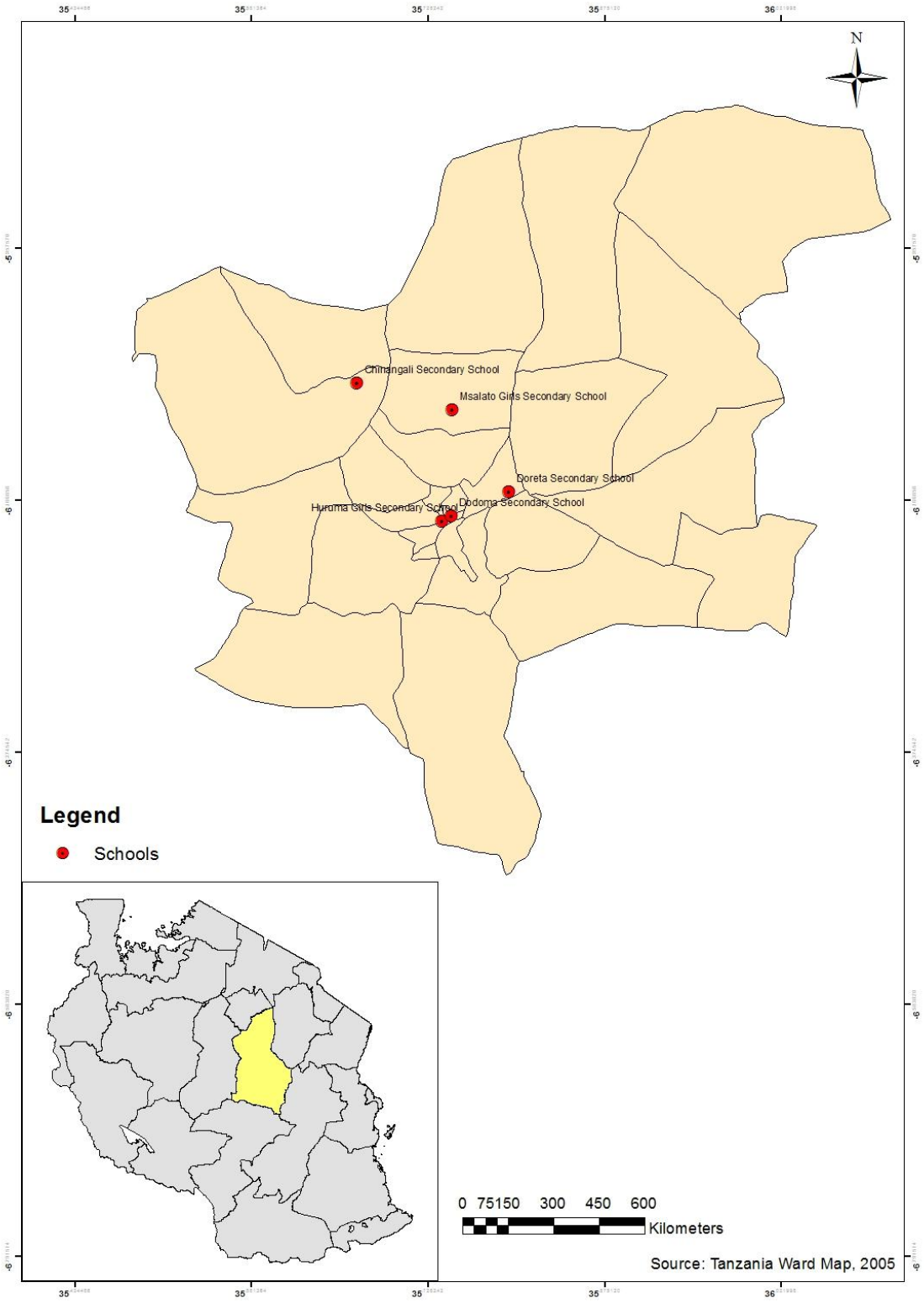


Figure 3. 2: Areas of Research in Dodoma Municipality

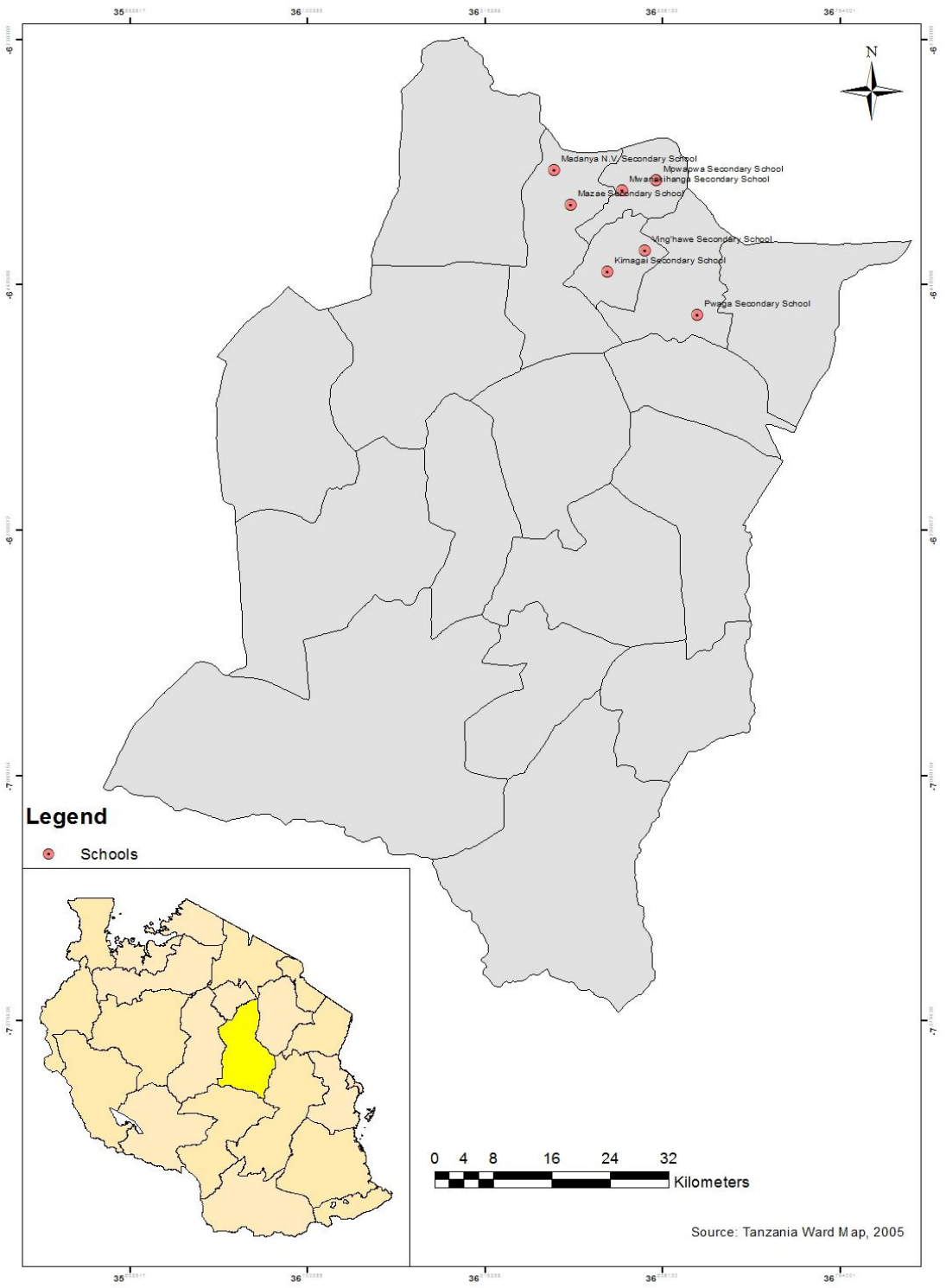


Figure 3.3: Areas of Research in Mpwapwa District

3.2 Philosophical Underpinnings of the Study

The choice of the research paradigm, design and instruments of data collection depends much on the philosophical world view that guides the beliefs of the researcher towards identification of the knowledge gap and research problem (Gray, 2013). This research was mainly guided by the positivist orientation, which looks at the social world as external force whose properties needs to be studied using objective rather than subjective methods (Critelton & Seers, 2001; Scotland, 2012; Gray, 2013). Ontologically, positivism assumes the existence of objective truth and reality external to the researcher and that truth must be investigated through the rigorous process of scientific process (Gray, 2013; Krauss, 2005). Epistemologically, scientific knowledge reveals the truth about reality, which is based on sensorial experience, and hence amenable to observation and experimentation (Mack, 2010; Omari, 2011). Furthermore, since knowledge is absolute and value free it can be deduced from the theories and through testing the plausible explanations from the theory. This is opposed to the interpretivism, which holds that research must be observed from inside through the direct experience of the people since there is no absolute truth but rather multiple realities as reality is perceived differently by various people (Mack, 2010; Creswell, 2009). It is the interpretivist approach which underpins the general approach of qualitative research as the focus is to understand, explain, and demystify social reality through the eyes of different participants" (Cohen et al, 2007).

The choice of the positivist philosophical orientation followed the conscious decision by the researcher to investigate the relationships between the theoretical constructs

(students' cognitive characteristics) and the theoretical assumptions that had not been tested in Tanzania, in an attempt to explain the problem of academic underperformance. Despite the claims that studies guided by the positivist orientation are inflexible because the instruments cannot be modified once the study begins (Ingham, 1993, Johnson, 2014), piloting the research instruments prior to their administration to a larger sample helped to minimize this possibility as there is a room to modify and improve the perfection of the instruments as was done in this study.

3.3 The Study Paradigm and Design

This study employed a quantitative research paradigm, which allows for examining the relationship among variables using instruments to assign numbers so as to analyze data using statistical procedures (Creswell, 2009). Quantitative research relies on the principle of verifiability; that means confirmation, proof or substantiation. Besides, quantitative approach was considered appropriate for this study because of its ability to study large numbers of people (Cohen, Manion & Morrison, 2007). The researcher is aware of the arguments by the opponents of quantitative approach that self-reported information obtained from questionnaires may be inaccurate or incomplete (Mertens, 1998). Thus, the present study carefully planned a design using tests, which directly measured participants ability rather than relying only in self-reporting instruments.

The study thus, employed a repeated measures multi variables research design; and specifically, a 10 x 3 with 3 trial positions and 10 item types. The term repeated

measures means that all the subjects were exposed to all measures of the determinant variables; while the term multivariable is used here to mean that there were more than one independent variable in the equation model or conceptual framework for this study. After taking the background information upon the informed consent of the subjects, the subjects were exposed to a test for divergent thinking. The test was preceded by the following directions (Appendix 1):

i) There are five items in this task for you. You have 10 minutes to respond to each item. Think aloud before you write your answer. Remember that there are no correct and wrong answers for this work. Thus, think and write whatever answer you consider relevant from your experiences. The more responses you can come up with the better; so write as many as possible.

Then they were allowed to start answering the test items. The test session took about 50 minutes. The subjects were then prepared for the next session, where new directions were read by the researcher as follows:

i) In the questions below, you are not expected to apply any taught formula, but please, make sure to actively involve your thinking until you reach a correct answer.

Then the participants were allowed to proceed with the test for convergent thinking which was allowed for 50 minutes. After 50 minutes, all the subjects had to stop writing whether or not they finished. A break of 10 minutes was allowed before they were exposed to a metacognitive thinking scale, where the instructions were again read by the researcher as follows:

i) In the scale provided below, read the statements about what people do when they read *academic or school-related materials* such as textbooks or library books. After reading each statement, circle the number (1, 2, 3, 4, or 5) that applies to you. Please note that there is no right or wrong answers to the statements in this task but be very sincere to yourself in responding to a statement. The numbers mean:

1 = "Never or almost never"

2 = "Only occasionally"

3 = "Sometimes" (about 50% of the time).

4 = "Usually"

5 = "Always or almost always"

Then the participants were allowed to start responding to the metacognitive thinking scale. The session took about 30 minutes to be completed.

3.4 Participants of the Study

The target population for this study was all form four pupils enrolled for 2013 academic year in Dodoma region. The group was selected because the problem of academic underperformance was mainly acute at O-level secondary schools, and the group was deemed capable of understanding the tasks to be used. In addition, teachers teaching Geography in the same schools were targeted to provide information regarding their ability to foster creative and metacognitive thinking.

3.4.1 Sample Selection Procedures

The selection of the sample of secondary schools adopted a purposive sampling

technique. The great heterogeneity and uneven distribution of secondary schools in the region ruled out the use of random sampling. Table 3.1 shows the sampled schools and form four enrolments.

In the final analysis, 6 secondary schools in each district were selected for inclusion. These were selected on the basis of set criteria such as national and regional rank in form four examinations of the year 2011, school ownership to include traditional government, community, and non-government secondary schools. In each of the two districts, schools were arranged in their academic performance rank both at national and regional level to obtain the high performing schools and the low performing schools. This balancing was considered to be consistent with the objectives and the hypotheses of the study.

Table 3.1: The Sample Selected Schools

School	**National Rank**	**Regional Rank**	**Quality**		**Ownership**			**No. of F. IV**	**Selected**
			High	*Low*	*Gov.*	*Comm.*	*Non-Govt.*		
Msalato	24	1	✓		✓			118	**50**
Huruma	27	2	✓				✓	50	**50**
Chinangali	2870	93	✓			✓		138	**50**
Dodoma	547	10		✓	✓			250	**50**
Doreta				✓			✓	45	**30**
Mpwapwa	159	5	✓		✓			84	**50**
Kimaghai	99	22	✓			✓		64	**50**
Ving'hawe	2368	81		✓		✓		72	**50**
Mazae	2125	67		✓		✓		64	**50**
Mwanakianga	1996	61		✓		✓		101	**50**
Pwaga	2870	93		✓		✓		71	**50**
Madanya N.V				✓		✓	✓	69	**50**
		Total						**1,126**	**580**

Thus, the sampled schools from the group of high performing schools included one traditional government secondary school, one community secondary school, and one non-government secondary school in each district, making a total of six secondary schools from a group of high performing schools. The same procedure was followed to obtain schools from a group of low performing secondary schools. The sampled schools in all two districts were thus, twelve, including six high performing and six low performing secondary schools.

3.4.2 Sample Size Used

To select individual pupils to participate in the study, the school academic masters assisted in obtaining the form four streams during their free time. The form four streams which were available on the days of research were included in the sample. As indicated in Table 3.1, the total students included in the sample size were 580.

Selection of Teachers: In addition to students, 3 teachers from each sampled school were observed. The selection of teachers was purposefully done. Teachers teaching Geography, English, and History were selected since these were the subjects of interest to the researcher.

3.4.3 Response rate and actual sample size subjected to analysis

It was expected that a set of instruments employed would help to study the total number of 580 students. However, after data collection all instruments were checked to ensure that responses were meeting the researcher's expectations. This check-up process revealed that some instruments were incomplete to the extent that the required sets of data for analysis could not answer research questions. As such, all

incomplete instruments were excluded in the process of analysis. Therefore, the total actual number of sample size used in the final analysis was 444 participants. This was about 76.6 percent of the total number of questionnaires distributed to respondents. According to Cohen et al (2007), such a response rate was considered adequate for this study.

3.5 Instrumentation for the Study

To collect data for this study, various instruments were employed. These are described in details in the next paragraphs:

3.5.1 The Guilford's Alternate Uses Task (AUT, 1967)

Divergent thinking component was assessed using an adopted Guilford's Alternate Uses Task (Appendix 1). In the *Guilford's Alternative Uses Task* examinees are normally asked to list as many possible uses for common items such as a brick, a paperclip, a newspaper, a drum, a piece of paper, a piece of an empty land, a tree, and a knife. For example, an item in this test could read: Use 10 minutes to provide all the uses for a brick. In response to this item examinees would write answers like:

i. a doorstop

ii. a paperweight

iii. a mock coffin at a Barbie funeral

iv. to throw through a window

v. to use as a weapon

vi. to hit my sister on the head with

In this study, only five items which are a drum, a piece of paper, a piece of an empty

land, a tree, and a knife were adopted because of their familiarity by the target population. The test can be found in Appendix 1 of this report. In scoring divergent thinking, four components of the traits were identified. These are originality, fluency, flexibility, and elaboration. To score originality, each response was compared to the total amount of responses from all respondents. Responses given by five percent of the group were considered unusual and were awarded one point. Responses that were given by one percent of respondents were considered unique and were awarded two points. The unusual and unique responses were then totalized so that the higher the score the higher the creative thinking and the lower the score the lower the creative thinking in terms of originality.

Fluency was scored by just counting all the responses given by the individual respondent. In the example given above, fluency could be six. Flexibility was scored by categorizing the responses of the same nature. In the given example, flexibility is five since weapon and hit sister are all sharing the same general idea of weapon. Lastly, elaboration refers to the amount of details provided by examinees to make their response clear to the reader or listener. For example, in the case given, "a doorstop" is awarded Zero, "a door stop to prevent a door slamming shut in a strong wind" is awarded two – one for explanation of door slamming, and two for further detail about the wind.

3.5.2 Assessment of Convergent Thinking Test Using Insight Problems (ACTT)

Convergent thinking was measured using an Assessment of Convergent Thinking Test Using Insight Problems (ACTT). The test was adopted from the Insight

Problems tasks (Dow & Mayer, 2004). The instrument was developed by Dow and Mayer (2004) for the purpose of measuring convergent thinking. It is a three factor test comprising the tasks measuring mathematical insights, verbal insights, and spatial insights. In the test, there are about 65 tasks measuring mathematical insights, 40 tasks measuring verbal insights, and 16 tasks for spatial insights.

Examples of mathematical insight tasks are:

1. Smith Family: In the Smith family, there are 7 sisters and each sister has 1 brother. If you count Mr. Smith, how many males are there in the Smith family?

   Solution: *Two (the father and the brother)*

2. Water lilies: Water lilies double in area every 24 hours. At the beginning of summer there is one water lily on the lake. It takes 60 days for the lake to become completely covered with water lilies. On which day is the lake half covered?

   Solution: D*ay 59 then it doubles on the 60th*

Examples for verbal insight tasks are:

1. Hole: How can you cut a hole in a 3 x 5 card that is big enough for you to put your head through?

   Solution: *Cut a spiral out and unwind it*

2. Prisoner: A prisoner was attempting to escape from a tower. He found in his cell a rope, which was half long enough to permit him to reach the ground safely. He divided the rope in half and tied the two parts together

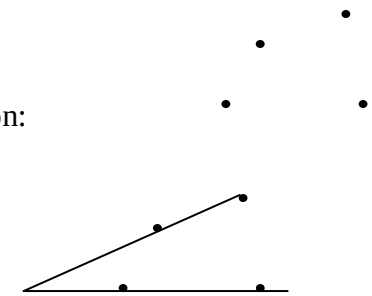
and escaped. How could he have done this?

Solution: *Unwind the rope and tie the ends together*

Examples for spatial insight tasks are:

1. 4 dots: Without lifting your pencil from the paper, show how you could join all 4 dots with 2 straight lines

Solution:



2. Trees: A landscaper is given instructions to plant four special trees so that each one is exactly the same distance from each of the others. How is he able to do it?

Solution: *Plant them on a hill: three at the base one on the top like the four corner points on a pyramid*

However, only five items from each factor category were adopted and tested to the respondents in this study, making a total of 15 items in total (Appendix 2). The test is normally scored by awarding one point for every correct response. Then the correct responses are totalized for each factor category, and then for the whole test so that the higher the score the higher the convergent creative thinking and the lower the score the lower the convergent creative thinking.

3.5.3 The Metacognitive Awareness of Reading Strategies Inventory

Metacognitive thinking was measured by the Metacognitive Awareness of Reading Strategies Inventory. The instrument was developed by Mokhtari and Reichard (2001) for the purpose of measuring metacognitive knowledge among young adults and adults. In developing the instrument, Mokhtari and Reichard (2002) reviewed research literature on metacognition and reading comprehension such as Alexander and Jetton (2000); Baker and Brown (1984); Garner (1987); Paris and Winograd (1990); Pressley (2000); Pressley and Afflerbach (1995), and used factor analyses to formulate a self-report instrument to measure metacognitive thinking. The scale comprises three strategy subscales or factors. The factors are global reading strategies, problem-solving strategies, and support reading strategies. Global reading strategies subscale included items measuring setting purpose for reading, activating prior knowledge, checking whether text content fits purpose, predicting what text is about, confirming predictions, previewing text for content, skimming to note text characteristics, making decisions in relation to what to read closely, using context clues, using text structure, and using other textual features to enhance reading comprehension.

Problem-solving strategies included items measuring reading slowly and carefully, adjusting reading rate, paying close attention to reading, and pausing to reflect on reading. Other items include rereading, visualizing information read, reading text out loud, and guessing meaning of unknown words. Support reading strategies included items measuring taking notes while reading, paraphrasing text information, revisiting previously read information, asking self questions, using reference materials as aids,

underlining text information, discussing reading with others, and writing summaries of reading. This study agreed with the instrument and considered it appropriate, and therefore adopted it in collecting information on metacognitive thinking.

To score the scale, the scores obtained for each strategy were added up in each column to obtain a total score, and then divided by the number of items to get an average response for the entire inventory as well as for each strategy subscale. These scores can then be interpreted using the interpretation guidelines provided. The guidelines require that the means should be interpreted as follows:

i. 3.5 or higher = high
ii. 2.5–3.4 = medium
iii. 2.4 or lower = low.

Sample items for Global reading subscale are: *'I have a purpose in mind when I read', I preview the text to see what it's about before reading it', and 'I think about what I know to help me understand what I'm reading'*.

Sample items for problem – solving strategies are: *'I try to get back on track when I lose concentration', 'I adjust my reading speed according to what I'm reading', and 'When text becomes difficult, I begin to pay closer attention to what I'm reading'.* Lastly, sample items for support reading strategies are*: 'I take notes while reading to help me understand what I'm reading', 'When text becomes difficult, I read aloud to help me understand what I'm reading', and 'I write summaries to reflect on key ideas in the text'.*

The instrument can be found in Appendix 3 of this report.

3.5.4 The Teacher Observation Protocol (TOP)

Teacher's ability to develop creative and metacognitive thinking was tapped using a Teacher Observation Protocol that can be found in Appendix 5. The protocol was adopted from a classroom observation protocol developed by Wainwright, Flick, and Morrell (2003) designed to improve the preparation of science and mathematics teachers in elementary, middle, and high schools, and to attract a more diverse group of students to the teaching profession. Their protocol was named 'The OCEP–Teacher Observation Protocol (O–TOP). That protocol consisted of ten factors to be observed in the classroom session. The factors are habits of mind with 7 items, metacognition with 6 items, students' discourse and collaboration with 5 items, rigorous challenging of ideas with 6 items, students preconceptions and misconception with 5 items, conceptual thinking with 5 items, divergent thinking with 5 items, interdisciplinary connections with 4 items, pedagogical content knowledge with 6 items, and multiple representations of concepts with 2 items. All the items in the protocol are about 71.

The Teacher Observation Protocol, which was used in this study, was adopted to incorporate only items relevant on measuring the variables of interest which were divergent, convergent, and metacognitive thinking. The protocol consisted of three factors to be observed including fostering of divergent thinking with 13 items, fostering convergent thinking with 7 items, and fostering metacognitive thinking with 8 items. Examples of items checking if the teacher fostered divergent thinking were *'Teacher encouraged input and challenged pupils' ideas'* and *'Teacher was*

non-judgmental of pupil opinions'.

Examples of items checking if the teacher fostered convergent thinking were, *'Teacher encouraged pupils to extend concepts and skills'* and *'Teacher related integral ideas to broader concepts'*. Examples of items checking if the teacher fostered convergent thinking were, *'Teacher encouraged pupils to explain their understanding of concepts'* and *'Teacher encouraged pupils to explain in own words both what and how they learned'* the complete instrument can be found in Appendix 5 of this report.

The protocol required the researcher to observe whether the teacher fostered creative and metacognitive thinking abilities or not, and the timing of the fostering episodes of the abilities in the classroom in a given lesson. This requirement faced two difficulties to achieve. First, it would be difficult to timely and accurately capture every action that would be interpreted as really fostering creative and metacognitive thinking to students.

Secondly, it was necessary to ensure that researcher bias in judging presence or absence of the ability is kept to the minimum. To overcome these difficulties, a video camera was used to record the classroom interaction sessions. The video tapes were then given to two juries to observe and check the presence and or absence of the specific items measuring teachers' ability to foster creative and metacognitive thinking.

The juries were university lecturers in the field of education, who were also the experts in the selected subjects' combinations. Before starting assessing the video clips, a discussion with the juries was made to make them familiar with how to identify the fostering criteria as identified in the protocol. The judgments by the juries were compared to the researcher's observations, discussed, and then averaged to obtain teachers' scores. Three teachers from each school were observed, making a total of 36 teachers for all 12 sampled schools. The teachers were purposefully selected basing on the subjects they taught. The subjects selected were Geography, English, and History. The subjects were selected because they were the ones that the researcher was familiar with.

3.5.5 Academic Performance Scores

Academic performance was measured by using Form Two national examination results done in 2011. These were obtained from students' academic records. Form Two national examination record were considered acceptable as the examinations are done nationwide directly to test the students' level of academic performance, and questions are professionally prepared by the National Examination Council of Tanzania.

Form Two national examination in Tanzania involves all academic subjects such as civics, history, geography, Kiswahili, English, physics chemistry, biology, and mathematics. However, some schools sit for unique subjects which are not done by other schools. For example, subjects like Agriculture, Islamic Knowledge, Bible Knowledge, Nutrition, and Fine Arts are unique to some schools. To relate creative

and metacognitive thinking to academic performance, it was necessary to decide to either use Grade Point Average (GPA) or to select representative academic subjects.

It was decided to select few academic subjects that are compulsory and done by all Form Two students in the secondary schools visited for that purpose. The selected subjects were civics, history, geography; Kiswahili, English, physics, chemistry, biology, and mathematics were used for the purpose of this study. The students' scores for all the selected subjects were then totalized to get a total academic performance, which was used as a dependent variable. Figure 3.4 summarizes the tasks, key variables measured, and the instrument used to collect data as well as the analytical tool to achieve the specific objectives of the study.

Table 3.2: The Main Tasks, Key Variables Measured, Instrument for Data Collection, and the Annex Reference of the Instrument

Main task	Key variable measured		Instrument for data collection		Annex reference of the Instrument
	Determinant variable	Outcome variable	Determinant variable	Outcome variable	
Investigating the relationship between learners' divergent thinking and academic performance	***Divergent thinking***	***Academic performance***	***The AUT***	***School records***	***Appendix 1***
Examining the relationship between learners' convergent thinking and academic performance	***Convergent thinking***	***Academic performance***	***The ACTT***	***"***	Appendix 2
Investigating the relationship between learners' metacognitive thinking and academic performance	***Metacognitive thinking***	***Academic performance***	***The MARSI***	***"***	Appendix 4
Finding out the relationship between school ranking and measures of divergent, convergent, and metacognitive thinking	***Divergent thinking Convergent thinking Metacognitive thinking***	***School ranking (ranking in national examinations)***		***"***	
Investigating the difference in teacher's ability to foster creative and metacognitive thinking in classrooms by school ranking	***Teachers' ability to foster: Divergent thinking Convergent thinking*** Metacognitive thinking	***School ranking***	***The Teacher Observation Protocol***	***"***	Appendix 5

3.6 Validity and Reliability of the Instruments

3.6.1 Pilot Study for Testing and Modification of the Instruments

The instruments were originally written in English (Appendix 1). It was necessary to translate them into Kiswahili (Appendix 4), because the respondents were more likely to express themselves better in Kiswahili than in English. This process required the maintenance of construct validity of the instruments while addressing cross-cultural issues in sharing the meanings of the concepts. For example, during translation of the instruments, in the Guilford's Alternative Uses Tasks, the term drum meant both *ngoma* and *pipa* to Kiswahili speakers. The term drum for *ngoma* refers to a musical instrument made up of a skin stretched tightly over a round frame while the term drum for *pipa* refers to a large cylindrical container used to store liquid substances. To avoid confusion the term *pipa* was chosen because it is familiar as it is used by most people in Tanzania for storage of liquid materials, especially water.

In the second question of the *Assessment of Convergent Thinking Test*, the term 'lilies', is not common in Kiswahili culture. The term 'magugumaji', which is a common plant in Tanzania, normally grows and covers large part of lakes and rivers, was selected. Though the term was not a direct translation, it maintained the original meaning since the emphasis reflected in the construct was on a plant coverage and not the type of plant or specific species. In the same test, in question number 5 under mathematical insight tasks, direct translation for the term 'horse' was supposed to be '*farasi*' in Kiswahili. However, because the animal is not common and was not known by most people in Dodoma, the term was replaced by the term *'ng'ombe'*,

which means ‘cow’ in English. The animal was selected because cows are common and familiar animals reared among people of Tanzania in general and Dodoma in particular. The use of ‘US$’ in the same question was also replaced by the use of ‘Tshs’.

In question two in verbal insight tasks section of the same test, the use of ‘inches’ units was replaced by the use of centimeters and hence conversion of the measurements was made. This was done because students in secondary schools in Tanzania are learning measurements in metric system instead of empirical system, which was originally used in the instrument. The term ‘triplicates’ which is the answer for question three of the same section, is almost missing in Kiswahili, since most people use the phrase *‘mapacha watatu’* for the term triplicate. Thus, during scoring of the instrument it was necessary to accept the phrase *‘mapacha watatu’* literally means ‘three twins’ response instead of the ought to be answer which is *‘triplicate’* as instructed in the original professional guide. In all these translations, the avoidance of direct or literal translation did not change the central focus of the items since the measured skills were maintained.

Statistical validity checks among independent variables for the Kiswahili version of the instruments; namely divergent, convergent, and metacognitive thinking tasks were further performed. The calculations yielded tolerance and variance inflation factor values as indicated in Table 3.3. The Table indicates that, in all instruments measuring the key independent variables of the study, the tolerance values were about .92 and the variance inflation factor values were higher than .10.

These tolerance values were interpreted to mean the instruments were independent from each other and measured the intended constructs for more than 92 percent. On the other hand, the Variance Inflation Factor values obtained in this study indicated that the instruments used to measure the key independent variables of the study had no multicollinearity effect, implying that every instrument was valid and measured the intended traits (Pallant, 2011).

Table 3.3: The Validity Indices for the Key Tasks

	Beta	Sig. value	Tolerance	VIF
Total Metacognitive Thinking	.052	.186	.979	1.022
Total Divergent Thinking	.274	.000	.938	1.066
Total Convergent Thinking	.375	.000	.917	1.091

The Reliability of the instruments was checked by calculating the Cronbach's alpha coefficients, which is an index showing internal consistency of the instruments. The items in the Divergent Thinking test reached an internal consistency of Cronbach alpha coefficient of $\alpha = .91$. The Cronbach alpha coefficients for Convergent thinking test items were: $\alpha = .92$, for mathematical insight tasks, $\alpha = .93$ for verbal insight tasks, and $\alpha = .90$ for spatial insight tasks.

With regard to Metacognitive Awareness of Reading Strategies Inventory, the results were consistent with Mokhtari and Reichard (2001) who reported indices of the subscales ranging from Cronbach alpha coefficient of $\alpha = .89$ to $\alpha = .93$. In this study the subscales reached internal consistencies of Cronbach alpha coefficients of $\alpha = .66$, for support reading strategies; $\alpha = .72$ for problem – solving reading strategies; and $\alpha = .75$ for global reading strategies subscales. For the whole metacognitive

thinking task, the internal consistency was Cronbach alpha coefficient of $\alpha = .88$.

Lastly, the Teacher Observation Protocol reached an internal consistency of Cronbach alpha coefficient of $\alpha = .97$. Although internal consistency for support reading strategies subscale was Cronbach alpha coefficients of $\alpha = .66$ which is below the threshold of 0.70, the total scale for metacognition reached the Cronbach alpha coefficients of $\alpha = .88$. These were considered very acceptable reliability indices of the instruments used for this study.

In addition, reliability of the teacher observation protocol instrument was confirmed by checking for inter-coder consistency. Two juries were given the video films together with the criteria for observation. The juries were the learned individuals in the field of education. The researcher and the observers discussed the items in the protocol for agreement on what is and what is not meant by fostering the divergent, convergent, and metacognitive thinking by the teacher. After observation of one classroom session, the points scored by each jury were discussed for an agreement. The difference in the scores was small, such that it was fare to calculate the mean as an agreement for the scores as shown in Table 3.4.

To ensure the reliability of the agreement among the juries and the researcher, the Cohen's Kappa Measure of Agreement was calculated and it reached the value of .70, with a significance of $p < .01$. According to Peat (2001, p. 228), a value of .5 for Kappa represents moderate agreement, .7 and above represents good agreement, and above .8 represents very good agreement. Therefore, the inter-coder agreement

among the juries on fostering creative thinking and metacognitive thinking in this study was considered a good agreement.

Table 3.4: The Judgments on Fostering Thinking Skills using the Teachers Observation Protocol

Timing of Fostering	Juries' Coding	The Coded Thinking Skills Fostered			
		Divergent thinking	Convergent Thinking	Metacognitive thinking	Total Scale
First 10 minutes	Researcher	10	3	2	15
	Jury 1	12	4	2	18
	Jury 2	11	5	2	18
	Average	**11**	**4**	**2**	**16**
11-20 minutes	Researcher	10	5	5	20
	Jury 1	9	4	6	19
	Jury 2	11	3	4	18
	Average	**10**	**4**	**5**	**19**
21-30 minutes	Researcher	24	8	9	41
	Jury 1	23	8	7	38
	Jury 2	25	8	8	41
	Average	**24**	**8**	**8**	**40**
31-40 minutes	Researcher	21	9	12	42
	Jury 1	22	11	12	45
	Jury 2	23	10	12	45
	Average	**22**	**10**	**12**	**44**
Total fostering	Researcher	65	25	28	118
	Jury 1	66	27	27	120
	Jury 2	70	26	26	122
	Average	67	26	27	**119**

3.7 Limitations of the Study

Divergent thinking tests have been the widest way to studying creative thinking among researchers (Kuhn & Holling, 2009). From the experience of this study it was

however, observed that the divergent thinking of the subjects might be limited by the instructions given to them during administration of the divergent thinking tasks. For example, in the present study the subjects were given the following instructions:

'Briefly think of and provide all different ways you could make use for the following items:

For example,
A stone is used to:
Uses: - *build houses*
- *make fire*
- *hit cows*
- *sit on, etc.'*

From the experience of administering the instrument, to some subjects, it was confusing as to whether they could be allowed to elaborate or not. Some subjects followed exactly what was written in the instruction, and some of them elaborated. When total divergent thinking was correlated with total academic performance correlation was $r = 0.36$. When elaboration was excluded from the total divergent thinking the correlation between the two variables was $r = 0.35$. Though the observed difference was negligible, it is thought here that if instructions of the instrument were improved to clearly state that the responses be elaborated, scores in elaboration would be higher than in the present research, and could have improved the scores of the subjects in the total divergent thinking tasks.

The use of the Metacognitive Awareness of Reading Strategies Inventory (MARSI) to measure Metacognitive thinking to some extent clings the cues of the weaknesses of self-reported data. This is because very low positive correlations were significant [$r = 0.13^{**}$, $n = 444$, $p < .01$ between Global Reading Strategies and Academic

Performance; r = 0.20**, n = 444, p = .01 between Problem – solving Reading Strategies and Academic Performance; r = 0.03**, n = 444, p < .01 between Support Reading Strategies and Academic Performance; and r = 0.14**, n = 444, p < .01between total Metacognitive Thinking and Academic Performance].

While this might be attributed to large sample size, two explanations for this phenomenon exist:

i) Students with low performance ability could not be able to retrospectively report their thinking process perfectly.

ii) Students might not be honest in reporting what exactly happens in their mental processes.

It is thought that self-reporting items might be not very much suitable for measuring cognitive variables as it might be with the use of tests.

The possible second limitation of the questionnaire was revealed in the response rate of about 76.6 percent. However, close administration of the instruments such as the researcher being there physically to clarify for the misunderstood sections of the instruments might have improved the response rate.

3.8 Delimitations of the Study

Confinement of the present study to form four students might in Dodoma could not interfere with the results as the nature of form four schools and students selected were both prototype and representative of form four student s in the country. This provides for the possibility of generalizing the findings in the rest of the country and in other countries with similar context to that of Tanzania.

3.9 Ethical Considerations

Ethical issues were addressed. In the first place, permission to carry out research was sought from the relevant authorities (Appendix 8) such as from the Directorate of Research and Publication and Postgraduate Studies of the Open University of Tanzania. The permit letter from the University was taken to the Dodoma Regional Administrative Secretary. The permission obtained from RAS was then taken to the Dodoma Municipality and Mpwapwa Districts' Administrative Secretaries who authorized a research permit to the schools where the researcher worked together with the heads of schools. The research permit letters from the relevant authorities may be found in Appendix 4 of this report. Second, respondents were asked to give their informed consent to respond to the research instruments and to access their examination results. Third, the information provided by respondents was treated with a maximum confidentiality and was only used for the purpose of this study. Thus, identities of the respondents are not part of this report. The testing was also done at the convenience of the schools and students.

CHAPTER FOUR

4.0 DATA ANALYSIS AND PRESENTATION

This study focused on investigating the relationship between creative thinking, metacognitive thinking and academic performance among secondary school students. Specifically, determinant variables under creative thinking were divergent and convergent thinking. Divergent thinking was measured in all its four components, namely fluency, flexibility, elaboration and originality. With regard to convergent thinking, three components namely; mathematical insights tasks, verbal insights tasks, and spatial insights tasks were administered to the subjects.

Likewise, in measuring metacognitive thinking, the MARSI scale with three subscales representing three components of the trait, namely global reading strategies, problem – solving reading strategies, and support reading strategies were studied. This chapter presents the data on these instruments. The chapter is organized into two sections. The first section presents descriptive statistical data for the determinant variables, while section two of the chapter presents parametric statistical data used to test hypotheses of the study.

4.1 Characteristics of the Respondents in the Study

Discussing how to design studies, Pallant (2011) recommends that in studies involving human participants, it is useful to collect and report information on the number of people in the sample, the number and percentage of males and females in the sample, the range and mean of ages, education level, and any other relevant background information. Though a lot of variables need to be studied, in this thesis

some had to be prioritized and others left to future studies given space and time. It was thus, thought that such important variables as age, sex, location of the school, and education level of the family members be included in the conceptual model of this thesis as the intervening variables. Participants in this study were heterogeneous in nature. About 48.9 percent (217) were males and 51.1 percent (227) were females. Their age varied between a low of 16 years and a high of 23 years with a mean age being 17.76 and a standard deviation of 1.19. Participants came from both urban and rural schools the proportions of which are indicated together with other variables in Table 4.1.

Table 4.1: Characteristics of the Respondents in the Study

Variables	**Levels**	**Proportion**	
		F	**%**
Sex	Males	217	48.9
	Females	227	51.1
School Ownership	Government	165	37.2
	Private	76	17.1
	Community	203	45.7
School ranking	High performing school	218	49.1
	Low performing school	226	50.9
Location of the School	Urban	186	41.9
	Rural	258	58.1
The Highest Education level of the Respondent's Father or Guardian	No formal education	32	7.2
	Standard seven	195	43.9
	Form four	90	20.3
	Form six	25	5.6
	Diploma	45	10.1
	At least First Degree	57	12.8
The Highest Education level of the Student's Mother	No formal education	32	7.2
	Standard seven	241	54.3
	Form four	94	21.2
	Form six	20	4.5
	Diploma	31	7.0
	At least First degree	25	5.6
The Highest Education level of the Student's first Sibling	No formal education	66	14.9
	Standard seven	63	14.2
	Form four	133	30.0
	Form six	71	16.0
	Diploma	48	10.8
	First degree or higher	63	14.2

4.2 Data Analysis Procedures

After data collection, the coding instructions were prepared in a code book that can be found in the Appendix 6 of this report. Then the questionnaires were checked for their clarity, and those well filled were given identification numbers before data screening. A few incomplete tests were excluded from the analysis. The net effect of this was that test scripts actually subjected to the analysis were 444, which is about 76.6 percent of the total administered test scripts. This response rate was considered acceptable and not chancy since the distribution of incomplete instruments was not systematic but rather random.

The responses from the open ended questions such as the mentioned uses of items in response to the divergent thinking test were quantified using scoring guide instructions given by Guilford (1967). To quantify originality, responses given by five percent of the group only were labeled unusual, thus were awarded one point. Responses given by two or less percent of the respondents were labeled ‘unique’ thus, were awarded two points. To quantify fluency and flexibility, one point was awarded to each relevant response and to each category of responses respectively.

Lastly, to quantify elaboration, two points were awarded to each detail given in the response. This way, data from each level of divergent thinking were obtained. Second, quantification of convergent thinking followed the scoring guide provided by Dow and Mayer (2004) so that each correct response was awarded one point and each incorrect response was awarded Zero point. All correct responses were then totalized to obtain one’s score for mathematical insight tasks, verbal insight tasks,

and spatial insight tasks. To obtain one's scores for the total convergent thinking scale, scores from each subscale were totalized for each respondent.

Responses from the Metacognitive Awareness of Reading Strategies Inventory followed the scoring guide provided by Mokhtari and Reichard (2001). The scores reported by respondents were directly totalized in subscales such as global reading strategies, problem solving strategies, and support reading strategies. To obtain each respondent's score for the scale, scores for each subscale were totalized to obtain data for metacognitive thinking. Data from the Teacher Observation Protocol scored by two juries were discussed to reach a consensus. Then the scores were averaged to get a mean score of each teacher observed for each subscale in the Protocol. The scores for each subscale were then totalized to obtain total score in teacher's ability to develop creative and metacognitive thinking.

The items in the instruments were coded and entered in the Statistical Package for Social Sciences (SPSS) program version 21, alongside the pupil's scores from academic subjects. The analysis involved the computation and categorization of data to obtain frequency distribution, percentages, mean, and standard deviations. The Pearson Product Moment Correlation Coefficient was computed so as to analyze the relationship between creative thinking variables such as divergent thinking, convergent thinking, metacognitive thinking and academic performance. For school ranking, which is a categorical variable, the independent t-test was performed. Lastly, in the conceptual framework for the present study it was assumed that the mediating variables such as age, sex, location of the school, mother's education,

father's education, and siblings' education levels would have mediating effect on the determinant and the outcome variables. To check the mediation effect of these variables in the equation, it was necessary to perform a logistic regression analysis to see the contribution of each determinant variable and mediating variables when other variables were put under control.

4.3 Performance in the Key Research Tasks

In the following sub-sections, results showing performance in the key research tasks are presented before presenting another subsection which deals with testing the hypotheses of the study.

4.3.1 Performance in Divergent Thinking Tasks

Data in Table 4.2 indicates that in all of the divergent thinking components, respondents from high performing schools scored relatively higher than respondents from low performing schools. Within the two groups, standard deviation indicates large dispersion from the mean for fluency and flexibility while for elaboration and originality the standard deviations seem to be clustering around the means for both high and low performing groups; suggesting a small deviation of responses for most respondents.

Table 4.2: The Means and Standard Deviations of Divergent Thinking by School Ranking

School Ranking	Divergent Thinking Variables (DT)											
	Fluency		Flexibility		Elaboration		Originality		Total Div.Thinking			
High Performing Schools (N = 218)	M	SD	M	SD	M	SD	M	SD	Min.	Max.	M	SD
	27.67	12.58	17.58	5.53	5.99	6.00	3.02	3.85	.00	134.00	54.32	23.92
Low Performing Schools (N =226)	M	SD	M	SD	M	SD	M	SD	Min.	Max.	M	SD
	20.46	9.41	13.36	4.11	3.77	4.53	1.44	2.11	14.00	121.00	39.01	16.63

4.3.2 Performance on Convergent Thinking Tasks

Results in Table 4.3 indicate that respondents from high performing schools scored relatively higher than respondents from low performing schools in all components of convergent thinking. Despite the difference being clear for the two groups, the closeness of the standard deviations to the mean within each group implies that respondents did not differ much in their responses within the same group in the convergent thinking tasks. This was so for both high and low performing schools.

Table 4.3: The Means and Standard Deviations in Convergent Thinking Tasks by School Ranking

School Ranking	Convergent Thinking Tasks (CT)									
	Mathematics tasks		Verbal tasks		Spatial tasks		Total Conv.Thinking			
High performing schools (N = 218)	M	SD	M	SD	M	SD	Min.	Max.	M	SD
	1.64	.90	1.28	1.11	1.75	.92	.00	12.00	4.67	2.09
Low performing schools (N = 226)	M	SD	M	SD	M	SD	Min.	Max.	M	SD
	1.24	.87	.99	.95	1.45	.92	.00	9.00	3.68	1.93

4.3.3 Performance on Metacognitive Thinking Tasks

Metacognitive thinking was measured by the Metacognitive Awareness of Reading Strategies Inventory (MARSI). Three subscales of the MARSI, that is Global, Problem – Solving, and Support Strategies were analyzed using the professional guidelines in Mokthari and Reichard (2001). The analysis involved totalizing the scores for each of the subscale, and the calculation of the mean for the same. Then a total score and the mean for the MARSI were calculated. Normally the means are interpreted as follows:

i. 3.5 or higher = high

ii. 2.5–3.4 = medium

iii. 2.4 or lower = low.

Table 4.4 gives a summary of the analysis. It indicates that most respondents about 76.4 percent (339) reported high use of problem – solving reading strategies subscale than in the rest of metacognitive thinking subscales while the least high use of the global reading strategies was reported. On the other hand, in the total score, only 3.2 percent (14) of respondents reported low use of metacognitive thinking, 34.2 percent (152) reported medium use and 62.6 percent (278) reported high use of metacognitive thinking.

Table 4.4: Performance Distribution in Metacognitive Thinking

Metacognitive Variables	Levels	Proportion	
		Frequency	Percent
Global	Low	29	6.5
	Medium	194	43.7
	High	221	49.8
Problem-solving	Low	18	4.1
	Medium	87	19.6
	High	339	76.4
Support	Low	22	5.0
	Medium	164	36.9
	High	258	58.1
Total MARSI	Low	14	3.2
	Medium	152	34.2
	High	278	62.6

Table 4.5: The Mean and Standard Deviations in Metacognitive Thinking by School Ranking

School Ranking	**Metacognitive Thinking Variables (MT)**									
	Global		*Problem-solving*		*Support*		*Total MT*			
High performing schools (N = 218)	*M*	*SD*	*M*	*SD*	*M*	*SD*	*Min.*	*Max.*	*M*	*SD*
	44.10	7.79	30.89	4.92	31.20	5.49	38.00	144.00	106.19	15.87
Low performing schools (N = 226)	*M*	*SD*	*M*	*SD*	*M*	*SD*	*Min.*	*Max.*	*M*	*SD*
	44.22	9.17	30.46	6.07	32.21	6.15	46.00	150.00	106.88	19.19

Relatively, as indicated in Table 4.5, respondents did not differ in the mean scores of the metacognitive thinking subscales. The mean scores for the two groups seem relatively negligible. Similarly, for both high and low performing schools, standard deviations seem to be very far from the means suggesting that responses varied much and were spread among the available options.

4.3.4 Teachers' Ability to Foster Creative and Metacognitive Thinking

To capture teachers' ability to foster creative and metacognitive thinking in the classroom, the selected teachers were observed during classroom teaching. Teachers' observation protocol was used to check the specific skills fostered by the teacher against the timing of fostering episodes. A 40 minutes class session was divided into four parts, to check whether the teacher fostered the skills early or late in the session. The divisions were the first 10 minutes; between 11 and 20 minutes; between 21 and 30 minutes; and between 31 and 40 minutes of the class time. The results are summarized in Table 4.6.

Table 4.6: Teachers' Ability to Foster Divergent, Convergent, and Metacognitive Thinking

School Ranking		**Timing of Fostering Episodes**									
	Thinking Skills Fostered	**First 10 min.**		**11 – 20 min.**		**21 – 30 min.**		**31 – 40 min.**		**Overall Skill Fostering**	
		M	SD	M	SD	M	SD	M	SD	M	SD
High Performing Schools (N=18)	Divergent Thinking	10.3	7.4	8.0	2.7	22.4	11.9	18.5	13.7	59.2	26.8
	Convergent Thinking	4.7	2.0	4.7	2.0	7.2	3.9	10.4	7.7	27.1	11.8
	Metacognitive Thinking	2.9	1.9	4.2	1.4	9.7	6.5	13.7	10.3	30.6	18.4
Low Performing Schools (N=18)											
	Divergent Thinking	8.6	6.9	5.1	3.7	3.7	4.9	3.7	4.2	21.1	15.6
	Convergent Thinking	3.2	1.6	3.2	1.6	2.4	2.2	2.7	2. 7	11.3	6.5
	Metacognitive Thinking	2.5	1.9	2.9	2.9	1.4	1.5	2. 8	2.6	9.6	6.7

Unexpectedly, the table reveals that divergent thinking skills were highly fostered

than other skills, followed by convergent thinking skills and metacognitive thinking was the least fostered skill in both high and low performing schools. However, the extent of fostering was higher in the high performing schools than in the low performing schools. It is also obvious from the table that while the magnitude of fostering creative and metacognitive skills increased with time for the high performing schools the same decreased with time for the low performing schools. This means that teachers in high performing schools relatively highly fostered the skills from the first 10 minutes of the classroom sessions but as the time increased they also increased the fostering of the skills. On the other hand teachers in the low performing schools started by relatively lowly fostering the skills but decreased the fostering of the same as the time went on.

4.4 Testing the Hypotheses Using Inferential Statistics

This section presents the data as analyzed in response to the hypotheses of the study. It was hypothesized that there would be a significant relationship between learners' divergent thinking and their academic performance; learners' convergent thinking and their academic performance; learners' metacognitive thinking and their academic performance; school ranking and measures of divergent, convergent, and metacognitive thinking; and the relationship between teacher's ability to develop creative and metacognitive thinking in the classroom and school ranking. In this section subtitles are organized to represents these hypotheses. Tables are not presented separately for each hypothesis, but on the contrary, one table containing data for more than one hypothesis is a common practice in this work. The respective tables are Tables 4.7 and 4.8.

4.4.1 The Relationship between Divergent Thinking and Academic Performance

In the first hypothesis, it was hypothesized that there would be a significant relationship between learners' divergent thinking and their academic performance. As hypothesized, results from Pearson Moment Correlation Coefficient analysis in Table 4.7 indicate there were low to moderate but positive and significant correlations. The correlations were: $r = 0.41^{**}$, $n = 444$, $p < .01$between fluency and academic performance; $r = 0.26^{**}$, $n = 444$, $p = .01$ between flexibility and academic performance; $r = 0.35^{**}$, $n = 444$, $p < .01$ between elaboration and academic performance; $r = 0.35^{**}$ $n = 444$, $p < .01$ between originality and academic performance; and $r = 0.36^{**}$, $n = 444$, $p < .01$ total divergent thinking and academic performance. These correlations mean that the higher one scored in divergent thinking tasks, the higher was one's academic performance. Similarly, the lower one scored in divergent thinking tasks the lower was one's academic performance.

4.4.2 The Relationship between Convergent Thinking and Academic Performance

The second hypothesis presumed that there would be a significant relationship between learners' convergent thinking and academic performance. Results in Table 4.7 indicate there were low to moderate positive and significant correlations. The correlations were: $r = 0.39^{**}$, $n = 444$, $p < .01$ between Mathematical Insight Tasks and Academic Performance; $r = 0.36^{**}$, $n = 444$, $p = .01$ between Verbal Insight Tasks and Academic Performance; $r = 0.29^{**}$, $n = 444$, $p < .01$ between Spatial Insight Tasks and Academic Performance; and $r = 0.48^{**}$, $n = 444$, $p < .01$ between

total convergent thinking and academic performance. These correlations mean that the higher one scored in convergent thinking tasks the higher was one's academic performance. On the other hand, the lower one's score in divergent thinking tasks the lower was one's academic performance.

4.4.3 The Relationship between Metacognitive Thinking and Academic Performance

The third hypothesis stated that there would be a significant relationship between learners' metacognitive thinking and academic performance. As indicated in Table 4.7, there were significant but very low positive correlations. The correlations were: r = 0.13**, n = 444, p < .01 between Global Reading Strategies and Academic Performance; r = 0.20**, n = 444, p = .01 between Problem – solving Reading Strategies and Academic Performance; r = 0.03**, n = 444, p < .01 between Support Reading Strategies and Academic Performance; and r = 0.14**, n = 444, p < .01between total Metacognitive Thinking and Academic Performance.

These correlations interpret that the higher one reported awareness of metacognitive thinking the higher was one's academic performance. On the other hand, the lower one's score in metacognitive thinking tasks the lower was one's academic performance. However, such very low correlations imply very low relationship among these variables. Large samples in this study might explain significance in such low correlations.

4.5 School Ranking, Divergent, Convergent, and Metacognitive Thinking

In the fourth hypothesis, it was hypothesized that there would be a significant relationship between school ranking in academic performance rank and measures of divergent, convergent, and metacognitive thinking. To test this hypothesis an independent-samples t-test was conducted to compare schools in high quality ranking and those with low quality ranking in both National and regional ranks in scores of divergent, convergent, and metacognitive thinking measures. Table 4.9 presents the findings.

Table 4.7: Inter-Correlations between Divergent, Convergent, and Metacognitive Thinking

Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	*Sex*	1															
2	*Age*	-.33**	1														
3	*Mathematical tasks*	.04	-.02	1													
4	*Verbal tasks*	.15**	-.13**	.30**	1												
5	*Spatial tasks*	-.09*	-.13**	.23**	.29**	1											
6	*Fluency*	.02	.04	.19**	.13**	.07	1										
7	*Flexibility*	-.05	-.02	.22**	.17**	.13**	.82**	1									
8	*Elaboration*	.05	.02	.20**	.14**	.09	.52**	.46**	1								
9	*Originality*	.08	-.07	.20**	.14**	.12*	.58**	.61**	.53**	1							
10	*Divergent Thinking*	.02	.01	.23**	.17**	.11*	.94**	.88**	.71**	.74**	1						
11	*Convergent Thinking*	.05	-.13**	.69**	.77**	.70**	.18**	.24**	.20**	.21**	.24**	1					
12	*Global*	-.05	-.06	.09	.10*	.06	.09*	.11*	.13**	.11*	.12**	.11*	1				
13	*Problem-solving*	-.02	-.11*	.09	.12*	.07	.01	.04	.10*	.02	.04	.13**	.68**	1			
14	*Support Strategies*	.11*	-.04	.03	.05	.03	.03	.02	.08	.01	.04	.05	.68**	.63**	1		
15	*Metacognitive Thinking*	.01	-.07	.081	.10*	.06	.06	.07	.12*	.06	.09	.12*	.92**	.85**	.86**	1	
16	*Academic Performance*	.11*	-.26**	.39**	.36**	.29**	.28**	.41**	.26**	.35**	.36**	.48**	.13**	.20**	.03	.14**	1

Table 4.8: Inter-Correlations between the Research Tasks and School Subjects

Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	*Fluency*	1																		
2	*Flexibility*	.82**	1																	
3	*Elaboration*	.52**	.46**	1																
4	*Originality*	.58**	.61**	.53**	1															
5	*Global Strategies*	.10*	.11*	.13**	.11*	1														
6	*Problem-solving Strategies*	.01	.04	.11*	.03	.68**	1													
7	*Support Strategies*	.025	.02	.08	.01	.68**	.63**	1												
8	*Mathematical tasks*	.19**	.22**	.20**	.20**	.09	.09	.03	1											
9	*Verbal task*	.14**	.17**	.14**	.14**	.10*	.12*	.05	.30**	1										
10	*Spatial tasks*	.07	.13**	.09	.11*	.06	.08	.03	.23**	.29**	1									
11	*Civics*	.24**	.33**	.23**	.30**	.13**	.21**	.05	.34**	.35**	.26**	1								
12	*History*	.23**	.34**	.20**	.26**	.10*	.16**	-.01	.32**	.28**	.26**	.78**	1							
13	*Geography*	.28**	.39**	.26**	.32**	.14**	.21**	.05	.34**	.33**	.27**	.86**	.81**	1						
14	*Kiswahili*	.26**	.38**	.19**	.30**	.10*	.14**	.04	.33**	.27**	.24**	.72**	.73**	.75**	1					
15	*English*	.19**	.31**	.22**	.30**	.11*	.18**	.05	.35**	.35**	.29**	.81**	.76**	.80**	.74**	1				
16	*Physics*	.28**	.39**	.23**	.31**	.12*	.20**	.01	.35**	.31**	.26**	.84**	.77**	.87**	.73**	.75**	1			
17	*Chemistry*	.27**	.38**	.27**	.33**	.11*	.17**	.01	.38**	.34**	.26**	.86**	.81**	.88**	.78**	.80**	.91**	1		
18	*Biology*	.31**	.41**	.29**	.37**	.15**	.17**	.04	.38**	.33**	.29**	.85**	.81**	.89**	.75**	.78**	.88**	.90**	1	
19	*Mathematics*	.26**	.36**	.25**	.35**	.12**	.15**	.02	.36**	.34**	.22**	.77**	.72**	.80**	.71**	.72**	.84**	.84**	.83**	1

4.5.1 School Ranking and Divergent Thinking

As predicted, Table 4.9 indicates that there was a statistically significant difference for respondents from high performing schools (*M*= 54.32, *SD* = 23.92), and respondents from low performing schools (*M*= 39.01, *SD* = 16.63); *t* (442) = 7.78, *p* = .000 (two tailed) in total divergent thinking scores. This implies that respondents from high academic performing school scored higher in divergent thinking measures than their counterparts from low performing schools.

4.5.2 School Ranking and Convergent Thinking

Similarly, there was a statistically significant difference for respondents from high performing schools (*M*= 4.67, *SD* = 2.09), and respondents from low performing schools (*M* = 3.68, *SD* = 1.93); *t* (442) = 5.20, *p* = .000 (two tailed) in total convergent thinking scores. This was interpreted that respondents from high performing schools scored higher in convergent thinking than their counterpart students from low performing schools.

With regard to the difference between school ranking and metacognitive thinking, results from Tables 14 shows that there was no significant difference for respondents from high performing schools (*M* = 106.19, *SD* = 15.87), and respondents from low performing schools (*M* = 106.88, *SD* = 19.19); *t* (442) = -.42, *p* = .68 (two tailed) in reporting metacognitive thinking. This means that respondents reported metacognitive thinking in a similar way regardless of whether they were from a high or low performing school.

4.5.3 School Ranking and Metacognitive Thinking

Table 4.9: Differences in Creative and Metacognitive Thinking between High and Low Performing Schools

				Levene's Test for Equality of Variances		t-test for Equality of Means						
				F	*Sig.*	*t*	*df*	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
Variable	***School Ranking***	***Descriptive***										
		Mean	*S.D*	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Metacognitive Thinking	*High Performing*	106.19	15.87	8.13	.005	-.42	431.92	.678	-.69	1.67	-3.97	2.59
	Low Performing	106.88	19.19									
Divergent Thinking	*High Performing*	54.32	23.92	26.44	.000	7.78	383.86	.000	15.3	1.97	11.44	19.17
	Low Performing	39.01	16.63									
Convergent Thinking	*High Performing*	4.67	2.09	.57	.450	5.20	442	.000	.99	.19	.62	1.37
	Low Performing	3.68	1.93									

4.6 The Relationship between School Ranking and Teacher's Ability to Foster Creative and Metacognitive Thinking

It was hypothesized that there would be a significant relationship between teacher's ability to develop creative and metacognitive thinking in the classroom and school ranking. Results from independent-samples t-test analysis in Table 4.10 indicate the results:

4.6.1 The Relationship between School Ranking and Teachers' Ability to Foster Divergent Thinking

It was found that there was a statistically significant difference for teachers in high performing schools (M = 59.2, SD = 26.8), and teachers in low performing schools (M = 21.1, SD = 15.6); t (34) = 18.21, p = .000 (two tailed) in fostering divergent thinking in the classroom. This implies that teachers in high performing schools demonstrated higher ability in fostering divergent thinking skills than teachers in low performing schools.

4.6.2 The Relationship between School Ranking and Teachers' Ability to Foster Convergent Thinking

Results in Tables 15 indicate that there was a statistically significant difference between teachers in high performing schools (M = 27.1, SD = 1.8), and teachers in low performing schools (M = 11.3, SD = 6.5); t (34) = 17.33, p = .000 (two tailed) in fostering convergent thinking in the classroom. This means that teachers in high performing schools demonstrated higher ability in fostering convergent thinking skills than their counterpart teachers in low performing schools.

4.6.3 School Ranking and Teachers' Ability to Foster Metacognitive Thinking

Results in Tables 15 indicate that there was a statistically significant difference between teachers in high performing schools (M = 30.6, SD = 18.4), and teachers in low performing schools (M = 9.6, SD = 6.7); t (34) = 15.82, p = .000 (two tailed) in fostering metacognitive thinking in the classroom. This means that teachers in high performing schools demonstrated higher ability in fostering metacognitive thinking skills than their counterpart teachers in low performing schools.

Table 4.10: Differences in Fostering Creative and Metacognitive Thinking between High and Low Performing Schools

				Levene's Test for Equality of Variances		t-test for Equality of Means						
				F	*Sig.*	*t*	*df*	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
Variable	**School Ranking**	**Descriptive**										
		Mean	S.D	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Fostering Divergent Thinking	High Performing Schools	59.2	26.8	27.58	.000	18.21	34	.000	38.12	2.09	34.01	42.24
	Low Performing	27.1	11.8									
Fostering Convergent Thinking	High Performing	30.6	18.4	44.05	.000	17.33	34	.000	15.719	.91	13.93	17.50
	Low Performing	21.1	15.6									
Fostering Metacognitive Thinking	High Performing	11.3	6.5	96.55	.000	15.82	34	.000	20.95	1.32	18.34	23.56
	Low Performing	9.6	6.7									

4.7 The Role of the Mediating Variables

The conceptual framework for this study was comprised of determinant variables such as divergent thinking, convergent thinking, metacognitive thinking; and teachers' ability to foster divergent, convergent, and metacognitive thinking. The relationship between such determinant variables and academic performance has been shown in the preceding paragraphs. Mediating variables in the conceptual framework were age, sex, location of the school and education of the respondent's family members.

The extent to which the mediating variables mediated in the relationship between determinant and outcome variables was checked by performing direct logistic regression analysis. This helped to show the contribution of each of the determinant and mediating variables in the variability of academic performance when other variables are controlled for. Results in Table 4.11 reveals that the whole model containing all determinant and intervening variables was statistically significant, χ^2 (21, N=444) = 244.67, $p < .000$, indicating that the model was able to distinguish between respondents with low academic performance from those with high academic performance.

Table 4. 11: Explaining Academic Performance from Creative and Metacognitive Thinking

Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Sex(1)	-.878	.355	6.128	1	.013	.415	.207	.833
Age	-.317	.110	8.249	1	.004	.728	.587	.904
Location(1)	-1.997	.385	26.953	1	.000	.136	.064	.288
Fathedn2			5.125	4	.275			
Fathedn2(1)	.261	.600	.189	1	.664	1.298	.401	4.204
Fathedn2(2)	-.348	.639	.297	1	.586	.706	.202	2.472
Fathedn2(3)	-.605	.732	.684	1	.408	.546	.130	2.292
Fathedn2(4)	-.989	.787	1.577	1	.209	.372	.080	1.741
Mothen2			3.381	4	.496			
Mothen2(1)	-.100	.526	.036	1	.849	.905	.323	2.535
Mothen2(2)	.124	.590	.044	1	.834	1.132	.356	3.594
Mothen2(3)	1.115	.801	1.937	1	.164	3.051	.634	14.674
Mothen2(4)	.022	.825	.001	1	.978	1.023	.203	5.149
Siblingedn2			3.618	4	.460			
Siblingedn2(1)	-.034	.505	.005	1	.946	.967	.359	2.603
Siblingedn2(2)	-.197	.408	.232	1	.630	.822	.369	1.828
Siblingedn2(3)	.324	.547	.350	1	.554	1.382	.473	4.040
Siblingedn2(4)	.552	.514	1.153	1	.283	1.736	.634	4.755
TDIV	.014	.007	3.460	1	.063	1.014	.999	1.029
TCONV	.268	.072	13.841	1	.000	1.308	1.135	1.506
TMET	.011	.008	2.057	1	.152	1.011	.996	1.026
TFDT	.007	.026	.071	1	.789	1.007	.957	1.059
TFCT	.077	.059	1.717	1	.190	1.080	.963	1.211
TFMT	.003	.051	.003	1	.953	1.003	.907	1.109
Constant	2.715	2.300	1.393	1	.238	15.100		

TDIV – Total Divergent Thinking

TCONV – Total Convergent Thinking

TMET – Total Metacognitive Thinking

TFDT – Total Fostering of Divergent Thinking

TFCT – Total Fostering of Convergent Thinking

TFMT – Total Fostering of Metacognitive Thinking

The variables in the conceptual framework explained between 42.6 % (Cox and Snell R Square) and 56.8 % (Nagelkerke R square) of the variance in academic performance, and correctly classified 81.6 % of respondents with low academic

performance. As shown in table 4.4, location of the school made a unique statistically significant contribution to the model ($p < .000$), followed by convergent thinking ($p < .000$), age ($p < .004$) and sex ($p < .013$). The strongest predictor of academic performance in the model thus, was location of the school which recorded an odd ratio of 26.95. This means that respondents in the urban schools were over 26 times more likely to perform high in academics than respondents from rural area.

Likewise, convergent thinking variable recorded an odd ratio of 13.84 meaning that respondents who scored high in convergent thinking tasks were over 13 times more likely to perform high in academics than respondents who scored low in convergent thinking tasks. The age variable recorded an odd ratio of 8.25, meaning that the subjects who reported younger age (say 16, which was a minimum age in the sample) were over 8 times more likely to perform higher in academics than respondents who reported being older in age (say 26, which was the maximum age in the sample).

Lastly, sex recorded an odd ratio of 6.13, implying that males were over 6 times more likely to perform high in academics than females when all other factors in the conceptual model were kept under control. Other variables such as education level of the father, education level of the mother, education level of the siblings, and divergent thinking did not have any unique contribution of the variance in the outcome variable.

CHAPTER FIVE

5.0 DISCUSSION OF THE FINDINGS

This chapter focuses on the discussion of the findings as analyzed and presented in Chapter Four of this study. The discussion mainly relates the results obtained in this study to those of other studies, gravitating around the specific objectives of the present study. The chapter is organized in six sections, namely the relationship between creative thinking and schooling, the relationship between metacognitive thinking and schooling, potential application of creative thinking in teaching, potential application of metacognitive thinking in teaching, and the relationship between school ranking, creativity, and metacognitive thinking. Other themes discussed in the chapter include potential for the application of creative thinking in Tanzania, potential for the application of metacognitive thinking in Tanzania, and the role of creative and metacognitive thinking in the future development of secondary school education in Tanzania.

5.1 The Relationship between Creative Thinking and Schooling

Under this title, two hypotheses were tested. One of them assumed that there would be a relationship between divergent thinking and academic performance. The other assumed there would be a significant relationship between convergent thinking and academic performance. In the next paragraphs the findings for the two hypotheses are discussed in turn.

Regarding the relationship between divergent thinking and academic performance,

the findings of this study indicate low to moderate but positive and significant correlations between divergent thinking components, namely fluency, flexibility, elaboration, and originality, and academic performance. As a general measure, divergent thinking had a moderate positive but significant relationship with academic performance. The findings thus, confirmed the hypothesis and it can now be said that there is a significant relationship between divergent thinking and academic performance among secondary school students in Tanzania.

These findings are similar to other past findings indicating the existence of the relationship between divergent thinking and human cognitive performances such as inductive reasoning, memory span, intellectual speediness, and vocabulary among adults (Reese *et al.*, 2001); divergent thinking and performance in science subjects among sixth and seventh graders (Cohen, 2001); divergent thinking and final dissertation marks among university students (Chamorro-Premuzic, 2003); divergent thinking and pupils' performance in assessment formats where language was an important factor among secondary school students (Danili & Reid, 2006); and divergent thinking and general academic achievement among secondary school students (Naderi, *et al.*, 2009; 2010; Anwar, 2012).

Likewise, the study is in line with Nezhad and Shokrpour (2013) who used the Torrance Divergent Thinking Test to explore the influence of convergent and divergent thinking on reading comprehension performance through convergent versus divergent task types. Having conducted a study among 93 Iranian students who were 18-26 at University of Social Welfare and Rehabilitation Sciences, and

assessed the reading comprehension gains of the participants using four types of reading multiple choice items, i.e. simple factual, referential, inferential, and multiple-response items; their results from ANOVA indicated that the best results were achieved when divergent thinkers of the divergent task type group answered referential, and multiple-response items whereas the worst results were obtained when convergent thinkers in the convergent task group's performance on multiple-response items was used as the criterion for reading assessment. The researchers further found that a task-based course of instruction through convergent or divergent tasks caused the participants to have respectively lower or higher gains on the divergent thinking test.

However, the moderate correlation found in this study of $r = 0.36$ between the variables means a determinant coefficient of 0.129 or about 13 percent of variance between divergent thinking and academic performance. This implies that though a determinant of academic performance, divergent thinking cannot stand as the only and sufficient determinant of the same. Practically, however, the results do not imply causal relationship between creative thinking and academic performance; rather, the two have a reciprocal interaction. With regard to generalizability of these findings, given the fact that similar findings have been reported elsewhere outside Tanzania, large sample size employed, careful designing and selection of sample schools, which were considered having a prototype nature of secondary schools in Tanzania, and the inclusion of both high and low performing secondary schools in the sample, the findings do confidently generalize to other parts of the country as well.

Practical implications of these findings are directly relevant to secondary schools in Tanzania because, practically, students from high performing schools scored relatively higher than students from low performing schools in divergent thinking tasks. On the other hand, students from urban schools significantly scored higher (M = 50.30) than those from rural schools (M = 43.81) in the same tasks, implying that, partly, students from urban and high performing schools might be favored by divergent thinking environment found in their schools. Akume, Awopetu, and Nongo (2013); Oladinma (2003); and Denga (1999) have similar opinion and they argue that children from urban families are exposed to better environment with access to libraries, television, magazines and newspapers; the facilities that enhance divergent learning.

On the other hand, their counterparts from rural schools are hardly exposed to these facilities contributing to the relatively low academic performance and probably creative thinking. Oladinma (2003) observed that rural schools, which are attended by children from rural families, lack adequate provision of human and material resources for positive educational achievement. This makes teaching and learning uninteresting and thus, can contribute to both students' learning and creative thinking.

With regard to *the relationship between convergent thinking and academic performance*, the findings of this study indicated moderate, positive and significant correlations between convergent thinking tasks, namely Mathematical Insight Tasks, Verbal Insight Tasks, and Spatial Insight Tasks; and Academic Performance. As a

total measure, Convergent Thinking had a moderate positive and significant relationship with academic performance. The correlation obtained of $r = 0.48$ meant a coefficient of determination of 0.23, which is about 23 percent of a shared variance between convergent thinking and academic performance. This was a bit higher relationship relative to divergent thinking measures. Convergent thinking was found to predict academic performance even when all other variables in the equation such as location, sex, age, education level of the family, divergent thinking, and metacognitive thinking were kept under control. The correlation was such that respondents who scored high in convergent thinking tasks were over 13 times more likely to perform high in academic subjects than their counterpart students who performed low in convergent thinking tasks.

Similar findings on the relationship between convergent thinking and academic performance have been reported in the past studies. These include the findings that there was a relationship between past success and convergent thinking of the groups (Gongalo, 2004); negative relationship between performance in referential and multiple – response type items (Nehzad & Sokrpour, 2013); performance in mathematics problems and performance in convergent thinking tasks; and performance in science and convergent thinking (Sak & Maker, 2005; 2003).

These findings should not be interpreted that students in secondary schools in Tanzania can't think divergently, but rather that they just applied their convergent thinking in the appropriate place. This is because students have demonstrated high performance in divergent thinking tasks even more than in convergent thinking tasks

when they were required to do so in this study. Probably the more plausible interpretation could be that convergent thinking abilities were much favored by the type of examinations which required students to come up with only one correct response rather than using their divergent thinking abilities. It is argued here that it is what is emphasized by the education system through examinations set which narrow the students' thinking abilities to focus on a single activity rather than being fluent, flexible, elaborate, or original in their thinking. The difference between being dominated by either divergent or convergent thinking abilities is sharpened by the practice made by individuals in applying one than other thinking ability.

Practically, in Tanzania, regardless of whether a school location is rural or urban, academic year in secondary schools in the country is about 194 days with secondary schools beginning in January and ending in November, with a one month break in the middle. Country-wide examinations for Primary 7 and Form IV take place normally in October or November staggered, but examination results are not normally available until as late as February/March of the following year, so schools sometimes start late. Sometimes a second batch of students selected to join form one start schools in April or early May. Each day a secondary school student should receive an average of 6 hours of school learning, an estimate of 9 classes of 40 minutes each. Despite such short time remaining for learning the Ministry requires homework, exercises as well as periodic tests to be taken by students, and that teachers correct them regularly, which is a good requirement for school learning. However, the conditions in some students' homes are not conducive for doing homework, both in rural and urban schools, especially for day scholars.

5.2 The Relationship between Metacognitive Thinking and Schooling

This study found the relationship between metacognitive thinking and academic performance being low but significant and positive. Students from high performing schools and those from low performing schools did not show any difference in reporting metacognitive thinking. This might imply that the more students reported metacognitive thinking the higher their academic level of performance and the lower they reported metacognitive thinking the lower their performance in academics regardless of whether they were from low or high performing schools. In addition, low correlation between metacognitive thinking and academic performance of r = 0.14 meant a coefficient of determination of 0.0196, which is about a rounded 2 percent of variance shared between metacognition and academic performance.

However, the finding that the scores in metacognitive thinking tasks were alike for students from both high and low performing schools were unexpected. This is because in many past studies the trend has been that of students from high performing groups reporting the use of metacognitive strategies than their counterparts from low performing groups. This unexpected finding might lead to three interpretations; first, the thought that examinations set for secondary schools' students in the country do not require much of metacognitive thinking. Second, though metacognitive thinking is found among high performing students, it is not a strong determinant of academic performance but rather the two appear together very rarely. Lastly, because metacognitive thinking was measured by a self-reporting scale, it might be that it was not easy for one to remember exactly what happened in their thinking process retrospectively.

If the latter is true, then one may think that low performing pupils in academics were also likely to give wrong or exaggerate information regarding their metacognitive thinking because they couldn't retrospectively report their thinking process perfectly well. If for example, a test on metacognitive thinking tested subjects' ability to apply and demonstrate metacognitive thinking as it was done with convergent or divergent thinking in this study. Instead of relying on subjects' self-report, it is likely that the relationship between metacognitive thinking and academic performance would significantly improve and the difference of performance in metacognitive thinking tasks between students in high performing and low performing schools would be significant at a large magnitude just like in convergent or divergent thinking tasks.

The findings that there was a low positive correlation between metacognitive thinking and academic performance are in line with other past studies which found similar relationship between metacognitive thinking and performance in accounting classes among university students (Schleifer & Dull, 2009); metacognitive strategies and vocabulary development among university students (Cubukcu, 2008); metacognitive thinking and achievement in writing among elementary students (Stevens, Gould, & Isken, 2007); metacognitive skills and in-training percentile scores among graduate medical education students (Plants, 2000); performance in comprehension test scores and metacognition among college students (Zabrucky & Lin-Miao, 2009); metacognition and students' academic writing among university students (Negretti, 2012); metacognition and academic achievement, and thinking styles among university students (Vrugt & Oort, 2008); and metacognitive knowledge and performance in comprehension test scores (Koch, 2001).

The findings of this study have indicated that the variables of creative thinking, which are divergent and convergent thinking, have shared about 36 percent of variance between them and academic performance. In addition, though in a small magnitude, metacognitive thinking has correlated positively with academic performance. Notionally, these findings imply the relevance of both the Item Response Theory and the Theory of School Learning in the context of Tanzania. In the first place, the determinant variables such as divergent thinking, convergent thinking, and metacognitive thinking were the analogue of the constructs from these theories.

In the theory of school learning (Bloom, 1976) it is stated that the cognitive entry behaviors, affective entry characteristics, and the quality of instruction determine the nature of learning outcomes, which are the level and type of achievement, rate of learning, and affective outcomes. This means that given favorable learner's entry characteristics and quality of instruction; all learning outcomes are likely to be at a high or positive level and little variation in the learning outcomes such as academic achievement. In this study, cognitive entry behavior was analogous to creative and metacognitive thinking. It is clear that all three hypotheses drawn from this theoretical construct have been confirmed, implying an applicability of the theory of school learning in the context of secondary schools in Tanzania.

The relevance and applicability of the Item Response Theory has also been confirmed. According the theory, both item parameters and learners' latent traits predict one's academic performance, and that people at the higher levels of trait have

higher probability of responding correctly to an item (Sternberg & Thissen, 1995). On one hand, item parameters refer to important features of the items in a test such as item difficulty, discrimination, and the role of pseudo-guessing. On the other hand, the term 'latent trait' refers to underlying variables of interest, which are usually intuitively understood such as intelligence and creativity. First, students in high than low performing schools have also scored well in creative thinking measures such as divergent and convergent thinking. These were analogous to the students' latent traits in the Item Response Theory.

However, the difference in metacognitive thinking was negligible between high and low performing schools. On the other hand, it has been found in this study that convergent thinking was more robust in explaining academic performance when all other variables in the model were controlled for. This is also another element confirming the applicability of the Item Response Theory in our schools because as it has been interpreted, the types of examinations demand students to come up with the single correct responses. This is like what is argued for in the model that item parameters, which refer to important features of the items in a test such as item difficulty and discrimination, determine the level and type of one's academic performance.

5.3 The Relationship between School Ranking, Creativity, and Metacognitive Thinking

The findings in this study have indicated a significant difference between students from high performing schools and their counterparts from low performing schools in

both divergent and convergent thinking performance. However, there was no significant difference between the two groups in metacognitive thinking implying that respondents reported metacognitive thinking in a similar way regardless of whether they were from a high or low performing school. On the other hand, analysis has indicated that low correlation of about .14 was significant between metacognitive thinking and academic performance. These two findings were not expected in this study. The two findings might appear contradicting each other.

However, they are not because when two groups were compared on metacognitive thinking, no difference was found but when the whole sample was treated as one group very low relationship between metacognitive thinking and academic performance was found. However, analysis indicated such low relationship as significant. This is due to the large sample size used in this study since in such large sample size; even low correlations can be found significant (Pallant, 2011). On the other way of interpretation, this might have happened by pseudo-guessing or chance as the item response theory suggests.

Regarding creative thinking, despite significant difference found between these two groups, it is obvious that even in a group of students from low performing schools, students scored in both divergent and convergent thinking as their mean scores indicated in previous chapter. In the correlation Table 4.7, it was also shown that the relationship between divergent thinking and convergent thinking was r = 0.29**, which is low positive but significant with 8 percent of a shared variance (p = .01). This indicates that divergent and convergent thinking are not mutually exclusive

traits but rather the two can exist together within the same person. In other words it is conceivable that one can be divergent thinker and a convergent thinker at the same time. Omari (2011) has discussed this principle in details and according to the author; divergence is an aspect of convergence. Omari (2011) argues that most highly divergent people are also quite convergent, but the reverse is not necessarily true. The author has come up with the Figure 5.3 to illustrate the interaction between convergent and divergent thought. Though unlike Omari (2011), the argument in this study holds that convergent, divergent, and metacognitive thinking are within human as a being, working in a continuum of which the dominance of one depends on how the trait is emphasized, encouraged, and practiced by an individual in the context at which such trait is needed.

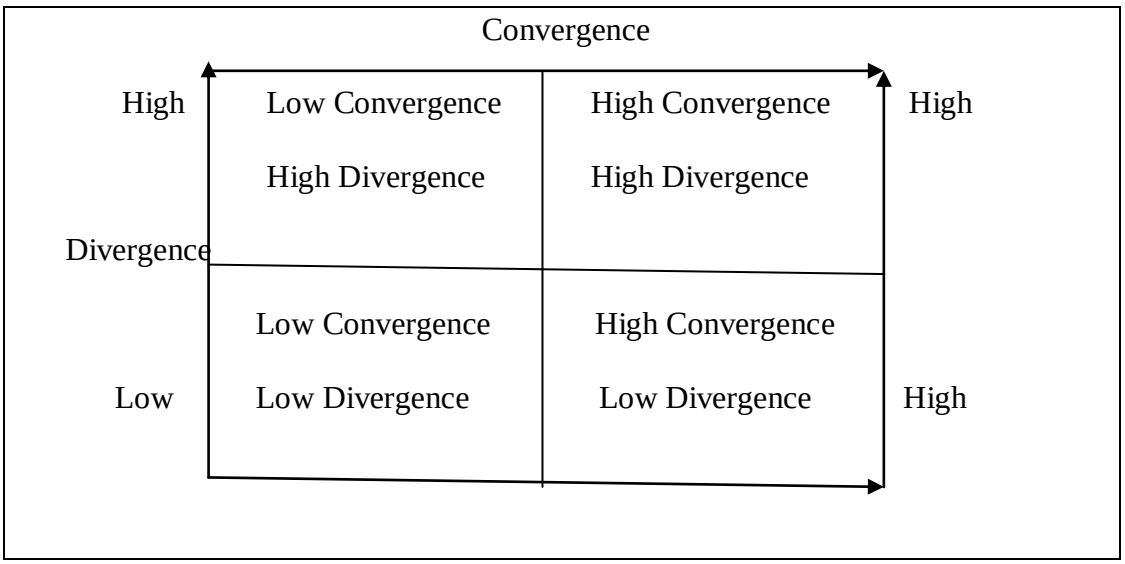


Figure 5. 1: Contingences between Divergence and Convergence (Omari, 2011)

Most literature reviewed on the relationship between divergent, convergent, metacognitive thinking, and academic performance have studied academic performance in general in terms of individual students' achievement, but not in terms

of schools as was done in this study. It has been hard therefore, to compare these findings with the past studies. The discussion comparing with studies that related these variables with academic performance of individual learners has been covered under the respective subtitles in the preceding paragraphs.

Analysis has however indicated that such low correlation of about .14 was significant. This is due to the large sample size used in this study since in such large sample size; even low correlations can be found significant (Pallant, 2011). On the other way of interpretation, this might have happened by pseudo-guessing or chance as the item response theory suggests.

5.4 Potential for the Application of Creative Thinking in Tanzania

In this study it has been observed that teachers' ability to foster divergent thinking was higher in the high than in low performing schools. The trend of fostering creative thinking also differed with school ranking since teachers in high performing schools almost fostered both divergent and convergent thinking throughout the class time starting slowly but increasing the fostering as they taught with time increase. The opposite was observed in low performing schools where teachers fostered some aspects of divergent thinking only occasionally and usually at the beginning of the classroom session and they stopped fostering creative thinking as time increased, usually in the first ten minutes to around 20 minutes of the time.

It was observed that while some teachers were flexible enough to bring learning in students' environment, to provoke students' thinking, to engage students in learning

and trigger students' motivation to learn, some teachers were in fact, loyal to follow the suggested guidelines in the syllabus. To be flexible and creative thinking teacher, Gardner (1991) comments that teachers need to have,

> *a sufficient grasp of concepts, principles, or skills so that one can bring them to bear on new problems and situations, deciding in which way one's present competencies can suffice and in which ways one may require new skills and knowledge. An important symptom of an emerging understanding is the capacity to represent a problem in a number of different ways and to approach its solution from varied vantage points; a single, rigid representation is unlikely to suffice (p.18).*

Gardner is addressing what is really the thirst for the education system in Tanzania as reflected by the community and education stakeholders in general. Education that can produce problem solvers, people with the answers facing the society at the time of need - divergent thinkers! Divergent thinking is not only for solution seeking but also it has been associated with academic success. Divergent thinking is thus, a crucial element one needs in designing as many as possible one's ways of presenting learning materials for the students to enable understanding.

On the other hand, creative teachers do foster divergent thinking among students to enable them face learning and academic problems from as many alternative angles as possible. This does not mean that teachers need to foster to students divergent thinking alone, but rather both convergent and divergent thinking. In the observed classrooms, convergent thinking was not really fostered. On the contrary, students were spoon-fed, meaning that they were taught exactly what to say when asked what kind of a question. It is argued here that this kind of teaching fosters neither divergent nor convergent thinking but leads students to cramming of the so called

correct answers according to the teacher. When students are equipped with both divergent and convergent thinking abilities they become more flexible to apply the appropriate thinking ability when faced by a novel problem or challenging task that needs their thinking. This is because in daily life, humans are surrounded by challenges, whose nature requires solutions of different approaches of thinking.

On their side, students may apply divergent thinking in learning several alternatives to tackle similar problems in different contexts or new problems that they never experienced before. They may also apply convergent thinking to come up with the correct way to address the problem which must be solved but which students never came across. For example, in their learning, students are exposed to different academic problems, which their teachers guided them to solve through given examples. When they come across similar questions with different formulation requiring their application, analysis, synthesis or evaluation in the examinations, most students fail to apply their thinking, fail to solve the problems, claiming that they have never been taught what they are being asked in examinations. Such problem could be easily tackled if students were exposed to creative thinking tasks that could develop their abilities to think beyond examples given in the class.

Students, whose minds were nurtured to perfectly think creatively, might apply creative thinking beyond academic learning to see more life opportunities even after they complete their studies. In Tanzania today, the increase of universities have come with new challenges of unemployment among university graduates. Month after month, these graduates walk in the offices seeking for formal employment in the

government and private sectors. On the other hand, self-employment in the informal sector is left in the hands of people without formal education, implying that these graduates were not prepared to utilize their creative thinking abilities beyond the learning contexts. They cannot think and come with alternatives to address new life after schooling without being formally employed for salary gains.

The common practice in Tanzania is that education, which starts at homes, usually puts emphasis on obedience to parents and other elders in the community. This automatically forces children to trust adults and mistakenly believe that these parents and adults are infallible. Even when exposed to school life, students are introduced to certain pseudo facts and the so called 'right' answers by their teachers. These early practices potentially lead children to believe that imaginations, intuitions, criticisms, and different opinions are associated with arrogant people who are likely to be punished. It is not until children reach higher learning institutions, when university lecturers insist that learners in higher learning institutions should be critical and creative thinkers. This emphasis usually appears strange to students whose entire life in education has been that of returning to teachers the 'right answers' in a word to word form, of which small mistakes in memorization lead to a negative feedback in a form of a wrong mark (Stevens, 2000).

Even in higher learning institutions, some lecturers still demand the same from the students. When providing their lectures, some of these lecturers read some prepared class notes in a form of dictation to enable students write every word they are saying in lecture hours. In these lecture theaters, it is a common practice to hear students

shouting, *'excuse sir, would you please repeat the last sentence?'* Indeed, the 'sir' repeats twice or three times to ensure everyone is comfortable with taking the notes without skipping even a single word from the 'sir' lecturer. This follows then that examinations constructed to fulfill a course work requirement, and at the end of semester, usually place high demands upon students, without necessarily employing any thinking, to reproduce a word to word response from the lecture notes. Showing discontent with the education systems similar to that in Tanzania and emphasizing the need to inculcate in students the highest degree of understanding Gardner (1991) remarks,

> *...even when school appears to be successful, even when it elicits the performances for which it has apparently been designed, it typically fails to achieve its most important mission. ...investigations document that even students who have been well-trained and who exhibit all the overt signs of success - faithful attendance at good schools, high grades and high test scores, accolades from teachers - typically do not display an adequate understanding of the materials and concepts with which they have been working (p.5).*

The quotation indicates how Gardner is insisting the need to aim at deeper understanding by the learners instead of superficial learning which is usually a characteristic of most students in our school systems. This does not mean that facts and correct answers do not exist or that students should not cram the facts or correct answers. Indeed, these are the basic skills as means in developing higher order thinking abilities but not in themselves the end. In addition, this system might continue to benefit the few whose opinions and point of view are matching those of their teachers and close the doors for those with constructive thoughts that do not necessarily match their teachers.'

Marshall and Tucker (1992) argues that the future now belongs to societies that organize themselves for learning and that nations that want high incomes and full employment must develop policies that emphasize the acquisition of knowledge and skills by everyone, not just a select few. This thesis argues for the need to incorporate and sustain creative thinking that exist in children and develop them throughout their school experience, for meaningful tangible outcomes of education in the education practices of Tanzania.

5.5 Potential for the Application of Metacognitive Thinking in Tanzania

With regard to cognitive thinking, results have indicated no significant difference between students from high and those from low performing schools in reporting the same. This would suggest that metacognitive thinking is really present and its strategies applied in the daily life of students. However practically, one questions oneself as to what is happening if students who performed low in academics really apply metacognitive strategies the same way as students performing high in academics! It is expected that students whose awareness if high in metacognition would demonstrate some measurable characteristics or strategies when interacting with academic texts.

The strategies are such as setting purpose for reading, activating prior knowledge, checking whether text content fits purpose, predicting what text is about, confirming predictions, previewing text for content, skimming to note text characteristics, making decisions in relation to what to read closely, using context clues, using text structure, and using other textual features to enhance reading comprehension. Other

strategies are such as reading slowly and carefully, adjusting reading rate, paying close attention to reading, pausing to reflect on reading, rereading, visualizing information read, reading text out loud, and guessing meaning of unknown words. Metacognitive thinking is also useful for teachers who are interested in making their students more thoughtful, critical, and reflective learners. This may be done in two ways, first by incorporating metacognitive thinking in the lessons taught in the classroom, second, by incorporating metacognitive thinking in the test items constructed in tests and examinations.

Teachers may develop metacognitive thinking among students as they continue teaching the subject domains by encouraging students to ask themselves some metacognitive questions. For example, after teaching a particular topic the teacher may ask students to write down these questions: What do I know about the taught lesson? What don't I know in the taught lesson? What do I need to know? Then the teacher may help students to write systematically the answers for the questions before starting new lesson. Sometimes the teacher may help students to visualize and draw a conceptual map reflecting an understanding of what student know from the lesson a teacher has just taught.

Teachers can also help to develop metacognitive thinking among students by incorporating metacognitive thinking in the test items constructed in tests and examinations according to the education level of the students. This requires a specific metacognitive thinking skill the teacher wants students to apply in addressing the question. For example, if the teacher wants to develop students' metacognitive

regulation specifically in allocating resources and using prior knowledge, the following question from topic 9 – 'Ratio, Profit and Loss' of the form one mathematics syllabus may be formulated.

Sample question 1:

The retailer bought one pair of shoes for Tshs. 20,000/= and sold for Tshs 25,000/=. He also bought one pair of socks for Tshs. 6000/= and sold it for Tshs. 1,000/=. Which item gave the retailer a big profit percentage?

a) Prior knowledge:
   i) Students must reflect on their prior knowledge on how to obtain the profit made, and decide that one cannot state the magnitude of the profit percentage without firs calculating the profit made out of each item sold.

b) Allocating resources:
   i) Students must then ask themselves as to which resources do they need in addressing the task ahead. They must decide that a in the first place they must put a formula to calculate a profit made, which is:
      - Profit made = selling – Buying price,
      - Then, they must reflect and come with another formula to calculate a percentage profit, which is:
      - Percentage profit = (Profit made/Buying price) X 100%.

Sample Qn 2 for third year student-teachers in the test and measurement course would suffice be an example:

Juma scored 90 marks in a Civics test, whose mean score was 50 and standard deviation = 20. He also scored 80 marks in Geography whose mean was 50 and standard deviation = 10. Is Juma better in Civics or Geography?

a) Prior knowledge:
    i) Students must reflect on their prior knowledge on making comparison of different test score, and decide that one cannot compare two different test scores by looking at raw scores.
b) Locating resources:
    i) Students must then ask themselves as to which resources do they need in addressing the task ahead. They must decide that a 'Z – *Score'* formula to standardize the two scores must be in place i.e. Z = X – Mean / Standard Deviation.

When one wants to measure student's metacognitive regulation specifically appraising the results of learning, the following example question from Omari (2011) may be a good example of both interpretative and appraising the result of one's learning at second year of university education level.

Sample question 3:

The following data illustrates deaths from accidents in a hypothetical population in the year 2008. Read them carefully and judge the appropriateness of the interpretative statements given in the next scale by putting a **tick** (✓) under the best option.

Age group	Deaths per 100,000 persons	
	Men	Women
1 – 4	11	8
5 – 14	10	5
15 – 19	54	16
20 – 24	76	13
25 – 44	36	9
45 – 64	33	13
65+	58	23
All ages	33	11

The options mean:

T = True according to the data

NT = Not true according to the data

IR = Irrelevant, according to the data

Items:

	Statement	T	NT	IR
i.	The death rates are higher for men than women			
ii.	Accidents are the main cause of deaths for 20 – 24 age group			
iii.	Men over 65 years do not drive more recklessly than teenagers			
iv.	The largest number of fatal accidents are of people 65+			
v.	Overall only about 11 percent of female deaths results from accidents			

In addition, the MARSI may be used as a tool for helping students increase metacognitive awareness and strategy use while reading. The results obtained can be used for enhancing assessment, planning instruction, or conducting classroom research. First, teachers may guide students to use the items in the scale to enable students increase awareness of their own reading strategies. This information will allow them to evaluate themselves in relation to other readers and also to amend the conceptions they hold about reading and learning from texts.

According to Paris and Winograd (1990), the current models of reading emphasize that learners should be aware of their cognitive processes while reading. This awareness would help them achieve the type of constructively responsive and thoughtful reading. Added to that is the role of such awareness transferring responsibility for monitoring learning from teachers to students themselves, and promotion of positive self-perceptions, affect, and motivation among students. These are the key roles of metacognitive thinking that provide personal insights into one's own thinking and foster independent learning" (p. 15).

The information derived from the Metacognitive Awareness Reading Strategies Inventory can provide teachers with a useful means of assessing, monitoring, and documenting the type and number of the reading strategies used by students for the purpose of improving learning development of students. For example, teachers can examine how students responded to the instrument to get a general sense of the students' awareness and use of the individual learning strategies invoked using the guidelines provided. In doing this, the teacher may discover that some students are over or under relying on a particular strategy in approaching the learning tasks.

Students with internalized conceptions of the reading process often relate to the textual information they attended to. A student who reports over using support strategies such as *using the dictionary* to look up every word in text may have a restricted view of reading. Garner and Alexander (1989) have argued that poor readers often rely on a single criterion for textual understanding such as understanding of individual words. On the other hand, students who report under

using problem-solving strategies such as *rereading to increase understanding* may develop inadequate control of their comprehension processes, leading to inability to quick understanding.

The instrument can serve as a useful tool for teachers and researchers in investigating the impact of teaching strategic reading on students' reading comprehension under a variety of conditions, including reading for different purposes; for example, reading to answer questions on a test, and or reading to research a particular topic; reading texts varying in length, difficulty, structure, and topic familiarity such as reading a chapter book as opposed to reading a computer manual; and reading assigned versus self-selected readings.

Teachers and researchers can use the data obtained from the instrument as a means of monitoring students' progress in becoming constructively responsive readers. They can administer it as a pretest and posttest in studies aimed at evaluating the impact of instruction on students' awareness and use of strategies while reading. They can use the individual and group average scores to derive a profile designating students along the three subscales of the inventory. Depending on the students' individual profiles, teachers might consider devising specific instructional strategies for addressing the specific weaknesses and needs. Some educators recommend maintaining performance data in portfolios, which can be used to demonstrate changes in the metacognitive awareness and use of strategies over time. Differences in performance can be documented along with other measures of reading in portfolios for individual students (Henk & Melnick, 1995).

5.6 Creative and Metacognitive Thinking and Future Development of Secondary Education

In any given education system, secondary education occupies an extremely, important pivotal role, both in the functioning of the whole education system, and the operations of the economy in general. With the current trend in academic performance in secondary school education in Tanzania, it is convincing to argue that for longtime to come, the labor force in the country, will be predominantly composed of secondary school leavers. The role of this semi – educated group of citizens need not to be ignored given the aims and objectives of secondary education in the country as identified by the 1995 Education and Training Policy as follows:

i) Consolidation and broadening of ideas, knowledge, skills, principles and aptitudes acquired and developed at the primary education level.

ii) Promotion of the development of language competency in Kiswahili, and in at least one foreign language, primarily English.

iii) Preparation of students for tertiary and higher education, vocational, technical, and professional training.

iv) Preparation of students to join the world of work.

Having lost the first three goals of secondary education, the students who fail to join tertiary and higher education, one goal remaining to them is preparation of students to join the world of work in vocational, technical, and professional training. These students need some necessary cognitive and affective skills to enable them match the world of work. Even those who successfully pass examinations and join higher levels

of education will still need the necessary skills to smoothly adapt tertiary and higher education, vocational, technical, and professional training.

It is therefore, of great importance that students at secondary school level acquire convergent thinking skills in mathematical reasoning, verbal reasoning, scientific and spatial reasoning. They will also need divergent thinking in terms of fluency, flexibility, elaboration and original thinking skills. Metacognitive thinking skills are also of great importance in terms of declarative knowledge, procedural knowledge, and conditional knowledge. Secondary school students also need other metacognitive skills such as planning, information management, monitoring, debugging, and evaluation. This does not mean that they don't need other non cognitive skills such as learning how to learn, self confidence, holding a conversation, and holding down to a task. They need both cognitive and non-cognitive concurrently as these determine their subsequent success both in higher learning and the world of work.

Short of this it is likely that remedial work will be done in the tertiary and higher education sector and the economy will chronically underperform. In the global context where the economy is bent on being driven by science and technology, secondary education will assume even greater responsibly of supplying the tertiary education sector with well equipped, well motivated, and academically well prepared to benefit from the increasingly more sophisticated and demanding competitive world. It is in this context that Tanzania should be reflecting and planning on new and more effective ways of offering secondary education in the country.

In so doing, schools need to work for the desired outcomes and how to go about the given goals. Some of the direct but narrow essential skills demonstrating creative and metacognitive thinking for secondary school students are: mathematical and number usage and reasoning; reading, comprehension, and good writing; problem – solving in a methodological manner; thinking analogically, analytically, and critically; effective and confident communication; ability to work steadily both individually and in teams; and finding, using, and making sense of information using computers. In a broad way however, some the lead question that need to be addressed: Is the system producing all the desired outcomes? In addressing this question, Omari and Heather (2010) investigated how Tanzania was doing in some specific human resource parameters of interest and indicates the findings in Figure 5.2:

	Parameter of Interest	**Rating**		
	Producing:	**Very Good**	**Fair**	**Poor**
1	Successful teachers who are happy with themselves, their lives, their profession, cooperative and out by petty troubles such idling, absenteeism, stealing, raping etc?		*	
2	Success students, highly motivated , keen of learn on their own , learn how to learn, self disciplined, confident, clean, and out of troubles such as drugs, truancy, rape, bullying, beating teachers, etc?		*	
3	High academic achievers, passing examinations well in large numbers, at all levels, and being competitive regionally and internationally?			*
4	Teachers and students who willingly and voluntarily participate in classroom activities , school cleaning, community services, communal activities such as cleaning roads, planting trees, and helping the sick and disabled persons, etc?			*
5	Employable graduates, energetic, confident, skilled, and who can hold down to a job successfully and over an extended period of time?			*
6	Services that satisfy the broad spectrum of clients, to include parents, employers, students, taxpayers, funders etc?		*	

Figure 5.2: Ranking Specific Human Resource Parameters in Tanzania

Source: Omari and Hearther (2010)

Omari concluded that Tanzania did not receive very good rating in any of the six parameters of what the human resources should accomplish or strive to achieve. As can be seen from the figure, the country was deficient in academic achievements, handling of the teaching force, and producing employable students. It is obvious that given the findings of this study and the situation of the country with regard to secondary school education, the future development of secondary school education need to be improved by making creative and metacognitive skills part of secondary education life.

CHAPTER SIX

6.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

In this chapter, the summary of the study, conclusions, and recommendations for education stakeholders and psychological researchers are provided. There are also areas suggested for further studies.

6.1 Summary of the Study Findings

This was a study about the relationship between creative thinking, metacognition, and academic performance. The independent variables investigated were divergent thinking, convergent thinking, metacognitive thinking, and other intervening variables, namely age, location of the school, education level of the family, and sex of respondents. These were studied against academic performance.

The data were collected using the Guilford's Alternate Uses Task (AUT, 1967) for measuring divergent thinking, an Assessment of Convergent Thinking Test Using Insight Problems (ACTT) for measuring convergent thinking, and the Metacognitive Awareness of Reading Strategies Inventory (MARSI) for measuring metacognitive thinking. The tests were administered to 580 secondary school students, out of which 444 complete scripts were analyzed. The study was guided by five hypotheses. The first hypothesis predicted that there would be a significant relationship between learners' divergent thinking and their academic performance. It was found that there was a moderate, positive and significant correlation of $r = .36^{**}$, $n = 444$, $p < .01$ between total divergent thinking and academic performance.

Second, it was hypothesized that there would be a significant relationship between learners' convergent thinking and academic performance. It was found that there was a moderate, positive and significant correlation of $r = .48^{**}$, $n = 444$, $p < .01$ between total convergent thinking and academic performance.

Third, it was hypothesized that there would be a significant relationship between learners' metacognitive thinking and academic performance. It was found that there was a very low, positive but correlation of $r = .14^{**}$, $n = 444$, $p < .01$ between total Metacognitive Thinking and Academic Performance.

In the fourth hypothesis, it was hypothesized that there would be a relationship between school ranking in academic performance rank and measures of divergent, convergent, and metacognitive thinking. The findings confirmed the hypothesis except with metacognitive thinking where there was no significant difference for respondents from high performing schools ($M = 106.19$, $SD = 15.87$), and respondents from low performing schools ($M = 106.88$, $SD = 19.19$); $t\ (442) = -.42$, $p = .68$ (two tailed) in reporting metacognitive thinking.

Lastly, It was hypothesized that there would be a significant relationship between teacher's ability to develop creative and metacognitive thinking in the classroom and school ranking. The results confirmed the hypothesis in all measures. In summary, the whole model containing all determinant and intervening variables was statistically significant, $\chi^2\ (21, N=444) = 244.67$, $p < .000$, indicating that the model was able to distinguish between respondents with low academic performance from

those with high academic performance. Though age and sex mediated the relationships between independent and dependent variables, convergent thinking still explained academic performance among students.

6.2 Conclusions Based on the Findings

From these findings therefore, four conclusions can be made. First, divergent thinking and convergent thinking do not only exist among secondary school students in Tanzania but also can partly explain their academic performance. Secondly, divergent, convergent, and metacognitive thinking are not mutually exclusive traits but rather they can exist together within the same person, and one can be highly applied than others at the time of need. Thirdly, the fact that divergent and convergent thinking have something to do with school learning has been clearly shown in this study, being an indicative that examinations in secondary schools are mostly associated with convergent thinking than divergent and metacognitive thinking.

Fourthly, the fact that teachers in high performing schools fostered divergent and convergent thinking and students in high performing schools demonstrated high abilities in creative thinking than their counterparts in low performing schools, partly explains the consistent pattern of such schools remaining in the same ranking categories in national examinations. Lastly, although the relationship between metacognitive thinking and academic performance has been found, it was too weak to explain academic performance. Thus, the significance indicated in the analysis should be cautiously interpreted since this might be due to large sample employed in

this study. It is therefore; wise to replicate the study on the relationship between metacognitive thinking and academic performance using the improved instruments before closing the discussion on whether or not metacognitive thinking explains academic performance.

6.3 Recommendations for Administrative Actions and Further Research

As far as the findings of this study are concerned, two types of recommendations are provided. The first type is a set of recommendations for the education stakeholders, and the second type is a set of recommendations for further research.

6.3.1 Recommendations for the Practice of Teaching and Learning

i) Due to the fact that there were significant relationships between creative and metacognitive thinking on one hand; and academic performance on the other, there is a need for parents to be sensitized on these relationships so that they could start boosting the more creative and metacognitive thinking early as children grow at home before they hand them over to teachers in schools.

ii) Students should be made aware of the importance of divergent, convergent and metacognitive thinking so that they might practice and make themselves at high levels of all the traits as possible. This is because the traits are demanded in their schooling and beyond; as these will be utilized at the time of need even after schooling.

iii) Students should work hard to develop their motivation to learn, coming to school every day ready to learn rather than trudging aimlessly and

wondering about what to do next. This requires total school commitment to a culture of learning and continuous improvement and sending that message to parents as well.

iv) Teachers need to re-orient themselves to incorporate divergent, convergent, and metacognitive thinking in teaching throughout the class sessions to enable students become creative and metacognitive thinkers. This will make students' minds strong not only in academic matters but also in general life after schooling.

v) Teachers need to incorporate divergent, convergent and metacognitive thinking in construction of questions in all test and examinations according to the level of the learners to help promote application of these traits in a variety of challenges among students.

vi) Universities and teacher education institutions in Tanzania should develop programs aiming at improving creative and metacognitive thinking among both teachers and students, to improve the students' academic performance.

vii) Curriculum developers need to incorporate the development of divergent, convergent, and metacognitive thinking in the teaching and learning activities of the syllabuses to formalize the application of these traits to effectively promote them among both teachers and students from pre-school to college education levels.

viii) The National Examinations Council of Tanzania needs to improve examination formats to incorporate more varieties of test items that put at advantage divergent, convergent and metacognitive thinking of

students. This will help students develop their mental faculties in thinking than cramming direct responses to direct questions that may be predicted year after year.

ix) To the education system in general including the government officials in the Ministry of Education and Vocational Training, it has been found that there is clear demarcation of performance between the high and low performing schools in creative and metacognitive thinking in a similar way it is in academic performance. It is therefore, recommended that in the low performing schools like in the high performing schools, there should be the following:

a) *Continuous professional development and training of teachers and school leadership*. With unfettered globalization, technological revolutions, and information explosion, everyone in the education system needs regular retooling so as to meet the needs of the education systems, and the students in particular, for new knowledge and skills.

b) *Retaining the best*. The education system needs to position itself such that it can attract, develop, and retain innovative, bold, and visionary leaders and teachers. Therefore, in selecting students to and teachers to learning position and teaching posts respectively, the best should be retained.

c) *Strong and positive learning environment*. Schools require stability, confidence, and a collaborative atmosphere, with

everyone focusing on the goal, which is the students and their achievement.

d) *Transparency and accountability need to permeate the school environment*. All teachers and students should be treated transparently and on an equitable basis. It is also important to focus on a comprehensive accountability framework for ensuring that the achievement levels of students continue to improve.

e) *Good leadership and management.* Senior managers and school heads should be chosen for their leadership potential. They should be able to articulate a vision and inspire those around them to follow it. Leaders need nurturing themselves through appropriate training and work assignments. Leadership does not necessarily come from the top down and good managers encourage bottom-up initiatives.

6.3.2 Recommendations for Further Research

On the basis of the findings and experience of the present study, it is recommended that:

i) Future research in this area in Tanzania may investigate on how to improve the instruments on measuring metacognitive thinking. These might be in a form of test tasks instead of the use of self report inventories like MARSI and MAI.

ii) Most of the researches done in this area including the present one have been designed to measure the relationships between creative,

metacognitive thinking and academic performance concurrently. Future research may investigate the role of these cognitive variables in subsequent learning and performance. In addition, the practice of research in the area has been that of studying prediction of academic performance from creative and metacognitive thinking rather than causal relationship existing between these variables. Future research in Tanzania may also focus on causal relationships existing between convergent, divergent, and metacognitive thinking variables; and academic performance.

iii) Future research may specifically analyze the types of examinations offered by the National Examination Council of Tanzania to students in secondary schools in relationship to creative and metacognitive thinking to see what types of items relate to what kind of traits.

REFERENCES

Akume, G. T Awopetu, R. G and Nongo, T.T. (2013). Impact of Socio-Economic Status of Parents and Family Location on Truant Behaviour of Secondary School Students in the North-West Senatorial District of Benue State. *Ife PsychologIA, 21(1), pp.274 – 283.*

Alexander, P.A., and Jetton, T.L. (2000). Learning from text: A Multidimensional and Developmental Perspective. In *Handbook of reading research* (Kamil, M.L., Mosenthal, P.B. Pearson, P.D. & Barr, R.), Mahwah, NJ: Erlbaum. pp. 285–310.

Andreou, E., Andreou, G., and Vilachos, F. (2005). Studying Orientations and Performance on Verbal Fluency Tasks in a Second Language. *Learning and Individual Differences, 15 (1), 23-33.*

Andrews, R.C., Rooyackers, O., and Walker, B.R. (2003). Effects of the 11 Beta-Hydroxysteroid Dehydrogenase Inhibitor Carbenoxolone on Insulin Sensitivity in Men with Type 2 Diabetes. *J Clin Endocrinol Metab* 88 (1): 285 –291

Anwar, M.N., Annes, M., and Khizar, A. (2012). Relationship of Creative Thinking with the Academic Achievements of Secondary School Students. *International Interdisciplinary Journal of Education, 1(3), 44 – 47.*

Arap-Maritim, E.K. (1987). *Developmental analysis of sex differences in class rank of primary-grade children*. Psychological Reports, vol. 60, 155 – 158.

Audia, P. G., Locke, E. A., and Smith, K. G. (2000). The Paradox of Success: An Archival and a Laboratory Study of Strategic Persistence Following Radical Environmental Change. *Academy of Management Journal*, 43(5), 837–853.

Austin, F.M. (1961). *The Arts of Questioning in the Classroom*. London. University of London Press: 81pp.

Ayres, A.J. (1995). *Sensory Integration and the child*. Los Angeles: Calif-WPS: 213pp.

Baker, F.B. (2001). *The Basics of Item Response Theory*. Wisconsin: ERIC Clearinghouse on Assessment and Evaluation: 180pp.

Baker, L., and Brown, A. L. (1984). Metacognitive Skills and Reading. In *Handbook of Reading Research*. (Edited by Barr, R.., Pearson, D., Kamil, M.L., and Mosenthal, P.B.), Lawrence Elbaum Associates: London; pp.353-394.

Bandura, A. (2000). Exercise of Human Agency through Collective Efficacy. *Current Directions in Psychological Science,* 9(3), 75–78.

Beattie, V., Collins, B. and Mcinnes, B. (1997). Deep and Surface Learning: A Simple or Simplistic Dichotomy? *Accounting Education, 6 (1), 1-12.*

Bedwell, L.E., Hunt, G.H., Touzel, T.J., and Wiseman, D.G. (1984). *Effective Teaching*. Illinois: Charless C. Thomas.183pp.

Best, J.W. and Khan, J.V. (2006). *Research in Education*. Boston: Person Education; 121pp.

Bloom, B.S. (1976). *Human Characteristics and School Learning*. McGraw-Hill: New York; 305pp.

Borkowski, J. G., and Thorpe, P. K. (1994). Self-Regulation and Motivation: A Life-pan Perspective on Underachievement at any Point during the Life Span In Self-*regulation of Learning and Performance: Issues and Educational Applications.* (Edited by Dale, B. J. Z., and Schunk, H.). Lawrence Erlbaum

Associates: Hillsdale, NJ, US; pp. 45-73.

Brown, A. (1987). Metacognition, Executive Control, Self-Regulation, and Other More Mysterious Mechanisms. In *Metacognition, Motivation, and Understanding.* (Edited by Weinert, F. and Kluwe, R.), Hillsdale, NJ: Erlbaum, pp. 65–116.

Brown, A.L. and Palincsar, A.S. (1989). Guided, Cooperative Learning and Individual Knowledge Acquisition. In *Knowing and Learning: Essays in Honor of Robert Glaser.* (Edited by Resnick, L.B.), Hillsdale, NJ: Erlbaum; pp. 393–451.

Brozo, W. G. (2010). *The Achievement Gap in Reading: Exploring the Gender Literacy Connection for Boys*. Illinois: Northern Illinois University: [https://www.researchgate.net] site visited on 03/03/2013

Brunner, J.S. (1966). *Towards a Theory of Instruction*. New York: Norton. Mcgraw Hill: 307 pp.

Carson, S.H., Peterson, J.B., and Higgins, D.M. (2003). Decreased Latent Inhibition is Associated with Increased Creative Achievement in High Functioning Individuals. *Journal of Personality and Social Psychology, 85 (3) 499-506.*

Chonjo, P. and Welford, G. (2001). Research for Poor Performance for Students in A-Level Science Examination in Tanzania. *Papers in Education and Development, 21, 39-51*.

Chua, R.Y.J., Morris, M.W., and Mor, S. (2011). Collaborating Across cultures: Cultural Metacognition and Affect-Based Trust in Creative Collaboration. *Working Paper,* 63 pp 11 – 127.

Clay, M., and Cazden, C. (1990). A Vygotskian interpretation of Reading Recovery.

In *Vygotsky and Education: Instructional Implications of A Vygotskian Interpretation of Reading Recovery and Applications of Socio-Historical Psychology*. (Edited by Moll, L.C.), Cambridge: Cambridge University Press: pp. 206-222

Clement, C., and Gentner, D. (1991). Systematicity as a Selection Constraint in Analogical Mapping. *Cognitive Science, 15*, 89-132.

Coffield, F., Moseley, D., and Ecclestone, K., (2004). *Learning Styles and Pedagogy in Post-16 Learning: A System and Critical Review*. London: Learning and Skills Research Centre. 182pp.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education*. New York: Routledge: pp 638

Cohen, L., Manion, L., and Morrison, K. (2000). *Research Methods in Education.* London: Routledge-Falmer. [http://dx.doi.org/10.4324/9780203224342] site visited on 09/08/2011.

Cohen, S.R. (2001). The Relationship between Convergent and Divergent Thinking in Science as Revealed in Sixth and Seventh Graders. *The Journal of Educational Research. 327-330*

Como, L. (1986). The Metacognitive Control Components of Self-regulated Learning. *Contemporary Educational Psychology, 11*, 333-346.

Court, D. (1976). The Education System as a Response to Inequality in Tanzania and Kenya. *The Journal of Modern African Studies, 14 (4), 661-690*.

Creswell, J W. (2009). Research design: Qualitative, quantitative, and mixed methods approach. [https://www.hbs.edu/faculty/Publication%20Files/11-127.pdf] site visited on 22/08/2012

Critelton, N. and Seers, K. (2001). Quantitative research: Designs relevant to nursing and health care. *Nursing Times Research, 6*(1), 487 – 500.

Cubukcu, F. (2008). Enhancing Vocabulary Development and Reading Comprehension through Metacognitive Strategies. *Issues in Educational Research, 18(1), 1-18.*

Dahl, D.W., and Moreau, P. (2002). The Influence and Value of Analogical Thinking during New Product Ideation. *Journal of Marketing Research, 39, 47–60.*

Danili, E. and Reid N. (2006). Cognitive Factors That Can Potentially Affect Pupils' Test Performance. *Journal of Chemistry Education Research and Practice.7 (2), 64 - 83*

Denga, D.I. (1999). *The Eve of the 21st Century: Educational Threshold Strategies for Entry and Sustainable Development.* Calabar: Rapid Educational Publishers. [https://www.researchgate.net] site visited on 08/08/2012

Dennett, D. (1978). Beliefs about Beliefs. *Behavioral and Brain Sciences, 4,* 568-570

Dow, G. T., and Mayer, R. E. (2004). Teaching Students to Solve Insight Problems: Evidence for Domain Specificity in Creativity Training. *Creativity Research Journal, 16* (4), 389-402.

Duckworth, A. L. and Seligman, M. E. P. (2006). *Self-discipline gives girls the edge: Gender in self-discipline, grades, and achievement test scores*. Journal of Educational Psychology, Vol 98(1), 198-208.

Dunn, R. and Dunn, K. (1999). *The Complete Guide to the Learning Strategies in Service System.* Boston. Allyn and Bacon.125pp.

Egeland, B. (1974). Training Impulsive Children in the Use of More Efficient

Scanning Techniques. *Child Development, 45, 165-171.*

Eiffert, S.D., (1999). *Cross Train Your Brain: A Mental Fitness Program for Maximizing Creativity and Achieving Success.* New York: American Management Association. 201pp.

English, D.L. (2004). Mathematical Reasoning and Analogical reasoning of young Learners. [http://books.google.co.tz.] site visited on 04.10.2011

Ericsson, K. A. and Kintsch, W. (1995) Long-term Working Memory. *Psychological Review, 102, 211-245.*

Felder, R.M. (1996). Matters of Style. *ASEE Prism, 6 (4), 18-23*.

Feldman, R.S. (1999). *Understanding Psychology*. Boston: Mcgraw-Hill.788pp.

Flavell , J. H. , and Wellman , H. M . (1977). Metamemory . In *Perspectives on the Development of Memory and* Cognition (Edited by Kail R. V. and Hagen J. W.), Hillsdale, NJ: Erlbaum. pp. 3–33.

Flavell, J. H. (1979). Metacognition and Cognitive Monitoring. A new area of Cognitive Developmental Inquiry. *American Psychologist, 34,* 906 – 911.

Flavell, J. H. (2000). Development of Children's Knowledge about the Mental World. *International Journal of Behavioral Development, 24,* 15 – 23.

Franzoi, S.L. (2000). *Social Psychology*. Boston: McGraw – Hill. 615pp.

Gardner, H. (1983). *Frames of Mind.* [https://howardgardner01.files.wordpress.com] site visited on 09/07/2013

Gardner, H. (1991). *The Unschooled Mind*. New York, NY: Basic Books. [https://www.scirp.org] site visited on 13/02/2012.

Garner, R. (1987). *Metacognition and Reading Comprehension*. Norwood, NJ: Ablex Publishing. [https://www.researchgate.net] site visited on 23/03/2013.

Garner, R., and Alexander, P. A. (1989). Metacognition: Answered and unanswered questions. *Educational Psychologist, 24*, 143–158.

Gentner, D., and Holyoak, K. J. (1997). Reasoning and Learning by Analogy: Introduction. *American Psychologist, 52*, 32-34.

Ghatala, E. S. (1986). Strategy-Monitoring Training Enables Young Learners to Select Effective Strategies. *Educational Psychologist, 21*, 43-54.

Goleman, D. (1995). *Emotional Intelligence*. New York: Bantam. [http://www.eiconsortium.org] site visited on 29/05/2013

Gongalo, J.A. (2004). Past Success and Convergent Thinking in Groups: The Role of

Goswami, U. (1992). *Analogical Reasoning in Children.* Hillsdale, NJ: Lawrence Erlbaum.8pp.

Goswami, U., and Brown, A. L. (1989). Melting Chocolate and Melting Snowmen: Analogical Reasoning and Causal Relations. *Cognition, 35*, 69-95.

Goswami, U., and Brown, A. L. (1990). Higher-Order Structure and Relational Reasoning: Contrasting Analogical and Thematic Relations. *Cognition, 36*, 207-226.

Gray, D. E. (2013). *Doing research in the real world.* Los Angeles: Sage publications. 296pp.

Gronland, N.E. and Linn, R.L. (1990). *Measurement and Evaluation in Teaching*. NewYork: Macmillan Publishing Company. 545pp.

Group–Focused Attributions. *European Journal of Social Psychology*, 34, 385 – 395.

Guilford, J.P. (1967). *The Nature of Human Intelligence*. New York, NY: McGraw-Hill, Inc: 538pp.

Halford, G. S. (1987). A Structure-Mapping Approach to Cognitive Development.

International Journal of Psychology, 22, 609-642.

Halford, G. S. (1992,). Analogical Reasoning and Conceptual Complexity in Cognitive Development. *Human Development, 35,* 193-217.

Halford, G. S. (1993). *Children's Understanding: the Development of Mental Models*. Hillsdale, N.J.: Erlbaum: 528pp.

Halford, G. S., Cowan, N., and Andrews, G. (*2007*). Separating Cognitive Capacity from Knowledge: A New Hypothesis. *Trends in Cognitive Sciences, 11, 236-242.*

Halford, G.S., Bain, J.D. & Maybery, M.T. & Andrews, G. (1998). Induction of relational schemas: Common processes in reasoning and complex learning. *Cognitive Psychology*, 35, 201-245.

Harackiewicz, J.M., Barron, K.E., and Elliott, A.J. (1998). Rethinking Achievement Goals: When are They Adaptive for College Students and Why? *Educational Psychologist, 33(1),* 1-21.

Harackiewicz, J.M., Barron, K.E., Tauer, J.M., and Elliot, A.J. (2002). Predicting Success in College: A Longitudinal Study of Achievement Goals and Ability. *Journal of Educational Psychology* 94(3):562-575

Henk, W. A., and Melnick, S. A. (1995). The Reader Self-Perception Scale (RSPS): A New Tool for Measuring How Children Feel About Themselves as Readers. *The Reading Teacher, 48,* 470–482.

Hornby, A.S. (2000). *Oxford Advanced Learners Dictionary*. Oxford: Oxford University Press.553pp.

Hummel, J.E. and Holyoak, K.J. (1997). Distributed Representations of Structure: A Theory of Analogical Access and Mapping. *Psychological Revview,* 104,

427- 466.

Hyde, J. S. and Linn, M. C. (1988). Gender differences in verbal ability: A meta-analysis. *Psychological Bulletin*, 104 (1), 53-69.

Idama, A.N.M. and Ndabi, D.M. (1996). *The Examiner: Learning from Examinations Results and Candidates" Responses: CSEE1992.* Dar es Salaam: National Examination Council of Tanzania. 38pp.

Ingham, R. (1993) *Can we have a policy on sex? Setting targets for teenage pregnancies*. Southampton: Institute for Health Policy Studies, University of Southampton. [http://www.ucpress.edu/journals/rights.htm] site visited on 28/05/2012.

Ingule, F.O., Ruthie, C.N., and Ndambuki, P.W. (1996). *Introduction to Educational Psychology.* Nairobi: East African Educational Publishers.40pp.

Johnson, S. (2014). *Advantages and disadvantages of positivism* [http://www.ehow.com/info_12088541_advantages-disadvantages-positivism.html] site visited on 11/09/2014.

Jones, M. N., Kintsch, W., and Mewhort, D. J. K. (2006) High dimensional semantic space accounts of priming. Journal of Memory and Language. 55, 534-552.

Joshua, J.M. (2011). The Relationship between Thinking Styles and Academic Performance among Secondary School Pupils. *Journal of Teofilo Kisanji University, 2(1), 61-76.*

Joshua, J.M. (2012). The Pre-University Entry Qualifications' Difference in Academic Achievement among University Students. *Journal of Teofilo Kisanji University, 3(1), 27-39.*

Joshua, J.M. (2012). *Thinking Styles and Academic Performance: Experience from Secondary Schools in Tanzania.* Saarbrücken: Lambert Academic Publishing. 85pp.

Kagan, J. (1966). Reflection and Impulsivity: The Generality and Dynamics of Conceptual Tempo In *Journal of Abnormal Psychology, 71, 17-24.*

Kagan, J., Pearson, L. and Welch, L. (1966). Modifiability of an Impulsive Tempo In *Journal of Educational Psychology, 57, 359-365.*

Kamil, P. M. and Pearson, P. D. (Eds.), *Handbook of Reading Research* (2), 353–394. White Plains, NY: Longman. 772pp.

Keener, M.C. (2009). *Integration of Comprehension and Metacomprehension Using Narrative Texts: A PhD. Dissertation Proposal*. The University of Utah. 88pp.

Kintsch, W. (1998). *Comprehension: A paradigm for Cognition*. New York: Cambridge University Press. [https://www.scirp.org] site visited on 24/04/2012

Kintsch, W. (2000). Metaphor Comprehension: A computational theory. *Psychonomic Bulletin and Review*, 7, 257-266.

Kintsch, W. (2001). Predication. *Cognitive Science*, 25, 173-202.

Kintsch, W. (2007). Meaning in context. In Landauer, T. K, McNamara, D., Dennis, S. and Kintsch, W. (Eds.) *Handbook of Latent Semantic Analysis. Mahwah, NJ: Erlbaum. Pp. 89-105*.

Koch, A. (2001). Training in Metacognition and Comprehension of Physics Texts. *Journal of Science Education*, 85:758 – 768.

Kolb, D.A. (1984). *Experiential Learning*. Englewood Cliffs, NJ: Prentice-Hall. 38pp.

Koul, L. (1984). *Methodology of Educational Research.* New Delhi: Vikas Publishing House. 476pp.

Krauss, S. E. (2005). Research paradigms and meaning making: A primer. *The Qualitative Report, 10*(4), 759 – 770

Kuhn, D. (1999). A Developmental Model of Critical Thinking. *Educational Researcher, 28*(2), 16–26.

Kuhn, J. and Holling, H. (2009). Exploring the Nature of Divergent Thinking: A Multilevel Analysis. *Thinking Skills and Creativity (4), 116–123*

Lahey, B.B. (2004). *Psychology: An Introduction*. Boston: University of Chicago.720pp.

Leach, C. W., Zomeren, M. van, Zebel, S., Vliek, M. L. W., Pennekamp, S. F., Doojse, B., Spears, R. (2008). Group-Level Self-Definition and Self-Investment: A Hierarchical (Multicomponent) Model of In-Group Identification. *Journal of Personality and Social Psychology, 95,* 144–165.

Lee, K., Ng, E. L., and Ng, S. F. (2008). The Contributions of Working Memory and Executive Functioning To Problem Representation and Solution Generation in Algebraic Word Problems. *Journal of Educational Psychology, 101, 373–387.*

Legg, A.M. and Locker L. (2009). Math Performance and Its Relationship to Math Anxiety and Metacognition. *North American Journal of Psychology*, 11, (3),

471-486.

Leitz, P. (2006). A meta-analysis of gender differences in reading achievement at the secondary school level. *Studies in Educational Evaluation*, 32, 317-344.

Lytton, H. and Romney, D. M. (1991). *Parents' differential socialization of boys and girls: A meta-analysis.* Psychological Bulletin, 109 (2), 267-296.

Maccoby, E.E. (1966). The development of sex differences, Stanford University Press, Stanford, CA.[https://doi.org/10.1002/bs.3830130110] site visited on 22/02/2012.

Maccoby, E.E. and Jacklin, C.N. (1974). *The Psychology of sex differences.* Stanford, CA: Stanford University Press. 634pp.

Mack, L. (2010). The philosophical underpinnings of educational research. *Polyglossia, 19*, 5-11.

Magina, S.B. (2010). The relationship between self ego system, employer's responsibility, and secondary school teachers' performance in Tanzania. *A Dissertation Submitted in Partial Fulfillment of Requirement for the Degree of Master of Arts Education) of the University of Dodoma.* 110pp.

Magolda, M.B. (2001). *Making Their Own Way: Narratives for Transforming Higher Education to Promote Self-Development*. Sterling, Virginia: Stylus Publishing. 356pp.

Markstein, L. and Hirasawa, L. (1993). *Expanding Reading Skills.* Boston: Heinle & Heinle. 194pp.

Marshall,R. and Tucker, M. (1992). *Thinking for a Living: Education and the Wealth of Nations*. New York: Basic Books. 320pp.

Matlin, M.W. (2009). *Cognitive Psychology*. Hoboken N.J.: John Will & Sons.

643pp.

Mayer, R. E. (1992). *Thinking, Problem Solving, Cognition*. New York, NY: Worth Publishers. 266pp.

Mertens, D.M. (1998) *Research methods in education and psychology: Integrating diversity with quantitative & qualitative approaches*. Thousand Oaks: SAGE Publications. 422pp.

Messick, S. (1976). *Individuality in Learning*. San Fransisco: Jossey-Bass. 45pp.

Miles, M.B. and Huberman, A.M. (1994). *An expanded sourcebook: Qualitative data analysis.* London: SAGE Publications. 32pp.

MOEC (2004). *Secondary Education Development Plan.* Dar-es-Salaam: Ministry of Education and Culture. 94pp.

Mokhtari, K. and Reichard, C.A. (2002). Assessing Students' Metacognitive Awareness of Reading Strategies. *Journal of Educational Psychology*, 94 (2), 249 – 259.

Moulali, S. (2007). Effects of Different Teaching and Learning Methods. St. Clement: St. Clement University. 125pp.

Mumford, M., Yoarkin-Levin, K., Korotkin, A., Wallis, M., and Marshall- Mies, J. (1986). *Characteristics Relevant to Performance as an Army Leader: Knowledge, Skills, Aptitudes, Other Characteristics and Generic Skills.* (ARI Research Note 86-24). Bethesda, MD: Advanced Research Resources Organization. 95pp.

Naderi, H., Abdullah, R., Aizan, T., Shrrir, J. and Kumar, V. (2010). Relationship between Creativity and Academic Achievement: A Study of Gender Differences. *Journal of American Science 6(1), 181 – 190*

Naderi, H., Abdullah, R., Aizan, T., Shrrir, J., and Kumar, V. (2009). Creativity, Age and Gender as Predictors of Academic Achievement among Undergraduate Students. *Journal of American Science 5(5), 101-112*

Negretti, R. (2012). Metacognition in Student Academic Writing. A Longitudinal Study of Metacognitive Awareness and Its Relationship to Task Perception, Self-Regulation, and Evaluation of Performance. *Written Communication,* 29 (2), 142 – 179.

Nezhad, G. and Shokrpour, N. (2013). The Impact of Task Type and Divergent Thinking on Reading Proficiency. *International Journal of English Language and Literature Studies*, 2 (2): 124 – 137.

Oladinma, N.N. (2003). Privatization: Implication for Equality of Educational Opportunities in Nigeria. In *Implication of privatization of Education in Nigeria* (Edited by Okeke, E.A.C.), Nsukka: Institute of Education University of Nigeria, pp. 151–159,

Olajide, J.O. and Adeoye, F.A. (2010). The Effect of Analogical Reasoning and Extended Wait Time on Achievement in Biology. *International Journal of Education Science, 2(1): 21-28*

Omari I.M. (2011). *Concepts and Techniques in Educational Assessments and Evaluation:* Dar es salaam: Oxford University Press: 170pp.

Omari, I.M. (2008). Revisiting and Re-conceptualization of the Participatory and Mastery Learning Concepts in Methods of Instruction. The University of Dar es Salaam, Faculty of Education. 180pp.

Omari, M.I. (2011). *Education Research: Concepts and Methods.* Dar es salaam:

Delah Educational Publisher. 157pp.

Omari, M.I. and Heather, H. (2010). *Human Resources Situation Analysis.* Dar-es-salaam: The Ministry of Education and Vocational Training: 87pp.

Oppenheim, A.M. (1996). *Questionnaire Design, Interviewing and Attitude Measurement.* London: Continuum Publishers: 303pp.

Pallant, J. (2011). *SPSS Survival Manual: A Step By Step Guide to Data Analysis Using SPSS for Windows.* Chicago: Open University Press: pp353

Papaleontiou-Louca, E. (2003). The Concept and Instruction of Metacognition. *Teacher Development, 7, 9–30.*

Papaleontiou-Louca, E. (2008). *Metacognition and the Theory of Mind.* Cambridge: Cambridge Scholars Publishing: 93pp.

Paris, S. G., and Jacobs, J. E. (1984). The Benefits of Informed Instruction for Children's Reading Awareness and Comprehension Skills. *Child Development*, *55*, 2083–2093.

Paris, S. G., and Paulette, R. (2005). Cognitive Processes That Underlie the Impulsive-Reflective Cognitive Styles. In *The Journal of Genetic Psychology*, 166 (4), 451 463.

Paris, S. G., and Winograd, P. (1990). How Metacognition Can Promote Academic Learning and Instruction. In *Dimensions of Thinking and Cognitive Instruction.* (Edited by Jones B. F. and Idol, L.). Hillsdale, NJ: Erlbaum; pp. 15-51.

Paris, S. G., Lipson, M. Y., and Wixon, K. K. (1994). Becoming a Strategic Reader. In *Theoretical Models and Processes of Reading*. Edited by (Ruddell, R., Ruddell, B.M. R. and Singer, H.). Newark, DE: International Reading

Association; pp. 788-811

Pereira-Laird, J. A., and Deane, F. P. (1997). Development and Validation of a Self-Report Measure of Reading Strategy Use. *Reading Psychology: An International Journal, 18,* 185–235.

Perrott, D. A., Gentner, D., and Bodenhausen, G V. (2004). Resistance Is Futile: The Unwitting Insertion of Analogical Inferences in Memory. *Psychonomic Bulletin & Review:* 25pp.

Peter, F. (2008). Grinding Poverty Plagues 7 Regions. [http://www.ippmedia.com] site visited on 05/11/2010.

Phillips, J.A. (1998) An Analysis of Selected Cognitive Abilities of Secondary School Students and Its Relationship with Academic Achievement. [http://peoplelearn.homestead.com/cog.abl.htm*]* site visited on 04/10/2011

Piaget, J. (1972). *Psychology and Epistemology: Towards A Theory of Knowledge*. Harmondsworth, England: Penguin. 107pp.

Piaget, J. (1979). *Behaviour and Evolution*. London, England: Routledge and Kegan Paul. 158pp.

Piaget, J. (1981). Foreword. In *Darwin on Man: A psychological study of Scientific Creativity*. (Edited by Gruber H.) Chicago, IL: Chicago University Press. 310pp.

Plants, R.T. (2000). *The Relationship of Motivation and Metacognition to Academic Performance in Graduate Medical Education. A Dissertation Presented for the Doctor of Education Degree.* The University of Memphis: Bell and Howell Information and Learning Company. 230pp.

Possi, M.K. (2003). The Relevance of Special Schools for the Gifted and Talented in the Tanzanian Education System. *Papers in Education and Development, 23, 37-39.*

Pressley, M. (2000). What Should Comprehension Instruction Be The Instruction of? In *Handbook of Reading Research* (Kamil, M., Mosenthal, P. Pearson, P. and Barr, R.), Mahwah, NJ: Erlbaum, pp. 545–561.

Pressley, M., and Afflerbach, P. (1995). *Verbal Protocols of Reading: The Nature of Constructively Responsive Reading*. Hillsdale, NJ: Erlbaum. 165pp.

Pressley, M., Beard El-Dinary, P., and Brown, R. (1992). Skilled and Not-so-Skilled Reading: Good Information Processing of Not-So-Good Processing. In *Promoting Academic Competence and Literacy in School, (*Edited by Pressley M., Harris, K., and Guthrie, J.), San Diego, CA: Academic Press, pp. 91–127.

Pressley, M., Borkowski, J.G. and Schneider, W. (1987). Cognitive Strategies: Good Strategy Users Coordinate Metacognition and Knowledge. In *Annals of Child Development,* (Edited by Vasta R. and Whitehurst, G.), Greenwich, CT: JAI Press, pp. 890-129.

Pretorious, E.J. (2000). What They Can't Read Will Hurt Them: Reading and Academic Achievement. *Innovation (21), 33-41.*

Ratterman, M. J., and Gentner, D. (1998). More Evidence for A Relational Shift in The Development of Analogy: Children's Performance on a Causal-Mapping Task. *Cognitive Development, 13,* 453-478.

Reese, H.W., Lee, L., Cohen, S.H., and Puckett, J.M. (2001). Effects of Intellectual Variables, Age, and Gender on Divergent Thinking in Adulthood.

International Journal of Behavioral Development, 25 (6), 491 – 500.

Ricards, T. (1999). *Creativity and Problem Solving at Work*. Hampshire: Gower Publishing Company. [https://www.researchgate.net]. Site visited 09/09/2012.

Richmond, A.S. and Liu, L. (2005). Student Learning Styles of Traditional Courses Versus Online Distance Courses. In *Technology and Teacher* Education *Annual,* (Edited by Crawford, *C.*), Charlottesville, pp. 576-578.

Rosenblatt, L. M. (1978). *The Reader: The Text: The Poem*. Carbondale, IL: Southern Illinois University. 188pp.

Rosenfield, S., Houtz, J.C., and Stefero, F.A. (1977). Relationship of Children's Conceptual Tempo to Problem Solving and Creativity. *Psychology in the Schools. 14, (3).*

Ruiz, F.J. and Luciano, C. (2011). Croo-Domain Analogies as Relating Derived Relations Among Separate Relational Networks. *Journal of the Experimental Analysis of Behavior, 95, 369 – 385.*

Sak, U. and Maker, C.J. (2003). Divergence and Convergence of Mental Forces of Children in Open and Closed Mathematical Problems. *International Educational Journal, 6 (2), 252 – 260.*

Sak, U. and Maker, C.J. (2005). The Predictive Validity of the DISCOVERER Assessment: Problem Validity Abilities in Intellectual Domains. [https://nrcgt.uconn.edu] site visited on 11/07/2013

Santrock, J.W. (2003). *Psychology*. Boston: Mcgraw-Hill. 697pp.

Santrock, J.W. (2004). *Educational Psychology*. Boston: Mcgraw-Hill. 554pp.

Santrock, J.W. (2006). *Life Span Development*. Boston: Mcgraw-Hill. 655pp.

Sax, G. (1997). *Principles of Educational and Psychological Measurement and Evaluation*. Belmont, CA: Wadsworth. 678pp.

Scheerens, J. *(*2000). *Improving School Effectiveness.* Paris: IIEP. 137pp.

Schleifer, L.L. F. and Dull, R.B. (2009). Metacognition and Performance in the Accounting Classroom. *Issues in Accounting Education, (24)3,* pp. 339–367.

Schloemer, P., and Brenan, K. (2006). Metacognition and Learning. *Journal of Education for Business*, 81-87.

Schneider, W. (2008). The Development of Metacognitive Knowledge in Children and Adolescents: Major Trends and Implications for Education. *Journal Compilation of International Mind, Brain, and Education Society and Wiley Periodicals,* (2), 3: 114 - 121.

Schraw, G. and Dennison, R. S. (1994). Assessing Metacognitive Awareness. *Contemporary Educational Psychology* 19: 460–475.

Schunk, D.H. and Zimmerman, B. (1998). *Self-Regulated Learning: From Teaching to Self-Reflective Practice.* New York: Guilford Publications. 244pp.

Scotland, J. (2012). Exploring the philosophical underpinnings of research: Relating ontology and epistemology to the methodology and methods of the scientific, interpretive, and critical research paradigms. *English Language Teaching, 5*(9), 9-16.

Sdorow, L.M. (1998). *Psychology*. Boston: Mcgraw-Hill. 822pp.

Shaughnessy, J.J., Zechmeister, E., and Zechmeister, J. (2000). *Research Methods in Psychology*. Boston: Mcgraw-Hill. 488pp.

Sinetar, M. (2000). *Spiritual Intelligence: What We Can Learn from the Early Awakening Child.* New York. Orbis. 179pp.

Snelgrove, S. And Slater, J. (2003). "Approaches to Learning: Psychometric Testing of a Study Process Questionnaire" In *Journal of Advanced Nursing, 43 (5) 496-505.*

Spellman, B., and Holyoak, K. (1996). Pragmatics in analogical mapping. *Cognitive Psychology, 31*, 307-346.

Stenberg, L. and Thissen, D. (1995). Item response theory in personality research. In *Personality Research, Methods, and Theory: A Festschrift Honoring David W. Fiske.* (Edited by Shrout P.E. and Fiske S.T.) Hilldale NJ: Erlbaum. pp. 81 – 97.

Sternberg, R. J., and Nigro, G. (1980). Developmental Patterns in the Solution of Verbal Analogies. *Child Development, 51*, 27-38.

Sternberg, R. J., and Rifkin, B. (1979). The development of analogical reasoning processes. *Journal of Experimental Child Psychology, 27*, 195–232.

Sternberg, R.J. (1995). Styles of Thinking in Schools. *European Journal of High Ability, 6 (2), 201-219.*

Sternberg, R.J. (1997). *Thinking Styles*. Cambridge: Cambridge University Press. 198pp.

Sternberg, R.J. and Lubart, T.I. (1999). The concept of creativity: Prospects and paradigms. In *Handbook of Creativity* (Edited by Sternberg, R.J.), Cambridge: Cambridge University Press, pp. 3-15.

Sternberg, R.J. and Zhang, L. (2001). Perspective on Thinking, Learning, and Cognitive Styles. In *The Educational Psychology Series*. (Edited by Sternberg, R. J. & Li-fang Z.), Laurence Erlbaum: Mahwa, pp. 197-226.

Stevens, V. (2000). The Importance of Creativity, Emotional Intelligence and the Arts for Education in the 21st Century. [http//:www.drvictoriastevens.com.] Site visited on 13/09/2011

Stevens, V., Gould, R., and Isken, S. (2007). The Relationship between Training in and Exposure to Contemporary Visual Art and Creative Thinking and Metacognition in Elementary School Students. [http: // www.moca.org.] site visited on 19/09/2011.

Suddendorf, T. (1999). The rise of the metamind. In *The Descent of Mind Psychological Perspectives in Hominid Evolution* (Edited by Corballis M. C. & Lea S.), Oxford University Press: New York. pp. 218- 260.

Suddendorf, T., Fletcher-Flinn, C. M., and Johnston, L. (1999). Children's Divergent Thinking Improves when They Understand False Beliefs. *Creativity Research Journal, (12) 2, 115 – 128.*

Suddendorf, T., Fletcher-Flinn, C. M., and Johnston, L. (1999). Pantomime and Theory of Mind. *Journal* of *Genetic Psychology*, 160, 31-45.

The APA Delphi Report, (1990). *Critical Thinking: A Statement of Expert Consensus for Purposes of Educational Assessment and Instruction*. ERIC, Delphi, U.S.A. pp. 315 423

Thurstone, L.L. (1921). Intelligence and its Measurement. In *Journal of Educational Psychology 16, 201-207.*

Thurstone, L.L. (1924). The stimulus-response fallacy in psychology. In *The Nature of Intelligence*. (Edited by Kagan, P. and Trance, T.), London). Trubner & Co. Pp.1-23.

Torrance , E.P. (1987). Teaching for Creativity. In *Frotiers of Creativity Research:*

Beyond the Basics (Edited by Isaksen, S.G.), Buffalo, NY: Bearly Limited. pp. 189 – 215.

Torrance, E. P. and Myers, R. E. (1970). *Creative Learning and Teaching*. New York: Harper & Row. 350pp.

Treffinger, D.J. (1980). Encouraging Creative Learning for the Gifted and Talented. [https://journals.sagepub.com] site visited 12/06/2010.

URT (1995). *Education and Training Poicy,* The Ministry of education and Vocational Training. Dar es Salaam. 44pp.

URT (2012). *Certificate of Secondary Education Examination (CSEE) – 2011 Report and Analysis of the Results.* Dar es Salaam: The Ministry of Education and Vocational Training. 108pp.

URT (2012). *Education and Training Policy.* Dar es Salaam: The Ministry of Education and Vocational Training. 105pp.

URT (2013). *Basic Education Statistics in Tanzania.* Dar es Salaam: The Ministry of Education and Vocational Training. 94pp.

Veenman, M.V.J., Wilhelm, P., and Beishuizen, J.J. (2004). The Relation Between Intellectual and Metacognitive Skills from a Developmental Perspective. *Learning and Instruction 14 (2004) 89–109*

Vernon, P. E. (1969). *Intelligence and Cultural Environment.* London: Methuen. 264pp.

Voyer, D., Voyer, S. and Bryden, M. P. (1995). *Magnitude of sex differences in spatial abilities: A meta-analysis and consideration of critical variables*. Psychological Bulletin, Vol. 117(2), 250-270.

Vrugt, A. and Oort, F.J. (2008). Metacognition, Achievement Goals, Study

Strategies, and Academic Achievement: Pathways to Achievement. *The Journal of Metacognition Learning*, 30: 123 – 146.

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press. 170pp.

Vygotsky, L. S. (1986). *Thought and Language*. Cambridge, MA: MIT Press. 287pp.

Wainwright, C.L., Flick, L. and Morrell, P. (2003). The Development of Instrument for Assessment of Instructional Practices in Standard-Based Teaching. *The Journal of Maathematics and Science: Collaborative Expllorations,* 6, 21 – 46.

Walczyk, J. J., and Hall, V. C. (1989). Is the Failure to Monitor Comprehension an Instance of Cognitive Impulsivity? *Journal of Educational Psychology, 81, 294-298.*

Wallas, G. (1926). The Art of Thought. [https://Univ of Pretoria.on.worldcat.org] site visited on 23/04/2013

Weijers, G.H., Wiesbeck, G.A., and Böning, J. (2001). Reflection-Impulsivity Personality and Performance: A Psychometric and Validity Study of The Matching Familiar Figures Test in Detoxified Alcoholics. In *Personality and Individual Difference; 3, 731-754.*

Whyte, G. (1998). Recasting Janis's Groupthink Model: The Key Role of Collective Efficacy in Decision Fiascoes. *Organizational Behavior and Human Decision Processes,* 73, 185–209.

Wimmer, H., and Perrier, J. (1983). Beliefs about Beliefs: Representation and Constraining Function of Wrong Beliefs in Young Children's Understanding of Deception. *Cognition,* 13, 103-128.

Winograd, P. (1990). How Metacognition Can Promote Academic Learning and Instruction. In *Dimensions of Thinking and Cognitive Instruction* (Edited by Jones B. F. & Idol, L.), Hillsdale, NJ: Erlbaum. pp. 15-51.

Witkin, H.A. and Goodenough, D.R. (1981). *Cognitive Styles: Essence and Origins*. NY: International University Press. 130pp.

Wood, P. K. (1997). A Secondary Analysis of Claims Regarding the Reflective Judgment Interview: Internal Consistency, Sequentiality and Intra-Individual Differences in Ill-Structured Problem-Solving. A Paper Presented at the Annual Meeting of the American Educational Research Association. 4 - 8 April, 1997, New Orleans, L.A. USA. 91 pp. 243-312.

Zabrucky, K.M. and Lin-Miao, L.A. (2009). Metacognition in Taiwan: Students' Calibration of Comprehension and Performance. *International Journal of Psychology. 44 (4)*, 305 – 312.

Zanetti, M.A. (2006). "ADDIZIONARIO": A New Tool for Learning Between Metacognition and Creativity. *Informatica, 30, 399 – 405.*

Zhang, L. and Sternberg, R.J. (2002). Thinking Styles and Teacher Characteristics. In *International Journal of Psychology; 37(1), 3-12.*

Zimmerman, B. J. (1990). Self-Regulated Learning and Academic Achievement: An Overview. *Educational Psychologist, 25*(1), 3-17.

Zimmerman, B. J., and Schunk, D. H. (2001). Reflections on Theories of Self-Regulated Learning and Academic Achievement. In *Self-Regulated Learning and Academic Achievement: Theoretical Perspectives.* (Edited by Zimmerman B. J. & Schunk D. H.), Eribaum: Mahwah, NJ. pp. 289-307.

APPENDICES

Appendix 1: Test Materials: The Guilford's Alternative Uses Task

A: Introduction and Purpose

I am Joel Matiku Joshua, a lecturer and PhD student at the Open University of Tanzania. I am conducting a study about your experiences in school learning. The findings of this study will enable me to recommend some improvement to policy makers, teachers and parents on how to ease your learning conditions. I am requesting your willingness to fill in the following survey forms and answering the questions honestly. I assure you that the information you provide will remain confidential and will be used only for the purpose of this study. Should you agree to willingly participate in this study, please continue answering the following questions:

Name of your school: ……
Your name …….
Date ……
Your age: ……..….in years

Education of your family – please tick under the relevant education level of the members of your family in the table below:

	Highest education level reached				
Family member	Std 7	Form Four	Form Six	Diploma	Degree
Father					
Mother					
Older brother					
Older sister					

Test 1: Measures of Divergent Thinking

Directions:

There are five items in this task for you. You have 5 minutes to respond to each item. Think aloud before you write your answer. Remember that there are no correct and wrong answers for this work. Thus, think and write whatever answer you consider relevant from your experiences. The more responses you can come up with the better; so write as many as possible.

Briefly think of and provide all different ways you could use for the following items:

For example,

A stone

Uses: - To build houses
- To make fire etc.
- To hit cows
- To sit on etc.

Items:

1. A drum
   1) …… 3) …… 5) ……
   2) …… 4) …… 6) ……
2. A piece of paper
   1) …… 3) …… 5) ……
   2) …… 4) …… 6) ……
3. A piece of an empty land
   1) …… 3) …… 5) ……
   2) …… 4) …… 6) ……
4. A pot
   1) …… 3) …… 5) ……
   2) …… 4) …… 6) ……
5. A knife
   1) …… 3) …… 5) ……
   2) …… 4) …… 6) ……

Appendix 2: Test Materials: Convergent Thinking Test Using Insight Problems (ACTT)

In the questions below, you are not expected to apply any taught mathematical formula, but please, make sure to actively involve your thinking until you reach a correct answer.

I. Mathematical Insight Tasks Sample Items

1. In the Smith family, there are 7 sisters and each sister has 1 brother. If you count Mr. Smith, how many males are there in the Smith family?

   Solution:
   ……
   ……

2. Water lilies double in area every 24 hours. At the beginning of summer there is one water lily on the lake. It takes 60 days for the lake to become completely covered with water lilies. On which day is the lake half covered?

   Solution:
   ……
   ……

3. If you have black socks and brown socks in your drawer, mixed in a ratio of 4 to 5, how many socks will you have to take out to make sure that you have a pair the same color?

   Solution:
   ……
   ……

4. Yesterday I went to the zoo and saw the giraffes and ostriches. Altogether they had 30 eyes and 44 legs. How many animals were there?

   Solution:
   ……
   ……

5. A man bought a horse for $60 and sold it for $70. Then he bought it back for $80 and sold it for $90. How much did he make or lose in the horse trading business?

   Solution:
   ……
   ……

II. Verbal Insight Task

Like in the past section, you are not expected to apply any taught formula, but please, make sure to actively involve your thinking until you reach a correct answer.

1. A prisoner was attempting to escape from a tower. He found in his cell a rope, which was half long enough to permit him to reach the ground safely. He divided the rope in half and tied the two parts together and escaped. How could he have done this?

   Solution:
   ……
   ……

2. How can you cut a hole in a 3" x 5" card that is big enough for you to put your head through?

   Solution:
   ……
   ……

3. Marsha and Marjorie were born on the same day of the same month of the same year to the same mother and the same father - yet they are not twins. How is that possible?

   Solution:
   ……
   ……

4. Three women - Joan, Dana, and Sandy - have among them three children - Sam, Traci, and David. Sam likes to play with Dana's son. Sandy occasionally baby-sits for Joan's children. Who is Traci's mother?

   Solution:
   ……
   ……

5. Our basketball team won a game last week by the score of 73-49, and yet not even one man on our team scored as much as a single point. How is that possible?

   Solution:
   ……
   ……

III. Spatial Insight Tasks

As you did in the past sections, you are not expected to apply any taught formula, but please, make sure to actively involve your thinking until you reach a correct answer.

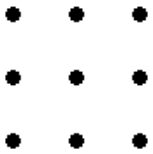
1. Without lifting your pencil from the paper, show how you could join all 4 dots with 2 straight lines.

2. A landscaper is given instructions to plant four special trees so that each one is exactly the same distance from each of the others. How is he able to do it?

Solution:

……
……

3. Draw four continuous straight lines, connecting all the dots without lifting your pencil from the paper.



4. You were instructed to escort a goat, a lion, and grass to the other side of the lake. The lake was too large to swim but you had to use a boat. The space in the boat allowed you to escort only one of them at a single escort. In your absence however, the lion would kill and eat the goat. Similarly the goat would eat the grass. You eventually managed to safely escort them all. How could you do this?

Solusion:

……
……
……

5. Imagine you are a doctor treating a patient with a malignant stomach tumor. You cannot operate but you must destroy the tumor. You could use high intensity X rays to destroy the tumor but unfortunately the

intensity of the X rays needed to destroy the tumor also will destroy healthy tissue through which the X rays must pass. Less power full X rays will spare the healthy tissue but will not be strong enough to destroy the tumor. How can you destroy the tumor without damaging the healthy tissue?

Solution:

……

……

6. Can you figure out where to put the letter Z, top or bottom line and Why?

A EF HI KLMN T VWXY

BCD G J OPQRS U

Solution:

……

……

Appendix 3: The Metacognitive Awareness of Reading Strategies Inventory (MARSI)

Directions:

In the scale provided below, read the statements about what people do when they read *academic or school-related materials* such as textbooks or library books. After reading each statement, **circle the number** (1, 2, 3, 4, or 5) that applies to you. Please note that there are no Right or wrong answers to the statements in this task but be very sincere to yourself in responding to a statement. The numbers mean:

1 = "N**ever or almost never**"

2 = "O**nly occasionally**"

3 = "S**ometimes**" (about **50%** of the time).

4 = "U**sually**"

5 = "A**lways or almost always**"

	Statements	Scale				
1	I have a purpose in mind when I read.	1	2	3	4	5
2	I take notes while reading to help me understand what I'm reading.	1	2	3	4	5
3	I think about what I know to help me understand what I'm reading.	1	2	3	4	5
4	I preview the text to see what it's about before reading it.	1	2	3	4	5
5	When text becomes difficult, I read aloud to help me understand what I'm reading.	1	2	3	4	5
6	I write summaries to reflect on key ideas in the text.	1	2	3	4	5
7	I think about whether the content of the text fits my purpose.	1	2	3	4	5
8	I read slowly but carefully to be sure I understand what I'm reading.	1	2	3	4	5
9	I discuss my reading with others to check my understanding.	1	2	3	4	5
10	I skim the text first by noting characteristics like length and organization.	1	2	3	4	5
11	I try to get back on track when I lose concentration.	1	2	3	4	5
12	I underline or circle information in the text to help me remember it.	1	2	3	4	5
13	I adjust my reading speed according to what I'm reading.	1	2	3	4	5
14	I decide what to read closely and what to ignore.	1	2	3	4	5
15	I use reference materials such as dictionaries to help me understand what I'm reading.	1	2	3	4	5
16	When text becomes difficult, I begin to pay closer attention to what I'm reading.	1	2	3	4	5
17	I use tables, figures, and pictures in text to increase my understanding.	1	2	3	4	5
18	I stop from time to time to think about what I'm reading.	1	2	3	4	5
19	I use context clues to help me better understand what I'm reading.	1	2	3	4	5
20	I paraphrase (restate ideas in my own words) to better understand what I'm reading.	1	2	3	4	5
21	I try to picture or visualize information to help me remember what I'm reading.	1	2	3	4	5
22	I use typographical aids like boldface type and italics to identify key information.	1	2	3	4	5
23	I critically analyze and evaluate the information presented in the text.	1	2	3	4	5
24	I go back and forth in the text to find relationships among ideas in it.	1	2	3	4	5
25	I check my understanding when I come across conflicting information.	1	2	3	4	5
26	I try to guess what the text is about when reading.	1	2	3	4	5
27	When text becomes difficult, I reread to increase my understanding.	1	2	3	4	5
28	I ask myself questions I like to have answered in the text.	1	2	3	4	5
29	I check to see if my guesses about the text are right or wrong.	1	2	3	4	5
30	I try to guess the meaning of unknown words or phrases.	1	2	3	4	5

Thank you for your corporation!

Appendix 4: Kiswahili Version of the Instruments

DODOSO KUHUSU FIKRA VUMBUZI NA NAMNA YA KUJIFUNZA

A: Utangulizi na Kusudi

Naitwa Joel Matiku Joshua. Mimi ni mwanafunzi wa shahada ya uzamivu (PhD) katika Chuo Kikuu Huria cha Tanzania. Ninafanya utafiti kuhusu uzoefu na mbinu mbalimbali unazotumia kujifunza. Matokeo ya utafiti huu yataniwezesha kupendekeza maboresho kadhaa kwa watunga sera, walimu na wazazi kuhusiana na jinsi ya kurahisisha kujifunza miongoni mwa wanafunzi. Hivyo ninaomba ushirikiano wako katika kujaza dodoso hii, na ujitahidi kujibu maswali yote kwa uaminifu. Taarifa utakazozitoa zitakuwa siri na zitatumika tu kwa lengo la utafiti huu. Ikiwa kwa hiari yako unakubali kushiriki katika utafiti huu tafadhali jibu maswali yafuatayo:

B: Taarifa Binafsi

i) Jina la shule yako: …….
ii) Jina lako …….
iii) Tarehe ……
iv) Umri wako ni miaka: ……..……...
v) Jinsia: weka tiki (✓) Me☐ Ke ☐

vi) Elimu katika familia yako: – Tafadhali tumia jedwali lifuatalo kuweka alama ya vema (✓) chini ya kiwango cha juu cha elimu aliyofikia mhusika katika familia yako:

Mwanafamilia	***Kiwango cha juu cha elimu alichofikia***						
	Darasa la saba	Kidato cha nne	Kidato cha sita	Staashahada (Diploma)	Shahada (Degree)	Shahada (Degree) +	Hakusoma
Baba yako							
Mama yako							
Kaka yako							
Dada yako							
Mlezi wako							

vii) Kazi ya wanafamilia – tafadhali taja kazi anayofanya kila mwanafamilia katika jedwali lifuatalo:

Mwanafamilia	***Kazi***
Baba yako	
Mama yako	
Kaka yako	
Dada yako	
Mlezi wako	

C: Fikra Mtawanyiko

Maelekezo:

Katika sehemu hii kuna vifaa vitano vinavyopatikana katika mazingira yetu. Tafadhali tumia dakika tano tu kuandika majibu kwa kila kifaa. Fikiri kwa makini na kwa haraka na uandike jibu unalofikiri kuwa sahihi kulingana na uzoefu wako.

Kwa ufupi fikiria na uorodheshe namna mbalimbali ambazo ungeweza kutumia vifaa vifuatavyo:

Kwa mfano,

Jiwe

- Matumizi: - Kujengea nyumba
  - Kuwashia moto
  - Kipigia ng'ombe
  - Kukalia n.k.

Vifaa:

1. Pipa
   - ……
   - …… ……
   - ……
   - ……
   - ……
   - ……
   - ……
   - ……
   - ……
   - …… ……
   - ……
   - ……
   - ……
   - ……
   - ……
   - ……
2. Kipande cha karatasi
   - ……
   - …… ……
   - ……
   - ……
   - ……
   - ……
   - ……
   - ……
   - ……

- ……. ……
- ……
- ……
- ……
- ……
- ……
- ……

3. Ardhi iliyo wazi
    - ……
    - ……
    - ……. ……
    - ……
    - ……
    - ……
    - ……
    - ……
    - ……
    - ……
    - ……
    - ……
4. Mti
    - ……
    - ……. ……
    - ……
    - ……
    - ……
    - ……
    - ……
    - ……
    - ……
    - ……
    - ……
5. Kisu
    - ……
    - ……. ……
    - ……
    - ……
    - ……
    - ……
    - ……
    - ……
    - ……
    - ……
    - ……

- ……
- ……
- ……
- ……
- ……
- ……

D: Fikra Mkusanyo

i) Chemsha bongo za hesabu

Katika kujibu maswali yafuatayo, hulazimiki kutumia kanuni yoyote ya hesabu uliyofundishwa, lakini jitahidi kufikiri kwa makini hadi upate jibu sahihi.

1. Katika familia ya Bwana Smith, kuna wasichana 7 na kila msichana ana kaka 1. Je, kuna wanaume wangapi katika familia ya Bwana Smith?
Jibu:
……
……

2. Magugu maji huongezeka mara mbili katika eneo kila saa 24. Mwanzoni mwa majira ya kiangazi kuna gugu maji moja katika ziwa. Magugu maji hutumia siku 60 kulifunika ziwa lote kikamilifu. Je, ni siku ipi (siku ya ngapi kati ya hizo 60) magugumaji yatakuwa yamefunika nusu ya ziwa?

Jibu:
……
……

3. Ukiwa na soksi nyeusi na kahawia, zilizochanganywa katika uwiano wa 4 kwa 5 kabatini, utalazimika kutoa soksi ngapi kabatini ili kuhakikisha kwamba una doti moja ya soksi yenye rangi sawa?

Jibu:
……
……

4. Jana nilikwenda katika hifadhi ndogo ya wanyama nikaona twiga na mbuni. Wote kwa pamoja walikuwa na macho 30 na miguu 44. Je, kulikuwa na wanyama wangapi pale?
Jibu:
……
……

5. Mtu mmoja alinunua farasi kwa shilingi 60 na kumuuza kwa shilingi 70. Halafu alimnunua tena kwa shilingi 80 na kumuuza kwa shilling 90. Je, mtu huyu alipata faida au hasara kiasi gani katika biashara yake ya farasi?

Jibu:

……

……

ii) Chemsha bongo za semi

Kama ulivyofanya katika sehemu iliyotangulia, hulazimiki kutumia kanuni yoyote uliyofundishwa, lakini jitahidi kufikiri kwa makini hadi upate jibu sahihi.

1. Mfungwa alikuwa akijaribu kutoroka kutoka katika ghorofa. Hata hivyo, kamba aliyoipata chumbani mwake ilikuwa na nusu tu ya umbali wa kuelekea chini, na hivyo isingemfikisha chini kwa usalama. Aliigawanya kamba nusu na kuvifunga vipande viwili kisha akatoroka. Aliwezaje kufanya hivyo?

   Jibu:

   ……

   ……

2. Ni kwa jinsi gani unaweza kukata tundu kwenye kadi ya upana wa sentimeta 7.5 kwa urefu wa sentimeta 12.5; ambalo litakuwezesha kupitisha kichwa chako kwa urahisi?

   Jibu:

   ……

   ……

3. Marsha na Marjorie walizaliwa siku moja ya mwezi mmoja wa mwaka mmoja kwa mama na baba mmoja lakini siyo mapacha. Linawezekanaje hili?

   Jibu:

   ……

   ……

4. Wanawake watatu - Joan, Dana, and Sandy – wana watoto watatu - Sam, Traci, na David. Sam anapenda kucheza na kijana wa Dana. Mara chache Sandy huwalea watoto wa Joan. Ni nani mama wa Traci?

Jibu:

……

……

5. Timu yetu ya mpira wa kikapu ilishinda mchezo wiki iliyopita kwa vikapu 73 - 49, lakini hakuna mwanamume hata mmoja katika timu yetu ambaye alipata hata alama moja. Je, hili linawezekanaje?

   Jibu:

   ……

   ……

iii) Chemshabongo za nafasi-anga

Tafadhali kumbuka kuwa hapa pia hulazimiki kutumia kanuni yoyote uliyofundishwa, lakini jitahidi kufikiri kwa makini hadi upate jibu lilio sahihi.

1. **Nukta:** Bila kuinua penseli/kalamu yako kutoka kwenye karatasi, unganisha nukta zote 4 kwa mistari 2 iliyonyooka.

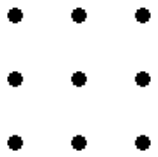
2. Mtunza bustani ameelekezwa kupanda miti minne na ahakikishe kuwa umbali kutoka mti mmoja hadi mti mwingine unakuwa sawa kabisa. Je, anawezaje kufanya hivyo?

   Jibu: (baada ya maelezo waweza kuonyesha pia kwa mchoro kwenye kisanduku).

   ……

   ……

3. Chora mistari minne iliyonyooka, ukiunganisha nukta zote bila kuinua penseli kutoka kwenye karatasi yako.



4. Uliagizwa kuvusha mbuzi, simba, na nyasi, ng'ambo ya pili ya mto. Mto ulikuwa mpana kiasi kwamba usingeweza kuogelea bali ulilazimika kutumia mtumbwi. Nafasi uliyopewa ndani ya mtumbwi ilikuwezesha kuvusha kitu kimoja tu kati ya hivyo kwa safari moja. Hata hivyo ulitahadharishwa kuwa usipokuwepo, Simba angeweza kumuua na kumla Mbuzi; halikadhalika, mbuzi angeweza kula majani. Licha ya vikwazo hivyo, hatimaye ulifanikiwa kuvivusha vyote. Uliwezaje kufanya hivyo?

   Jibu:

   ……
   ……

5. Fikiria wewe ni daktari unayetibu uvimbe hatari tumboni. Huwezi kufanya upasuaji lakini ni lazima uharibu uvimbe. Ungeweza kutumia mionzi mikali kuharibu uvimbe lakini kwa bahati mbaya mionzi mikali inayohitajika kuharibu uvimbe pia itaharibu chembe hai zitakazopitiwa na mionzi hiyo. Na mionzi yenye makali kidogo haitaharibu chembe hai lakini pia haitamudu kuharibu uvimbe. Ni kwa jinsi gani unaweza kuharibu uvimbe pasipo kuharibu chembe hai?

   Jibu:

   ……
   ……

6. Onesha ni wapi herufi Z inaweza kuwekwa, juu au chini ya mstari na kwa nini?

   A EF HI KLMN T VWXY

   BCD G J OPQRS U

Jibu:

……
……

iv) Jedwali lifuatalo lina maelezo kuhusu mbinu mbalimbali ambazo watu hutumia wanaposoma mambo yanayohusiana na masomo kama vile vitabu vya kiada au vitabu vya maktaba. Baada ya kila sentensi, zungushia namba (1, 2, 3, 4 au 5) kwa jinsi ambavyo sentesi hiyo ineleza kile unachokifanya. Kumbuka kuwa hakuna jibu la kweli au lisilo kweli katika maswali yaliyoko katika kipengele hiki, bali ninahitaji uzoefu wako halisi katika kutumia mbinu hizi. Hivyo jitahidi kueleza vile ulivyo hasa. Namba zinamaanisha:

1 = "Sijawahi kufanya hivi."
2 = "Nafanya hivi mara chache."
3 = "Wakati mwingine nafanya hivi" (kama asilimia **50** ya muda wangu wa kujifunza).
4 = "Mara nyingi huwa nafanya hivi ."
5 = "Nafanya hivi mara zote."

	Maelezo	Majibu				
1	Ninakuwa na lengo fulani akilini ninapokuwa nikisoma.	1	2	3	4	5
2	Huwa naandika notisi wakati ninaposoma kunisaidia kuelewa kile ninachosoma.	1	2	3	4	5
3	Huwa natafakari ninayoyaelewa kunisaidia kuelewa kile ninachosoma.	1	2	3	4	5
4	Huwa napitia ufupisho wa kitabu kuona kinaelezea nini kabla ya kuanza kukisoma.	1	2	3	4	5
5	Mada au aya inapokuwa ngumu, huwa nasoma kwa sauti kunisaidia kuelewa kile ninachokisoma.	1	2	3	4	5
6	Huwa naandika muhutasari kupata mawazo makuu katika mada au aya.	1	2	3	4	5
7	Huwa natafakari kama maudhui ya mada au aya yanaendana na lengo langu.	1	2	3	4	5
8	Huwa nasoma taratibu lakini kwa uangalifu kuhakikisha kuwa naelewa ninachokisoma.	1	2	3	4	5
9	Huwa najadili nilichokisoma na wenzangu ili kujiridhisha kama nimeelewa.	1	2	3	4	5
10	Huwa napitia mada au aya kwa harakaharaka kwanza kuangalia urefu na mpangilio wa vipengele vyake kabla ya kusoma kwa makini.	1	2	3	4	5
11	Huwa najitahidi kurudi kwenye mada ninapopoteza umakini (concentration)	1	2	3	4	5
12	Huwa napigia mstari au kuzungushia taarifa yenye pointi katika mada au aya kunisaidia kuikumbuka.	1	2	3	4	5
13	Huwa narekebisha kasi yangu ya kusoma kutokana na kile ninacho soma.	1	2	3	4	5
14	Huwa nachagua kipi nitilie mkazo kusoma na kipi nikipuuzie.	1	2	3	4	5
15	Huwa natumia vitabu vya ziada kama vile kamusi kunisaidia kuelewa ninachokisoma.	1	2	3	4	5
16	Mada au aya inapokuwa ngumu, huwa nazidisha umakini na usikivu katika kile ninachokisoma.	1	2	3	4	5
17	Natumia majedwali, maumbo, na picha zilizo katika kitabu kuongeza uelewa wangu.	1	2	3	4	5
18	Huwa natulia na kuacha kusoma kwa muda ili kutafakari ninachokisoma.	1	2	3	4	5
19	Ninatumia viashirio vya muktadha/mazingira kunisaidia kuelewa vizuri kile ninachokisoma.	1	2	3	4	5
20	Nikishasoma huwa naandika niliyoyasoma tena kwa maneno yangu mwenyewe ili nielewe vizuri ninayoyasoma.	1	2	3	4	5
21	Huwa najaribu kujenga picha au taswira ya kile ninachokisoma ili kunisaidia kukikumbuka.	1	2	3	4	5
22	Ninaposoma huwa natumia misaada ya kiuchapaji kama vile maandishi yaliyokolezwa au yaliyolazwa kubainisha pointi muhimu.	1	2	3	4	5
23	Huwa natathmini kwa kina taarifa ninayoisoma katika mada au	1	2	3	4	5

	aya.					
24	Huwa narudiarudia ninaposoma mada au aya kutafuta jinsi vipengele vya mada vinavyohusiana.	1	2	3	4	5
25	Huwa nahakiki uelewa wangu ninapokutana na poiti zinzopingana.	1	2	3	4	5
26	Huwa najaribu kubuni insha au aya inahusu nini ninapokuwa nasoma.	1	2	3	4	5
27	Mada au aya inapokuwa ngumu, huwa narudiarudia kuisoma ili kuongeza uelewa wangu.	1	2	3	4	5
28	Huwa najiuliza maswali ambayo ningependa kuyajibu kutoka katika mada au aya nilizosoma.	1	2	3	4	5
29	Huwa nahakiki ili kujiridhisha kama yale niliyobuni kuhusu insha au aya inachosema ni kweli au si kweli.	1	2	3	4	5
30	Ninaposoma huwa najitahidi kubuni maana ya maneno magumu au tungo nisizojua maana yake.	1	2	3	4	5

Ahsante kwa ushirikiano wako!

Appendix 5: Teacher Observation Protocols (TOP)

Name of school: …….
Teacher's name ……..
Teacher's age …….
Teaching experience ……..
Date ……
Subject taught …….
Class duration …….

Thinking skills fostered		**Timing of fostering**			
Variable	***Specific variable item***	***First 10 minutes***	***11-20 minutes***	***21-30 minutes***	***31-40 minutes***
Divergent thinking	Teacher encouraged input and challenged pupils' ideas				
	Teacher was non-judgmental of pupil opinions				
	Teacher solicited alternative explanations				
	Pupils provided evidence-based arguments				
	Pupils listened critically to others' explanations				
	Pupils discussed/Challenged others' explanations				
	Teacher presented open-ended questions				
	Teacher encouraged discussion of alternative explanations				
	Teacher accepted multiple responses to problem-solving situations				
	Teacher provided example evidence for pupil interpretation				
	Teacher encouraged pupils to challenge the text as well as each other				
	Pupils generated conjectures and alternate interpretations				
	Pupils critiqued alternate solution strategies of teacher and peers				
Convergent thinking	Teacher presented information that was accurate and appropriate to pupil cognitive level				
	Teacher asked higher level questions				

Thinking skills fostered		**Timing of fostering**			
Variable	***Specific variable item***	***First 10 minutes***	***11-20 minutes***	***21-30 minutes***	***31-40 minutes***
	Teacher encouraged pupils to extend concepts and skills				
	Teacher related integral ideas to broader concepts				
	Teacher encouraged pupils to come up with single correct answers				
	Pupils asked and answered higher level questions				
	Pupils related subordinate ideas to broader concept				
Metacognition	Teacher encouraged pupils to explain their understanding of concepts				
	Teacher encouraged pupils to explain in own words both what *and* how they learned				
	Teacher routinely asked for pupil input and questions				
	Pupils discussed what they understood from the class *and* how they learned it				
	Teacher encouraged pupils to take summary notes to reflect on key ideas of the lesson				
	Teacher posed from time to time to let pupils think about what has been taught				
	Pupils identified anything unclear to them				
	Pupils reflected on and evaluated their own progress toward understanding				

Appendix 6: The Coding Scheme for the Main Data Set

Variable	***SPSS variable name***	**Coding instructions**
Identification number	ID	Number assigned to each questionnaire
Sex	Sex	1= Male; 2= Female
Age	Age	Age in years
Location	Location	1 = Urban; 2 = Rural
Education Level of the father	Fathedn	1 = Primary education 2 = Secondary education 3 = Certificate or diploma 4 = Tertiary education
Education Level of the mother	Mothen	1 = Primary education 2 = Secondary education 3 = Certificate or diploma 4 = Tertiary education
Education Level of the sibling	Siblingedn	1 = Primary education 2 = Secondary education 3 = Certificate or diploma 4 = Tertiary education
School ranking	Quality	1 = High performing school 2 = Low performing school
Fluency in uses of a drum	DrumFlue	Number as calculated in the SPSS
Flexibility in uses of a drum	DrumFlex	“
Elaboration in uses of a drum	DrumElab	“
Originality in uses of a drum	DrumOrig	“
Fluency in uses of a piece of paper	PaperFlue	“
Flexibility in uses of a piece of paper	PaperFlex	“
Elaboration in uses of a piece of paper	PaperElab	“
Originality in uses of piece of paper	PaperOrig	“
Fluency in uses of a piece of land	LandFlue	“
Flexibility in uses of a piece of land	LandFlex	“
Elaboration in uses of a piece land	LandElab	“
Originality in uses of a piece of land	LandOrig	“
Fluency in uses of tree	TreeFue	“
Flexibility in uses of tree	TreeFlex	“
Elaboration in uses of tree	TreeElab	“
Originality in uses of tree	TreeOrig	“
Fluency in uses of a knife	KnifeFlue	“
Flexibility in uses of a knife	KnifeFlex	“
Elaboration in uses of a knife	KnifeElab	“
Originality in uses of a knife	KnifeOrig	“
Mathematical insight tasks	Mathtask	“
Verbal insight tasks	Verbaltask	“
Spatial insight tasks	Spatialtask	“
Metacognitive Awareness of Reading		1 = Never or almost never

Strategies Inventory; Items 1 – 30.	MARS1 – 30	2 = Only occasionally 3 = Sometimes (about 50% of the time) 4 = Usually 5 = Always or almost always
Total Divergent Thinking	TDIV	Number as calculated in the SPSS
Total Convergent Thinking	TCONV	“
Total Metacognitive Thinking	TMET	“
Total Fostering of Divergent Thinking	TFDT	“
Total fostering of Convergent Thinking	TFCT	“
Total Fostering of Metacognitive Thinking	TFMT	“

Appendix 7: Detailed Descriptive Statistics for the Main Tasks

The Mentioned Uses of Items

Item	Uses	Total Responses	
		f	*%*
Drum	To store liquid substances such as water and petroleum	444	100
	To brew local alcoholic drinks	311	70.05
	To store foods such as corns, millet and dry cassava.	151	34.00
	T o recycle and make other iron tools like cooker, bucket, frying pan, and dishes.	130	29.30
	To stand on it as a ladder to help reach high objects	127	28.60
	To cook foods like ugali in it for many people	113	25.45
	To boil water	93	20.95
	To boil the tarmac in it	19	4.28
	To burn waste materials	11	2.50
	To sail on it (travel by water)	8	1.80
	To hide oneself in it	8	1.80
	To make a loud speaker	4	0.90
A piece of paper			
	To write	429	96.62
	To lit fire	274	61.71
	To wrap or enclose commodities bought	146	32.88
	To print pictures	168	37.84
	To erase written words on the chalk board	118	26.58
	To make decorations	100	22.52
	To keep records	83	18.69
	To make cigarettes	36	8.11
	To make laboratory experiments e.g. differentiating color,	22	4.95
	To measure distance on maps	13	2.92
	To hold hot objects	11	2.48
	To fill or seal the holes on the wall	8	1.80
	To sit on to avoid dust	7	1.58
	To make teaching aids	5	1.13
	To vote with	5	1.13
	To fan or breeze oneself when it is hot	3	0.68
	To make money	1	0.23
	To clean one's ears	1	0.23
	To label samples or animals	1	0.23
A piece of an empty land			
	To cultivate / for agriculture	414	93.24
	To build settlements	379	85.36
	To make business	129	29.05

Item	Uses	Total Responses	
		f	*%*
	Construct playing grounds	162	36.49
	To conserve natural ecosystem	108	24.32
	To graze animals or stocks	75	13.29
	To construct roads and railways	59	13.29
	As a meeting square	41	9.23
	To dig minerals	36	8.10
	To beautify the landscape	31	6.98
	To bury dead bodies	16	3.60
	To quarry building materials like sand, and stones	12	2.70
	To lay crops for drying purpose	3	0.68
	To damp wastes	1	0.23
Tree			
	To make firewood and charcoal	362	81.53
	To cool the weather by providing breeze	357	80.40
	To make building materials	283	63.74
	To construct furniture	233	52.48
	To collect food and fruits	232	52.25
	To make timber	212	47.75
	To collect medicine	157	35.36
	To beautify surroundings	119	26.80
	To keep bees	88	19.82
	To stop storms or rough winds	58	13.06
	To grind maize, millet cassava etc.	47	10.59
	To make papers	47	10.59
	To make weapons like a stick or gun	15	3.38
	To make electrical posts	9	2.02
	To make tourism attraction	6	1.35
	To construct a bridge	5	1.12
	To make clothes	4	0.90
	To make matchbox	3	0.68
	Children play on it by flinging around	3	0.68
	To rescue a person from electrical shock	2	0.45
	To make decorations like sculptures or images	2	0.45
	To make soap	2	0.45
	To rest under the tree shade	2	0.45
	To hide on	1	0.23
	To make a boat	1	0.23
	To help reach and bring down high object	1	0.23
A knife			
	As a weapon	240	54.05
	To cut things into pieces	417	93.92
	To dig small holes	49	11.04
	To make decorations like sculptures or images	30	6.78

Item	Uses	Total Responses	
		f	*%*
	To tighten and loose nuts in absence of spanner	22	4.95
	To label cattle	2	0.45
	As a decoration	1	0.23
	To sell and get money	1	0.23

Descriptive Data for the MARSI

Scale:
1 = Never or almost never
2 = Only occasionally
3 = Sometimes (about 50% of the time)
4 = Usually
5 = Always or almost always

		Scale											
		1		**2**		**3**		4		5			
Statements		*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*M*	*Decision*
1	I have a purpose in mind when I read.	23	5.2	57	12.8	42	9.5	134	30.2	188	42.3	3.92	Usually
2	I take notes while reading to help me understand what I'm reading.	27	6.1	49	11.0	66	14.9	143	32.2	159	35.8	3.81	Usually
3	I think about what I know to help me understand what I'm reading.	9	2.0	43	9.7	57	12.8	156	35.1	179	40.3	4.02	Usually
4	I preview the text to see what it's about before reading it.	47	10.6	102	23.0	65	14.6	114	25.7	116	26.1	3.34	Usually
5	When text becomes difficult, I read aloud to help me understand what I'm reading.	162	36.5	98	22.1	51	11.5	76	17.1	57	12.8	2.48	Sometimes
6	I write summaries to reflect on key ideas in the text.	67	15.1	110	24.8	79	17.8	99	22.3	89	20.0	3.07	Sometimes
7	I think about whether the content of the text fits my purpose.	54	12.2	85	19.1	89	20.0	112	25.2	104	23.4	3.29	usually

8	I read slowly but carefully to be sure I understand what I'm reading.	10	2.3	30	6.8	44	9.9	129	29.1	231	52.0	4.22	Usually
9	I discuss my reading with others to check my understanding.	23	5.2	60	13.5	68	15.3	161	36.3	132	29.7	3.72	Usually
10	I skim the text first by noting characteristics like length and organization.	100	22.5	94	21.2	73	16.4	98	22.1	79	17.8	2.91	Sometimes
11	I try to get back on track when I lose concentration.	26	5.9	45	10.1	46	10.4	142	32.0	185	41.7	3.93	Usually
12	I underline or circle information in the text to help me remember it.	40	9.0	88	19.8	57	12.8	117	26.4	142	32.0	3.52	Usually
13	I adjust my reading speed according to what I'm reading.	38	8.6	66	14.9	82	18.5	136	30.6	122	27.5	3.54	Usually
14	I decide what to read closely and what to ignore.	151	34.0	82	18.5	68	15.3	71	16.0	72	16.2	2.62	Sometimes
15	I use reference materials such as dictionaries to help me understand what I'm reading.	18	4.1	49	11.0	61	13.7	138	31.1	178	40.1	3.92	Usually
16	When text becomes difficult, I begin to pay closer attention to what I'm reading.	21	4.7	29	6.5	45	10.1	149	33.6	200	45.0	4.08	Usually
17	I use tables, figures, and pictures in text to increase my understanding.	40	9.0	66	14.9	87	19.6	126	28.4	124	27.9	3.54	Usually
18	I stop from time to time to think about what I'm reading.	38	8.6	72	16.2	82	18.5	136	30.6	116	26.1	3.50	Usually
19	I use context clues to help me better understand what I'm reading.	40	9.0	86	19.4	94	21.2	135	30.4	89	20.0	3.33	Usually
20	I paraphrase (restate ideas in my own words) to better understand what I'm reading.	22	5.0	54	12.2	74	16.7	130	29.3	164	36.9	3.81	Usually

21	I try to picture or visualize information to help me remember what I'm reading.	11	2.5	41	9.2	59	13.3	151	34.0	182	41.0	4.02	Usually
22	I use typographical aids like boldface type and italics to identify key information.	64	14.4	67	15.1	78	17.6	122	27.5	113	25.5	3.34	Usually
23	I critically analyze and evaluate the information presented in the text.	22	5.0	55	12.4	83	18.7	147	33.1	137	30.9	3.73	Usually
24	I go back and forth in the text to find relationships among ideas in it.	25	5.6	57	12.8	78	17.6	154	34.7	130	29.3	3.69	Usually
25	I check my understanding when I come across conflicting information.	33	7.4	62	14.0	74	16.7	155	34.9	120	27.0	3.60	Usually
26	I try to guess what the text is about when reading.	75	16.9	83	18.7	99	22.3	107	24.1	80	18.0	3.08	Sometimes
27	When text becomes difficult, I reread to increase my understanding.	19	4.3	35	7.9	51	11.5	148	33.3	191	43.0	4.03	Usually
28	I ask myself questions I like to have answered in the text.	21	4.7	65	14.6	80	18.0	143	32.2	135	30.4	3.69	Usually
29	I check to see if my guesses about the text are right or wrong.	50	11.3	61	13.7	84	18.9	138	31.1	111	25.0	3.45	Usually
30	I try to guess the meaning of unknown words or phrases.	64	14.4	67	15.1	71	16.0	130	29.3	112	25.2	3.36	Usually

Appendix 8: Research Clearance Letters

THE OPEN UNIVERSITY OF TANZANIA
DIRECTORATE OF RESEARCH, PUBLICATIONS,
POSTGRADUATE STUDIES AND CONSULTANCY SERVICES

P.O. Box 23409
Dar Es Salaam, Tanzania
http://www.openuniversity.ac.tz

Tel: 255-22-2668992/2668445 ext.2101
Fax: 255-22-2668759
E-mail: drpgs@out.ac.tz

Ref. no. HD/E/755/T.12

19th October, 2012

The Regional Administrative Secretary,
Dodoma Region,
P.O. Box 914,
DODOMA.

RE: RESEARCH CLEARANCE

This is to certify that the bearer of this letter, **Mr. Joel Matiku Joshua,** is a student of the Open University of Tanzania pursuing a PhD degree program in the Faculty of Education. As part of his degree program he will be conducting research in selected secondary schools in Dodoma Region on **"The Relationship between Creative Thinking Metacognition and Academic Performance among Secondary School Pupils in Tanzania.** His study will begin in November 2012. It will end in December, 2013.

You are, therefore, kindly requested to allow the candidate to conduct his study.

Yours faithfully,
THE OPEN UNIVERSITY OF TANZANIA

Dr. John P.A. Msindai
For Director – Research, Publications and Postgraduate Studies
Open University of Tanzania

THE UNITED REPUBLIC OF TANZANIA
OFFICE OF THE PRIME MINISTER
REGIONAL ADMINISTRATIVE AND LOCAL GOVT.

Dodoma Region
Address REGCOM
Tel. No: 2324343/2324384
E-Mail No. rasdom2002tz@yahoo.com
Fax No. 255 026 2320046

Regional Commissioner's Office
P.O. Box 914,
DODOMA.

In reply please quote:

Ref. No. DB.467/526/01/7

15th November, 2012

The Municipal Executive Director,
P.O. Box 1249,
DODOMA.

RE: PERMISSION TO CONDUCT RESEARCH AT YOUR SECONDARY SCHOOLS – MR JOEL MATIKU JOSHUA

This is to introduce to you, Mr. Joel Matiku Joshua, who is a bonafide student of the Open University of Tanzania and who is at the moment conducting research.

Please grant permission for him to see and talk to the leaders and members of your Secondary School in connection with his research "**THE RELATIONSHIP BETWEEN CREATIVE THINKING METACOGNITION AND ACADEMIC PERFORMANCE AMONG SECONDARY SCHOOL PUPILS IN TANZANIA.**"

The period of research is from November 2012 to December 2013.

Please assist him for the success of his research.

Thank you,

Moshi, P.
For: REGIONAL ADMINISTRATIVE SECRETARY
DODOMA

Copy to: Joel Matiku Joshua

THE UNITED REPUBLIC OF TANZANIA
OFFICE OF THE PRIME MINISTER
REGIONAL ADMINISTRATIVE AND LOCAL GOVT.

Dodoma Region
Address REGCOM
Tel. No: 2324343/2324384
E-Mail No. rasdom2002tz@yahoo.com
Fax No. 255 026 2320046

Regional Commissioner's Office
P.O. Box 914,
DODOMA.

In reply please quote:

Ref. No. DB.467/526/01/8

15th November, 2012

The District Executive Director,
MPWAPWA.

RE: PERMISSION TO CONDUCT RESEARCH AT YOUR SECONDARY SCHOOLS – MR JOEL MATIKU JOSHUA

This is to introduce to you, Mr. Joel Matiku Joshua, who is a bonafide student of the Open University of Tanzania and who is at the moment conducting research.

Please grant permission for him to see and talk to the leaders and members of your Secondary School in connection with his research "**THE RELATIONSHIP BETWEEN CREATIVE THINKING METACOGNITION AND ACADEMIC PERFORMANCE AMONG SECONDARY SCHOOL PUPILS IN TANZANIA.**"

The period of research is from November 2012 to December 2013.

Please assist him for the success of his research.

Thank you,

Moshi, P.
For: REGIONAL ADMINISTRATIVE SECRETARY
DODOMA

Copy to: Joel Matiku Joshua

UNITED REPUBLIC OF TANZANIA
DODOMA MUNICIPAL COUNCIL
(All correspondence be addressed to Municipal Director)

DODOMA REGION
Tel: 2354817
Fax: 2354817

OFFICE OF MUNICIPAL DIRECTOR,
P.O.BOX 1249,
DODOMA

E-mail: dodomamunicipality@yahoo.co.uk

in reply please quote:

Ref: HMD/F. 20/26/200 ***19TH November 2012***

The Headmasters/Headmistresses
Msalato, Huruma Girls, Chinangali
Dodoma, Doreta and Chihanga Secondary School
Dodoma Municipal Council
Dodoma.

RE: INTRODUCING MR. JOEL MATIKU JOSHUA

The above named is a student of Open University of Tanzania pursuing a Doctor of Philosophy (Ph.D) degree.

I am sending him to you for data collection; he is doing a research titled **'THE RELATIONSHIP BETWEEN CREATIVE THINKING, METACOGNITION AND ACADEMIC PERFORMANCE AMONG SECONDARY SCHOOL PUPILS IN TANZANIA".**

Please give him cooperation

Sincerely

Ntilema Liberatus
For: MUNICIPAL DIRECTOR
DODOMA.

C.C **Joel Matiku Joshua**

Jamhuri ya Muungano wa Tanzania
OFISI YA WAZIRI MKUU

TAWALA ZA MIKOA NA SERIKALI ZA MITAA
HALMASHAURI YA WILAYA YA MPWAPWA
IDARA YA ELIMU SEKONDARI

Simu ya Maandishi: DISCO MPWAPWA
Simu ya Mdomo: 026- 2320122/2320152/2320795
Fax Na. 255 – 026 – 2320122/2320152

S.L.P 12
MPWAPWA
20/11/2012

Kumb.Na. ED/MP/NCT/CF/SS/148

Mkuu wa shule,
Shule ya sekondari Mpwapwa, Kimaghai,
Ipera, Pwaga, Vingh'awe, Madanya N.V, na Mazae.

YAH: RUHUSA YA KUFANYA UTAFITI KATIKA SHULE YAKO

Rejea mada tajwa hapo juu.
Napenda kumtambulisha Ndugu **Joel Matiku Joshua**, ambaye anahitaji kukutana na uongozi, walimu na wanafunzi katika shule yako ili kufanya utafiti wa kielimu. Tafadhali apewe ushirikiano.

D.S. Shayo
K.N.Y. Mkurugenzi wa Halmashauri,
Halmashauri ya wilaya ya Mpwapwa.

K.n.y. MKURUGENZI MTENDAJI
HALMASHAURI YA WILAYA
MPWAPWA

Nakala kwa:
- Joel Matiku Joshua