Resourcefulness Enhanced: Mnemonic Iconicity's Strategies in Advancing Creativity in Pupils

Audu Omar Ahmed Otobo[1*], Wama Zipporah Andrew[2]

[1]*Industrial Design Department, Faculty of Environmental Studies, University of Maiduguri, Nigeria*

[2]*Department of Primary Education. College of Education, Zing. Jalingo. Taraba State, Nigeria*

*Corresponding Author: Audu Omar Ahmed Otobo, Industrial Design Department, Faculty of Environmental Studies, University of Maiduguri, Nigeria.

Abstract: *In the field of resourcefulness (creativity) eruditions there is always space for development and new conceptualizations of the strategies involved. Thus, we present this paper as a brief arrangement of the strategies used to boost creativity and consider whether mnemonic iconicity strategies can increase creativity. The strategies are used in teaching process in order to ease the remembering process by creating a graphic representation. Mnemonic iconicity strategies are techniques that increase creativity as part of their own performance. We used a quasi-experimental, nonequivalent group design, the procedure involving the use mnemonic iconicity strategies. The results show that the degree of abstracting increased after using mnemonic iconicity strategies, along with articulacy and other creativity dimensions. The paper shows that the creativity increased, based on a national centile system (along with standard creativity index), after using the mnemonic iconicity strategies, thus indicative of a case for integrating the mnemonic iconicity strategies among methods to foster creativity.*

Keywords: *Resourcefulness development devices; mnemonic iconicity strategies; creativity*

1. INTRODUCTION

Originality stands alone as the spark of every achievement, by changing the usual mental pattern of information. Without originality, human modifications would not have been possible. Resourcefulness (creativity) is a legerdemain that can be improved or affected in time by one's topographical location and activities practiced (Lewis, Lovatt, 2013; Thagard & Stewart, 2011; Otobo & Nwazue, 2023). If we seek out to improve it, there are many techniques that can be used in different environments and by different types of users in order to boost creativity. We argue that mnemonic iconicity's strategies should be comprehended in that list of techniques.

The utmost apposite environment in which to use mnemonic iconicity's strategies is the pedagogical cycle (school), at any level, including even homeschooling or e-schooling. As any of these environments are based on the didactic process, we highlight the three approaches found in scholarly literature that aim to use to blend creativity into the didactic process: Instruction for the development of the pupil's creativity, creative instruction (creative methods and techniques used in this process), and creative learning (creative learning methods and techniques). These three strategies to creativity at the didactic level are defined by the conjunction and subtle variation of the anticipated objectives (Lin, 2014). In practice, it is also noted there can be skirmish to creative adherence to schooling (Nodding's, 2013). Perhaps one of the biggest challenges when it comes to integrating ideologies of developing creativity at the didactic level is the multiplicity and heterogeneity of the ideas and behaviors they generate (Bleakley, 2004; Gaspar, 2015).

1.1. Creativity Developing Techniques

Resourcefulness was enhanced until now in some very different ways. We have tried to collect all the important creativity developing techniques and the conclusion is that the techniques usually focus on creating some internal motivation by activating divergent thinking. Although scholarly evidence has it that …extrinsic benefits can undermine intrinsic motivation (Amabile, 1996; Amabaile & Hennessey cited Otobo, & Nwazue, 2023), Wendy & Lana, (2014), opined that, creating some extrinsic motivation can be either too exclusive or ineffective over a long period.

The creativity (resourcefulness) developing techniques and creativity dimensions could sometimes overlap, so the explicit sagacity can be found in one another (Bleakley, 2004). Eruditely, it is necessary to specify that the techniques used to develop creativity could be identified with some ways of manifesting creativity, taking into consideration the large usage of the creativity itself. The dimensions of creativity could be acknowledged with exactly those ways of demonstrating creativity.

Erudite Smith (1998), appraised 48 creativity techniques (structural analysis, input-output, focused-object, transfer analysis, and semi-robotic) used for inkling generation, classified in 15 categories, represented by 48 strategies. In addition, Smith, Ward, & Fink (1995), issued a chapter in a book about a latent of the creative techniques to succeed in problem-solving. In his paper, a scholar proposed six techniques to be used for product design issues in organizations to enhance creativity: the structural matrix, 6/3/5 method, brainwriting pool, card-circulating technique, gallery method and collective notebook method (Geschka, 1995).

The affective topographical polarity also affects cognitive flexibility and creativity, as Bledow, Rosing; & Frese (2013); Hirt, Devers, & McCrea, (2008) averred that a positive state affects cognitive flexibility and creativity by offering a feeling of freedom, eliminating constraints and enabling a complete and exploratory style of processing information. By probing the literature, we have found four techniques that are correlated to changes in the affective atmosphere and can perform in the creative field: dark and vague radiance (improves cataleptic creativity). It is also shown that an indirect light fosters creativity more than a direct one does empathy Hirt; Dever & McCrea (2008), Steidle, & Werth, (2013), the possibility of promotion (Fridman, & Foster (2000), and of course, positive feedback (the good feeling or the hedonistic philosophy enhances creativity by developing courage and self-confidence (Hirt, Devers & MeCrea, 2008).

Erudition suppositions asserted that, creativity techniques are structured into two types, namely the associative and provocative techniques. The principle of classification is based on the type of mental process applied to the preconceived elements; thus, associative techniques combine and bind together elements and provocative ones try to break and modify the given elements. (Roozeburg; Eekeles & Schlicksupp (1995), Leopoldino, et al., (2016), creativity techniques are structured into two types, namely the associative and provocative techniques. The principle of classification is based on type of mental process applied to the perceived elements; thus, associative techniques Geschka (1983), Jablin, (1981) Freedman, (1965), Braun; Hesse; Andeelfinger; Kittlaus, & Scheschonk (2000), In that literature, we found 22 associative techniques from simple (associative consonance) to complex ones (analytical or instinctual method) and 5 provocative ones (e.g., Conjectural and argumentative drilling Method).

In Couger, (1995), there were 22 techniques, divided into two categories, based on analytical or instinctual astute. In Miller, (1989) exposed 10 analytical (linear) techniques and 6 instinctual techniques. Analytical techniques imply the generation of a rational sequence regarding the elements involved, to gain a liner structure and to multiply the rational, liner sequences for a holistic viewpoint. Instinctual techniques are based on a single stimulus and generate a one-time response to that stimulus, usually used to starting solution (Leopoldino et al., 2016). Probing, the literature Geschka, (1983), Seghedin, (2010), Deyoung; Flanders; & Peterson (2006), Bailin, (1987), Brown & Reynolds, (1989); Kondo, (1994); Lumsdaine & Lumsdaine (1994); Linstone & Turoff (2002). We found nine analytical techniques (together with the structural matrix, fragmentation, visual-memo, typo-diagram) and six instinctual ones (e.g., imagery or animated activities (Clement, 2008; Schlicter, 1986; Colwell, 1969; Torrance, & Torrance1972; Selby, Shaw & Houtz, 2005; Tomescu, 2010).

In the erudite paper, Tasssoul, (2009) anticipated five key space categories for idea generator techniques. The associative, provocative and instinctual techniques have the same structural pattern as described in Leopoldino et all., 2016; Couger,1995; Miller, 1989. In addition to those, Tasssoul adds inventorying and confrontative techniques to the categories mentioned. The inventory techniques are based on gaining all detail or statistics surrounds an issue which will materialize into an inventory of ideas, details or information. The confrontative techniques try to break the boundaries of the common elements and offer unexpected keys to spaces and create new force-fit connections (Tassoul, 2009; Timbadia & Khavekar, 2017). In the frontier of knowledge, we found 4 confrontative techniques (e.g., bursting and crosswise thinking) and inventorying techniques (e.g., feature listing, worksheets, and recursions).

1.2. Mnemonic Iconicity's Strategies

The word "mnemonic" designates to reminiscence or in correlation to retention. Mnemonic strategies are techniques that can be used to convert information for better committal to memory of the concepts giving (Otobo & Aruku, 2022; Mostafa, & El Midany, 2017; Putman, 2016).

Mnemonic strategies are categorized in different ways. We will accent on the iconographic (visual) mental imagery of mnemonic strategies (Otobo & Aruku, 2021). The mnemonic iconicity strategies imply the imaginary elaboration of the aspects involved. "The iconicity has to be concrete object or referents of the word, not of words themselves (Mostafa, & EL Midany, 2017)". The mnemonic iconicity mental imagery strategies involve a mental representation" and the accompanying experience of sensory information without a direct external stimulus" (Bower, 1970). The strategies imply a verbal enumeration, classification, or definition of one concept (or more) and the imagery process of the component object in their iconicity (visual) perception. "Iconicity imagery has many of the properties of a spatially parallel system" (Bower, 1970). The imagery process is using the recall representations from other similar or a combination of them in order to re-experience the original representation, acting as a weak perception (Pearson; et al., 2015).

Mnemonic strategies were enormously premeditated in the field of their purpose-better committal to memory concept. Mnemonics iconicity mental imagery strategies were studied for the same purpose. Taking into consideration that the strategies imply a process of imagery, meaning a group of some creativity fostering techniques (insentiently used), we shall see that this method can itself foster creativity. Iconicity imagery implies that the learning process has to be set upon some graphic (photographic) figures that are imagined and associated with words given. It works exclusively when words are concrete (they have a real picture), but can be used even with intangible (abstract) words (through association techniques) (Bellezza, 1981; cited Otobo, 2023). The mnemonic iconicity must be unusual, out the consistent, clear-cut view, include at least two objects to efficiency, and include motion, color, or magnification, out of proportion, and activity (Lorayne & Lucas, 1974, cited Otobo & Aruku, 2021).

Generating a mnemonic iconicity operation by analogy means that one should imagine some analogical concept with the information that needs to be recalled. By definition of the recalled, we search to create an abstract parallelism between two concepts from unlike areas and it can be used in mnemonic iconicity's to find an informal to metaphorically represent concept in an unlike area that is abstractly concomitant to the main one (Holyoak & Thagard, 1996; Otobo & Aruku, 2021). The dialog about embellishment erudite Bart & Hokanson (2017), the *modus operandi* of adding specifics to information,

we pragmatized that it can be used in mnemonic iconicity's by adding specifics to the main information, more precisely a specific, very important detail, that can be easily be remembered (recalled) by its iconicity and will boost the process of recalling the main information by extrapolating detail or connecting it to the original information. The combination technique refers to combining different attributes with an apparent unlinked object and may be used when there is a need to remember a list of information presented in various forms (Scott; Lenite & Mumford, 2013; Otobo & Aruku, 2021). The details of the different concepts may be metaphorically (iconicity) linked, so there is an easier way to recall an iconicity linked details to extrapolate to the initial form. Feature listing can be used when there is need to recall a very significant concept that can have iconicity 's features. The listing will be made iconically, so it will be easier to recall and, after that, extrapolated to the initial information (Davis, 1967).

The mnemonic iconicity's listed above, by definition implied that mnemonic iconicity's also take the use of imagery process (the literary process of transposing the information gained from stimulus into literary text), but without an external stimulus (Mostafa & El Midany, 2017; Pearson; Naselaris; Holmes & Kossly, 2015; Clark & Paivio, 1987). This and the other definitions of the mnemonic iconicity's (the operation implies a verbal enumeration, classification or definition of one concept (or more) and the imagery process of component objects in their iconicity perception imply that the process must rely on the use of analogy, elaboration, combination, or feature listing.

We quantified that all the listed techniques can be used to augment creativity and the mnemonic iconicity strategies use only extrapolation or the listed techniques to return to initial information.

2. METHODOLOGY

2.1. Overview

The goal of this erudition was to substantiate if mnemonic iconicity strategies could improve creativity. To achieve our purpose, we tested the subjects before and after that operation was applied. We had two groups, a test group and a control group.

2.2. Participants

We targeted two groups, one called the investigational group, who used mnemonic iconicity's strategies and the control group, who were not equipped to use mnemonic iconicity's strategies. The sampling technique applied was convenience sampling, the groups being from two different classes.

The set was composed of seventeen (17) senior secondary school pupils (SSS III), age16-20, 23-27 Remedial students (undergraduates) only. The Torrance creativity tests in figural form were aggregated with the national percentile and score, using the highest age possible. All the pupils gave their informed consent for inclusion before they participated in the study.

The erudition was conducted in accordance with the assertion of the institutes and the protocol was approved based on the ethics of instructions.

2.3. Materials

In order of comparability of the results of using mnemonic iconicity's on the creativity of the pupils, we hand-picked creativity tests, one given before they used the mnemonic techniques and one after. Vis-à-vis, this aspect, the Torrance figural form were the most apposite for distinguishing the imagery (iconicity) mnemonic results, specifically because of their figural (metaphoric) form enhanced with artworks and regular and irregular forms (Otobo & Aruku, 2021; Couger, 1995; Hill & Westbrook, 1997; Paunescu, 2014). The dependability of the appraisal method used lies between 0.88 and 0.95, bequeathing to Torrance Creativity Test Thinking (TTCT-Figural Manual) (Kim,2006).

The mnemonic iconicity method was used to enhance the following aspect:

1. Natures of production schemes, which the pupils were familiar with
2. Classification of production schemes using the way of processing the inputs in order to attain the outputs
3. A categorization of interior design styles
4. A list of continents classified by Gross Domestic Product (GDP).

The words that required to be learn by rote were abstract in general, but also included some concrete words (labor, mediaeval, Victorian, art deco, art nouveau, curators, eclectic, minimalist, neo-classic, ragged chic, Africa, South Korea, Spain, Canada, Russia, Australia, Mexico) (Bower,1970; Atwood,1971; Higbee, 1979; Otobo & Aruku, 2021), as Paivio's dual code theory presumed that concreate words "provoked more distinct imagery" than abstract words (Yin, & Othman, 2009; Daniels-McGhee & Davis, 1994).

2.4. Procedure

For the investigational group, form A-X was applied before using the mnemonic iconicity strategies, and form B-X was applied after a mnemonic iconicity immoderation. For the rheostat (control) group, the form A-X was applied before using a classical committal to memory process (they needed to memorize the same aspects but without further mnemonic iconicity operation explanations) and form B-X was applied after.

All four isometrics were accompanied by guidelines to develop the mnemonic iconicity's and usage of paper was permitted, with the annotation that the paper must only include artworks and must be turned to other side when the appraisal form was addressed. The appraisal form was a form of appraising the mnemonic iconicity technique composed of simple question vis-à-vis the memorized information. The directions that were given include the types of mnemonic iconicity's that were possible for the specific case, including shapes, colors, means of hands and fingers, animals, continents, body parts etc.

The result was studied using the comparison of means, standard deviation, and relative standard deviation (as anticipated in Torrance, (1966) of the basic scores obtained along with the variation of the

composed creativity scores from form A-X to B-X and a statistical hypothesis test to validate the composed results. the significance level taken into contemplation was the standard 0.05 and the hypothesis test chosen was the two-sample pooled test, mainly because the variance was not equal but under the significance level of failing the test (Yin & Othman, 2009).

3. RESULTS

3.1. General Results of the Impact of Mnemonic iconicity Method over Creativity

The results of in Figure 1, unveiled a growth in the mean standard score, laterally with the standard creativity index and the centile rank, from form A-X to B-X. It is important to recall that form A-X was applied before the mnemonic iconicity's isometrics and form B-X was applied after. The ample growth of the mean creativity index was nine points, meaning that the techniques that are ancillary in the usage of mnemonic iconicity's are concomitant to creativity.

3.2. Standardized Creativity Index
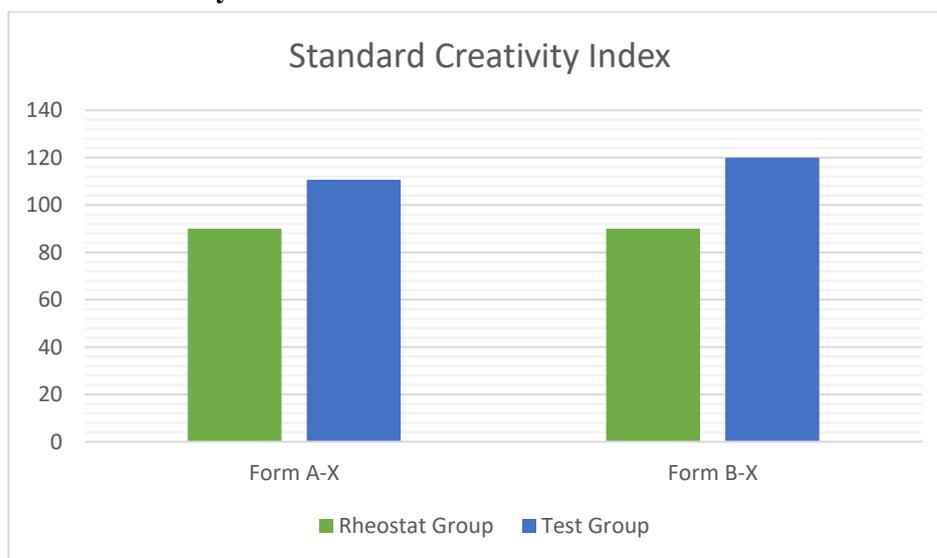
Figure 1. *Depiction of the mean of standardized creativity index for both groups in form A-X and B-X.*

Originality (creativity) elevated with a discrepancy of 12% (Table 1). Due to the use of the explicit mnemonic operation technique, creativity was raised 45% in the national centile system. Next, we will analyze which were the main dimensions that contributed to this variance.

Table 1. *Variance of the mean basic scores for each creativity dimension, from A-X to form B-X for investigational and rheostat group.*

Index	Articulacy	Originally	Embellishment	Degree of abstracting of tiles	Resistance to premature close-up	Mean standard score	Bonus points	Creativity index
Test	6%	1%	-13%	15%	24%	8%	41%	12%
Rheostat	-32%	-9%	-11%	-38	54%	-2%	40%	0%

Variation for the mean basic scores foy each creativity dimension.

3.3. The Five Dimensions of Creativity, before and after Mnemonic Iconicity Operation

The standard creativity score comprises of five dimensions of creativity predicted by Torrance and their scores with the centiles credited to each one. In Figure 2, standard scores for creativity dimensions, we pragmatized that articulacy and degree of abstracting had the most benefit of using mnemonic iconicity's, but an up going rate exists for all of the five dimensions. Resistance to hasty close-up remains on the same level of manifestation among respondents, seemingly due to the lack of connectivity between the technique used in mnemonic iconicity's and their power to create motivation, desire to create more, and maintain the active cognitive process. Table 1, variation of mean basic scores for each creativity dimension, shows that originality stands with positive variation of 5%, showing that mnemonic iconicity's devices did not have a big impact on originality, being a tool created for reproduction of the initial information, by creating a graphic depiction of a settled information.

Embellishment grew with 5%, from 94 to 98 points in the mean standard score and from 26 to 38 rank on the centile system, wholly because embellishment is already a technique that is part of the mnemonic iconicity operation and could be used in the isometrics predicted for respondents. Articulacy grew 9%, from 101 to 111 points in the mean standard score and from the 48 to 622 rank the national centile system. Articulacy was enriched by analogy and embellishment techniques that were used in the mnemonic iconicity's strategies. The two techniques also create new neurological connection between known concepts in order to find a suitable answer for the stimulus (that is the way articulacy is measured). The degree of abstracting of the title grew with the highest variance, 21%, 67 to 87 ranks in the national centile system, probable since the abstracting of the initial information was the first segment of the mnemonic iconicity's operation and it was determinedly and extensively used in the process, hence creating an ease of usage when the form B-X of Torrance tests were applied.

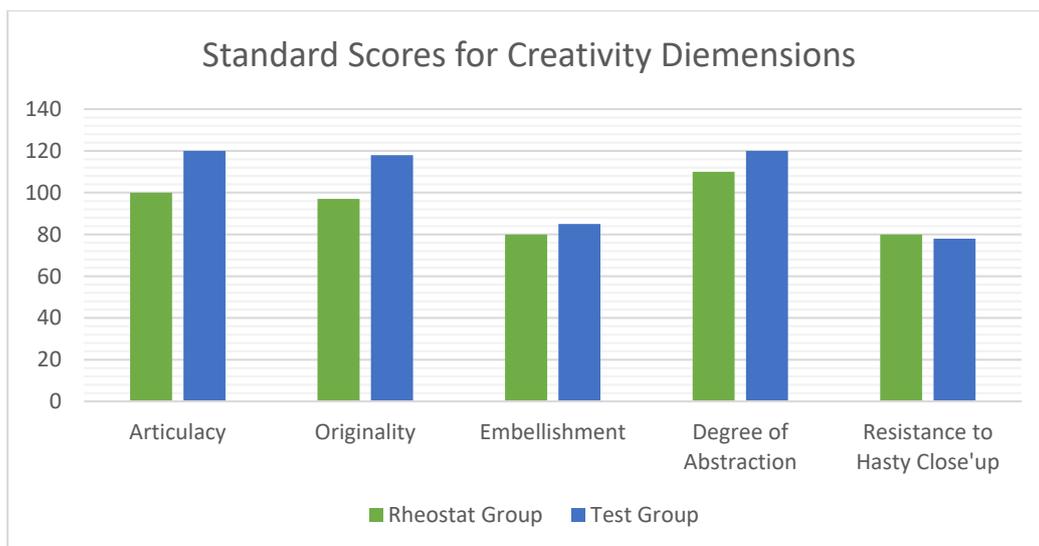### 3.4. Standard Scores for Creativity Dimensions

Figure 2. *Representation of mean standard scores for each creativity dimension*

The graph below parades the growth of the five dimensions, from form A-X to form BX.

In the following table, we can spot the comparative variation of each dimension along with the general results for both groups (mean standard score, windfall points, and standard creativity index among its national centile rank).

3.5. Overall Results

There is a manifest variance between the means of disproportions of the two sets of creativity indexes, the investigational (experimental) group mean being 12.17% and the rheostat (control) group being 0.25%. The rheostat group had only a tiny increase in the creativity with a reliability on time.

The null hypothesis was the zero effect that mnemonic iconicity strategies would have on creativity. The prospect of detecting a sizable difference in a null state, when mnemonic strategies were not applied is 0.00055, placed under the significance level alfa 0.05. The null value was rejected and there was evidence of difference between the variations of the scores attained by the investigational group and the rheostat group.

4. DISCUSSION

The outcomes efficaciously validate the hypothesis involved in the erudition, arguing that mnemonic iconicity strategies had a positive impact on creativity. To the best of our statistics, there are on pragmatic studies to show the relationship between mnemonic iconicity strategies and creativity in this direction (the impact of mnemonic iconicity over creative performance). In disagreement, some studies dispute the opposite relationship, the impact of creativity on mnemonic iconicity performance. In Herman, (1991) and Bellezza, (1981), the graphic imagery and mnemonic depend on one's creativity score could improve the performance on mnemonic iconicity strategies. In erudite Cramond's (2005) book itemized that, one mnemonic operation designed to help pupils when they get stuck during a

creative process (SCAMPER) is mentioned. It is not a technique that boosts creativity by its mnemonic structure but is grounded on six different types of mental processes that could be applied to a piece of information to enhance creativity. The book does not reference mnemonic iconicity strategies or other types of mnemonics as creativity techniques.

An appraisal integrated mnemonic iconicity's as a creativity technique built on its structural relative with imagery, and the "approachable" connection between imagery and creativity. The mnemonic iconicity technique is presented as a creative approach used to boost memory, which is built on imagery and supports to boost creativity through imagery (Daniel-McChee & Davis,1994). This erudition was focused on five dimensions of creativity (articulacy, originality, embellishment, degree of abstracting of title and resistance to premature close-up), from which embellishment and resourcefulness are the basic dimensions used in the imagery. (Danie-McGhee & Davis, 1994). By characterization, the mnemonic iconicity technique is a device grounded on the graphic imagery (Mostafa & EL Midany, 2017; Otobo & Aruku, 2021; Bower, 1970, Pearson; Naselaris; Holmes & Kosslyn ,2015; Clark & Paivio, 1987), imagery has a philosophical relationship with creativity, enhancing the connection between mnemonic iconicity's and creative performance. Using a rational argument based on fact that "graphic intelligence increases the effect of human intelligence, extends the creative spirit" (Erksson, cited in Otobo & Bango, 2023). Erksson avowed that using graphic imagery in education is reasoned on the fact that graphic thinking is an imperious part of the type of intelligence for generating creative ideas. He claims for a holistic curriculum that includes creativity and he underlines graphic intelligence as a dynamic to increase interactivity and modification of the curriculum. To boost creativity, he propositions graphic imagery as a within reach tool.

Erudite Brade (2011) averred that interactive mnemonic picturing's are suitable for managing creative works, involving high complex statistics, without restricting creativity regarding a creative commission. He postulates that the interactive mnemonic picturing's are to be structured as a map, containing connected information surrounding an issue, so the creativity being reinforced by flexibility and complexity of the statistics could be achieved by the anticipated operation. Erudite Brown (2009) acknowledged a graphic mnemonic device (Loci's method) as a creative technique used to enhance memorization in the didactic process. The technique's purposed is to enforce memorization, but Brown considered it a creativity technique owing to its connection with imagery. The correlation between creativity and picturing underlines that "efficacious creating seems to depend on the degree to which mental images can be manipulated" (Walkup,1967). The picturing (visualization) process includes mental amalgamation of sensory experiences, transformed into mental images. In the mnemonic iconicity strategies, the picturing process is exactly the key process used in order to gain the mnemonic needed, thus swaying immediate creativity, as shown in this erudition (Bower, 1970; Mostafa, 2017; Pearson, et al., 2015; Clark & Paivios, 1987).

An erudition presented during a consultation focused on critical intellectual, disclosed that graphic imagery had positive implications in critical thinking. Similarly, the intelligentsias markup the relationship between the two of them by degree of imagery used in creative functioning (Smorra,1992; Durio,1975). Besides, the first learnedness implied the relationship between mnemonic iconicity performance and critical thinking test scores and interpretation. The results endorsement that mnemonic iconicity performance was directly comparable to the critical and creative thinking and scores. Although, it was revealed that the mnemonic operation was not helpful with pupils having difficulties with graphic imagery, the advantage of using imagery was maintain a "relaxed receptiveness to the review of information" and a "lessening of trepidation in approaching the midterm as the information was 'owned' by the learner"

The present erudition confirmed the hypothesis considered; the mnemonic iconicity strategies were able to boost creativity, as the result disclosed different means by variations of the creativity tests before and after (12. 17 for the investigational and 0,25 for the rheostat group). Owing to the philosophical connection to creativity and imagery (Daniel-McGhee, & Davis, 1994), the mnemonic iconicity strategies seemed to affect creative performance.

5. CONCLUSION

The origination sphere is always expanding, like creativity itself, from any point of view. The present erudition resolved that there were effects of the mnemonic iconicity strategies on creative performance,

consequently supporting the initial hypothesis that mnemonic iconicity strategies would be able to augment creativity. However, the substantial erudition that was performed, it was revealed that creativity increase with 45% a national centile system (compatible to 12% in standard creativity index) after using the mnemonic iconicity strategies, supporting the case that mnemonic iconicity should be considered a technique that fosterages creativity. This erudition long-drawn-out the literature in the creativity field by tallying a new creativity technique to one already established. A graphic mnemonic operation is a technique that can be used in any type of upbringing and environs, being also extremely suitable for informative purposes, promoting creativity in the curricula adaptations in practice. Suggestion for future erudition may focus on investigating mnemonic iconicity tactics' effect on creativity on larger samples of groups or picking a different test group technique. The may motivation on erudition the impact of other mnemonic devise on creativity or critical intelligent.

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AUTHOR'S BIOGRAPHY

Audu Omar Ahmed Otobo was born on September 8th 1959 in Kaduna Nigeria, he hails from Owukpa, in Benue State, Nigeria. He obtained his masters and Ph.D. degree in Industrial design at Ahmadu bello university, Zaria. Currently the Head of Department, Industrial Design, University of Maiduguri, Article