

EFFECTS OF COGNITIVE STYLE AND CONTEXT ON CREATIVITY AMONG SECONDARY SCHOOL STUDENTS

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ABSTRACT

The study examined effects of cognitive style and context on creativity using one hundred and twelve (112) participants drawn from Capital City Secondary School Awka, Nigeria. Participants' responses from Group Embedded Figure Test (GEFT) and Alternate Uses Task (AUT) used in measuring cognitive style and creativity respectively were subjected to 2-way ANOVA statistical test. The results of the analysis showed a significant main effect for cognitive style, $F(1, 108) = 8.07, p < .005$ with the field-independent ($M = 13.63, SD = 3.50$) performing better on creativity task than the field-dependent ($M = 11.75, SD = 3.69$), which confirmed hypothesis I. Also, a significant main effect was observed for context, $F(1, 108) = 6.88, p < .01$ with the same environmental context ($M = 13.55, SD = 3.32$) performing better on creativity task than the different environmental context ($M = 11.82, SD = 3.89$), which also confirmed hypothesis II. The implications of the findings are that field-independent and field-dependent students performed differently to the same and different environmental context on creativity tasks. Suggestions were made for further study.

Keywords: cognitive style, field-dependent, field-independent, context, creativity

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Introduction

The school environment at present is changing and has gradually become more competitive, and as such, it is very critical to prepare students to live, work and be successful in this setting (Ford & Gioia, 2000). Hence, the ability to creatively exploit opportunities has become an essential skill (Florida, 2002).

This brings creativity to the fore when preparing students to deal with uncertainty and to adapt to continuous changes. Creativity is an innate part of individual's daily experience. This is because, the human capacity to be creative is evident in virtually all aspects of human life, especially when engaged in choice and decision making, language and communication, as well as planning and organization (Abraham, 2016; Runco & Pritzker, 2011; Sawyer, 2012).

According to Simonton (2000), creativity is that characteristic of human behavior that seems most mysterious, and yet most critical to human advancement. The ability or capacity to solve problems in new forms and to generate ideas or produce works that are novel, appropriate, and socially valued has fascinated people for centuries. Most creativity researches deal with the nature of creativity, the distinctive characteristics of the creative person, and creativity development across the individual's life span, as well as the social environments that are most strongly associated with creative activities (Simonton, 2000).

Basically, there is no simple definition of creativity but several emphases have been made in the past that highlight various aspects of the creative effort, with respect to its process and its product (Hans, 2006). A defining characteristic of creativity is that of novelty which means producing or generating something new and useful (Andreasen, 2005; Bean, 1992; Mumford, 2003). In the same

vein, Sternberg and Lubart (1999) gave the most commonly accepted definition of creativity as the ability to produce work that is both novel (original) and appropriate (useful). Simonton (2012) also came up with a formulae, Creativity = Originality × Appropriateness. If something is not original or appropriate then it cannot be considered creative.

Beghetto and Kaufman (2014) further elaborated on Simonton's formulae to include context: $C = [O \times A] \text{ context}$. Stressing on what is considered original or appropriate is determined by a particular cultural, historical and social context (Plucker, Beghetto, & Dow, 2004). Appropriateness can be trained by enhancing people's basic technical skills and by equipping them with sufficient domain-specific-knowledge. But, novelty or originality is not something that can be easily manipulated. Some think that people are born either with or without it and, others believe that novelty always requires features that are unpredictable and unexpected.

However, creativity study cannot be isolated; it also can be seen as a cognitive style (Wissink, 2001). It proposes the interpretation of creativity as a way of approaching the environment cognitively and of resolving and dealing with problems. In an investigation by Corbolan-Berna (1992), four creativity variables (flexibility, fluency, originality and development production) were studied as well as ten different cognitive processes (attention-perceptual speed, contextual patterning, details perception, letter search, memory,

metaphor generation, question generation, reaction, spatial perception and stroop effect). Here, the major identifier for the cognitive style “creativity” was “question generation”.

A creative problem is usually expressed as a question. A question, without being at the semantic level asks for information, which is at its symbolic or functional level the formation of a pattern. To question is to generate a new pattern from a former one, either by readjusting its items, or by linking it with other patterns. Research however, has demonstrated that individuals of various styles will possess different creative strengths and weaknesses (Bloomberg, 1967; Zilewicz, 1986). The utilization of the styles and its strengths, which individuals bring to a group, empowers the group to function more effectively and efficiently.

Style is concerned with form rather than content and refers to the manner in which one characteristically process information (Witkin & Goodenough, 1981). Styles are pervasive and cut across diverse spheres of behavior (Messick, 1976), that is, the style an individual possess at school will most likely be the one he/she possess at home or play. Individual’s cognitive styles are stable over time and when measured over a period of time, will relatively remain the same (Witkin, Moore, Goodenough, & Cox, 1977). Cognitive style therefore refers to individual’s creativity and pattern of problem solving. According to

Ozioko (1990), cognitive style is reported as the consistent way an individual looks at, evaluates and responds to a variety of situations.

Studies of Davis and Cochran (1989) observed that field-independent students typically demonstrate higher levels of achievement across some conceptual behaviour. Schunk (2000) for example, also points out that most children tend to be more field-dependent in their preschool years with a subsequent increase in field-independence that extends into adolescence. The study of Kush (1996) reported that regardless of students' cognitive style, those with field-independent teachers show greater achievement than those with field-dependent teachers. Studies (e.g., Amazue, 2006; Mbakwem & Mkpa, 2003; Ndukaihe, 2010) also found that field-independent subjects performed significantly better than field-dependent subjects. These findings are contrary to the work of Roach (1988) who found that the degree of students' field-dependence did not affect their ability to gain problem solving skills by either method.

It is necessary to recognize that the classroom environment impacts the development of creative potential (Beghetto & Kaufman, 2014), and to understand as well what it takes to develop an optimally supportive creative learning environment. Context, as another factor influencing creativity refers to a situation that forms the environment within which something exists or takes place. According to Mondofacto (2009), context is the instructional setting and

environment (e.g., fiscal conditions, student demographics, social milieu, and organizational relationships) within which the instruction occurs. Also, context effect is any influence of the physical, emotional, or social environment on an organism's response to a particular thing or event (Matsumoto, 2009). A study (e.g., Smith, Glenberg, & Bjork, 1978) on context-dependent memory, have found that physical environment is a powerful retrieval cue that demonstrably affects students' performance.

Godden and Baddeley (1975) observed in their study that what was learned under water was best recalled under water and vice versa. Biggs (1999) has insisted that; if teachers are serious about getting optimal performance from their students, then final examinations should be given in the same classroom in which the class meeting took place. However, some studies have shown that different testing conditions and different time constraints would result in differences in creativity test scores (Adams, 1968; Dewing, 1970). Although, the studies of Hattie (1977) as cited in Amabile (1983) and Mefoh (2006) found no significant effect of context on recall memory, this present study will however attempt to answer the following questions: would there be any significant difference in the performance of field-independent and field-dependent cognitive styles in a creativity task? Would there be any significant difference in the performance of same and different contexts in a creativity task?

Thus, this study examined the effects of cognitive style and context in relation to students' creativity. And it was hypothesized that field-independent cognitive participants will perform better in creativity task than the field-dependent cognitive participants. Again, same environmental context participants will perform better in creativity task than those in different environmental contexts.

Method

Participants

Participants for the study were one hundred and twelve (112) junior secondary school three (JSS3) students of Capital City Secondary School, Awka, Anambra State, Nigeria, consisting of fifty six (56) males and fifty six (56) females.

The participants were selected through simple random sampling method from the total population of one hundred and twenty eight (128) junior secondary school 3 students (2010 academic session). The age of the participants ranged from 12-16 years with the mean age of 13.87 years (SD, 1.42).

Materials

Two materials were used, the Oltman, Raskin, Herman, and Witkin (1971) Group Embedded Figures Test (GEFT) and the Silvia, Winterstein, Willse, Barona, Cram, Hess, Martinez, and Richard (2008) divergent thinking tasks: an alternate uses task. The Oltman and colleagues (1971) Group Embedded Figures Test is a group form of a scale for assessing field-independence and field-dependence cognitive style. The test is a perceptual test that requires a person to locate a simple figure when it is embedded within a large complex figure that has been organized in order to obscure the location of the simple forms. The test contains three (3) sections. The first section, with seven (7) items, was used for practice, while the last two sections, with nine (9) items each, were scored to identify those with field independent or field dependent cognitive styles. Any figure that was correctly located within the given geometric design was scored 1 and 0 when it was not located correctly. Upon completion of the GEFT's, individual scores were categorized by field-independent or field-dependent orientations. Possible scores on the GEFT ranged from 0 to 18. In this study, the division between field-independent and field-dependent was set at a score of 12, as recommended by Witkin, Ottman, Raskin, and Karp (1971). Students scoring 12 or above on the GEFT were classified as field-independent, as they could more easily complete the task of finding the "hidden" figures. Students scoring 11 or below were classified as field-dependent, as they could less easily disemblem the "hidden" figure from the

surrounding pattern. So, the higher the score, the greater the field-independent; while the lower the score, the greater the field-dependent.

This instrument has been used by researchers in Nigeria (e.g. Mbakwem & Mkpa, 2003; Amazue, 2006). The GEFT is a speed test and as such its internal consistency is measured by treating each scored section (sections two and three) as split-halves. Witkin et al., (1971) reported a corrected Spearman-Brown reliability coefficient of .82 on the GEFT. While, the data generated from a pilot testing conducted with fifty five (55) Jss3 students of Community High School, Amorka, Anambra State, yielded a corrected Spearman-Brown reliability coefficient of .80 on the GEFT.

The Silvia's and colleagues (2008) alternate uses task used as the second material is a test for assessing individual creativity level. This can be administered in a group, and was designed to elicit specific information about creativity. The test is a creative thinking test that requires people to generate unusual ways of object uses. For this task, participants were instructed to generate alternate or unusual creative uses for common objects like, bricks and knives which, were scored with subjective scoring method using 1-5 scale ranging from "not at all creative" to "highly creative".

However, three judges rated the responses based on Top 2 scoring method after which the responses are averaged to form each person's creativity score for the task. This Top 2 index evaluates people's best efforts, in their own

judgment, and it thus, represents people's best level of performance when they are instructed to do their best and ratings of these "top 2 scores" served as the measure of creativity (Silvia et al., 2008). As suggested by Michael and Wright (1989), this approach controls for the number of responses that make up each person's score and assesses people's level of creativity based on their best responses. An earlier generalizability analysis found that unusual uses tasks produce dependable scores (Silvia et al., 2008). The reliability of the instrument was determined using an inter-rater reliability method. Silvia et al., (2008) reported a Cronbach's Alpha reliability coefficient of .80 on the creativity tasks while the data generated from a pilot study conducted with fifty five (55) Jss3 students of Community High School, Amorka, yielded a Cronbach's Alpha reliability coefficient of .71.

Procedure

Before the administration of the test materials, the experimenter established some rapport with the participants. They were told that the materials were not for examination but purely for research purposes. The tests were administered by the experimenter with the help of the research assistants in the school selected to carry out the study.

However, the experiment was carried out in two (2) consecutive days. The first day, the experimenter administered the first test material; the Group Embedded Figures Test (GEFT) to the entire 128 JSS3 students that were willing to

participate in the study. The participants were given a tag bearing the same number written boldly on top of the test material which served as an identity to the participants. From their performance in the GEFT, a sample of 112 participants (56 males and 56 females) who were considered to be field-independent and field-dependent respectively was randomly selected for the study.

The first section of the material comprised of seven items that were used for practice with the participants. Later on, they were given 40 minutes to solve the remaining two sections of nine items each. Thus, the following instructions were given to the students:

This is the test of your ability to find a simple form when it is hidden within a complex pattern. Try to find the simple form in the complex figure. It is the SAME SIZE, in the SAME PROPORTIONS and FACES IN THE SAME DIRECTION within the complex figure as when it appeared alone. When you finish turn the page to check your solution.

At the end of the 40 minutes, the experimenter asked the participants to stop attending to the test material and collect them for scoring.

The second day, the experimenter gathered the selected participants with their tag identification into the same classroom where the first test material was administered and taught them for ten minutes. During this period, the participants were given description of the concept of creativity and what was expected from them through examples.

Context was manipulated by assigning participants randomly into two groups; A and B. A toss of coin was used to randomly assign participants to the two treatment conditions of context (Same context vs. Different context). Each condition had equal number of field-independent and field-dependent participants as determined from GEFT administration. That is, each condition consisted of fifty six (56) participants: 28 males and 28 females, who were field-independent; and another 28 males and 28 females, who were field-dependent. The same context conditions were tested for creativity in the same classroom where they were taught and, the participants in the different context conditions were similarly tested in an open environment, different from where they were taught.

After this session, the experimenter administered a creativity task to the participants. Thus, the following instructions were given to the participants:

This test requires you to generate unusual creative and alternate uses for a brick and a knife. For these tasks, you should write down all of the original and creative uses for a brick and knife that you can think of. Certainly there are common, unoriginal ways to use a brick and a knife; for these tasks, write down all of the unusual, creative, and uncommon uses you can think of. You will have three minutes in each of the tasks. Any question?

At the end of the three minutes in each of the tasks, the experimenter instructed the participants to stop writing. To evaluate their responses, they were told to pick which two were their most creative ideas for bricks and knives by circling. They were given seven minutes in each of the tasks to pick out their best two creative ideas. Twenty (20) minutes after the administration of the

material (creativity task) to the participants, they were asked to stop attending to the task. The researcher thanked the participants and collected the materials for scoring and analysis.

Design / Statistics

A 2 x 2 completely randomized factorial design was employed for the study. The factors were Cognitive Style (Field-independent vs. Field-dependent) and Context (Same context vs. Different context). Based on the design, a 2-Way Analysis of Variance (2-Way ANOVA) was employed to test the hypotheses.

Results

The results are stated in the order in which the hypotheses were presented.

Table 1 Mean (\bar{x}) and Standard Deviation (SD) of Cognitive style and Context on Creativity

Variables	Levels	Mean	SD	N
Cognitive style	Field-independent	13.63	3.50	56
	Field-dependent	11.75	3.69	56
Context	Same context	13.55	3.32	56
	Different context	11.82	3.89	56

**Table 2
ANOVA Summary Table of treatment effects on creativity**

SoV	SS	df	MS	F-Ratio	ES
Cognitive style (CS)	98.44	1	98.44	8.07**	.27
Context	84.01	1	84.01	6.88*	.26
CS * Context	21.44	1	21.44	1.76	.12
Error	1318.18	108	12.23		
Total	1522.06	111			

Keys: ** = Significant, $P < 0.005$; * = Significant, $P < 0.01$

In the summary tables above, a significant main effect for cognitive style was observed, $F(1,108) = 8.07$, $p < .05$ with field-independent ($M = 13.63$, $SD =$

3.50) performing better in creativity task than the field-dependent ($M = 11.75$, $SD = 3.69$). This result confirmed hypothesis one which stated, “field-independent participants will perform better in creativity task than the field-dependent cognitive styles”.

Again, the tables above further showed a significant main effect for context, $F(1,108) = 6.88$, $p < .05$ with same environmental context ($M = 13.55$, $SD = 3.32$) performing better in creativity task than the different environmental context ($M = 11.82$, $SD = 3.89$). The result also confirmed the second hypothesis which stated, “same environmental context participants will perform better in creativity task than the different environmental context”.

Moreover, the tables above showed no significant interaction effects between cognitive style and context on creativity.

Discussion

The results of the present study provide substantial evidence for the first hypothesis which stated that; field-independent participants will perform better in creativity task than the field-dependent cognitive styles. This finding is in congruence with Davis and Cochran (1989) who observed that; field-independent students typically demonstrate higher levels of achievement across some conceptual behaviour. The present result suggests that field-

independent cognitive style is more positively related to creativity. Also Schunk (2000), for example, observed that children tend to be more field-dependent in their preschool years with a subsequent increase in field-independence that extends into adolescence. Since most children are identified to be included into gifted programs early in their academic careers, it is quite likely that the use of cognitive style as an identification tool with that age group could be discriminatory toward children who are cognitively delayed.

In the same vein, the present finding is in line with Kush's (1996) finding which reported that regardless of students' cognitive style, those with field-independent teachers show greater achievement than those with field-dependent teachers. Mbakwem and Mkpa (2003), and Amazue (2006) also found that field-independent subjects performed significantly better than field-dependent subjects. However, the result of the present study contradicts the work of Roach (1988) who found that the degree of students' field-dependence did not affect their ability to gain problem solving skills by either method. Thus, the finding implies that field-independent participants are more creative than their field-dependent counterparts in solving difficult problems.

Moreover, the result on context revealed a statistically significant difference between same context and different context in the performance of students' creativity task. This finding is in line with other studies on context-dependent

memory (e.g., Smith, et al, 1978), which found that physical environment is a powerful retrieval cue that demonstrably affects students' performance. This also, corroborates with the findings of Godden and Baddeley (1975) study which observed that what was learned under water was best recalled under water and vice versa. Biggs (1999) has insisted that if teachers are serious about getting optimal performance from their students, then final examinations should be given in the same classroom in which the class meeting took place.

However, number of studies (e.g., Adams, 1968; Dewing, 1970) has shown that different testing conditions and different time constraints would result in differences in creativity test scores, although, Hattie (1977) found a contradictory result as cited in Amabile (1983). Also, Mefoh (2006) found no significant effect of context on recall memory. Moreover, the finding of the study indicates that participants in the same context performed better than their different context counterparts in solving creative problem tasks.

Finally, the results further showed no interaction effects. This indicates that cognitive style and context had no combined effects on creativity of secondary school students.

Implications of findings

The findings of this study have far reaching implications for students, teachers, and researchers. The study has shown that field-independent and field-

dependent students perform differently to the same and different environmental contexts on creativity tasks. This implies that children may have unique modes of learning that are not tapped by the conventional environmental context alone, rather, a variety of learning environment can cater for all categories of learners.

The study has provided some useful empirical basis for maximizing classroom teaching and learning of creativity tasks at the secondary school level since the group taught and tested for creativity in the same classroom did significantly better than the group tested for creativity in a classroom different from where they were taught.

The link between theory and practice as demonstrated in this study is a crucial implication of the study. The theoretical assertion that cognitive style and context have effect on creativity has been tested and the findings have given practical support to the earliest proposition.

Finally, the findings may stimulate further research and the work will therefore, serve as a reference source to researchers who will embark on a similar topic in the future.

Limitations of the study and Suggestions for future research

The study is not free from limitations like every other study. It is however, limited to cognitive style and context, and not to the overall factors that can affect students' performance in a creativity task. This is as a result of time on the side of the researcher. Future research should expand the scope of this research which will provide grounds for comparison and prove the validity and reliability of the study.

The present study was conducted with small segment of samples of respondents from one secondary school. It is therefore suggested that, future studies in this area should employ large sample of participants in order to arrive at a better result or finding that may lead to more conclusive and generalizable inferences.

Moreover, there was a problem of participation and cooperation. Some of the test materials administered were not completed appropriately. This, however, reduced the range of ecological validity of the data gathered. Teachers should always encourage their students to participate in researches. Also, efforts should be made to accommodate cross-cultural studies for wider ecological validity.

In addition, a study of cognitive style of students and their respective teachers may be helpful to curriculum specialists in planning effective instruction strategy. Teachers may become more aware of student needs driven by cognitive style and teachers' impact on the teaching-learning environment. Method designed to address these diverse needs may lead to a more creative, productive, effective, and efficient learning transaction.

Summary and Conclusion

This study investigated the effects of cognitive style and context on creativity among secondary school students in Awka, Anambra State. A total number of 112 male and female students participated in the study. The results of the study revealed a significant main effect of cognitive style on creativity; a significant main effect of context on creativity; and no significant interaction effect of cognitive style and context on creativity. Considering the findings, it is plausible to conclude that cognitive style and context are significant factors which enhance students' creativity, thus have implications for educational and other developmental processes in schools and other training institutions.

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