ADVERSE MATH ATTITUDES IN THE POST-PRIMARY EDUCATION OF RIVER STATE, NIGERIA: CAN METACOGNITION DO THE MAGIC?

Okoro Joyce Adaobi[*]

[*]Department of MathematicsFederal College of Education, Technical, Omoku, River State, Nigeria

[*]*Corresponding Author:*

Abstract

There is growing concern about the increasing adverse attitude towards mathematics in Nigeria's educational system. Numerous research has underscored appropriate steps to address the challenge of mathematics attitudes. However, little is known about the role of metacognitive teaching in promoting healthy math attitudes. The present study employed a quasi-experimental design to examine the effect of the metacognitive instruction approach on students' mathematical attitudes in River State. Ninety-one (n = 91) students comprising males and females between the ages of 10 and 14 years with a mean age of (M=9.14) and (SD= 1.24) were randomly selected from different public secondary schools in River State as the study participants. The participants were grouped into two and were subjected to a pre-test and post-test study. The independent t-test conducted on the data following the pre-test and post-test studies proved that Metacognition enhanced the participants' mathematical attitudes at MD = 13.65 (95% CI, 8.91 to 16.17), t (89) = 6.328, p = .001. Thus, the result supported the study's hypothesis. It was concluded that Metacognition is effective in enhancing students' mathematics attitudes. The study recommends that teachers be regularly trained in using the metacognitive approach in the classroom.

Keywords: *Metacognition, math, attitudes, students*

BACKGROUND

Mathematics describes the science of shape, quantity, and arrangement logic. Math is a ubiquitous part of our everyday lives and reflects the building block for everything in our daily lives, including the advances in technological innovations. In developing and developed nations, the value of mathematics in achieving success and contributing to national development is evident. (Etuk & Bello, 2016; Josiah & Olubunmi Adejoke, 2014). The growth of human capital in the fields of science, technology, engineering, and other essential economic areas depends critically on the study and use of mathematics. (Musa & Dauda, 2014), It serves as one of the pathways for realizing the shared goal of the Nigerian government. (Charles-Ogan, 2015). According to Usman (2002), education must include mathematical concepts and their practical applications. Education in mathematics has been suggested as one of the factors that should be considered when evaluating a nation's socioeconomic progress level.

The educational ecosystem in Nigeria recognizes mathematics as one of the fundamental courses pupils are required to study. (NPE, 2004) and a compulsory subject for all students (Ugodulunwa & Okolo, 2015). Anyone who wants to succeed in an academic career, whether in science or art, must have a solid understanding of mathematics. Any educational level requires pupils to learn mathematics as a basic subject. (Adebule & Ayoola, 2015). However, research has pointed to pedagogical challenges in mathematics education (Adedeji, 2018), thus, resulting in the expansive conception of mathematics as a complex subject (Dele-Ajayi et al., 2019). This trend has resulted in an increasing loss of interest and poor performance in math-related tasks among Nigerian students of various educational levels.

Despite the significance of mathematics, research has demonstrated that Nigerian pupils continue to do poorly in this subject area (Aburime, 2007; Agnes & Mathew, 2019; Dada & Akpan, 2019; Joseph Owan et al., 2020; Abdurrahman et al., 2015; Ogochukwu, 2010; Olanrewaju & Suleiman, 2019; Owan, 2018; Salami & Okeke, 2017). For instance, factors such as curriculum and methods (Muhammad Sani Abdurrahman et al., 2015), class size (Afolabi et al., 2020; Idowu, 2016), poor mathematics foundation and unconducive environment (Adolphus, 2011), student' handwriting (Oche, 2014), and other student's factors (Adesoji & Yara, 2008) have been linked to the country's notably low math scores. Therefore, it appears pointless to keep using the same old traditional and theoretical method for teaching and studying mathematics at Nigeria's primary and secondary school levels. This widespread pattern is likely to be blamed for students' poor results in math-related tasks and adverse mathematics attitudes.

The term attitudes describe a socio-psychological construct reflecting a person's cognitive, affective, and behavioral dispositions critical to learning. Attitudes encompass likenesses or dislikes of any aspect of a person's socio-world. Thus, a negative attitude limits performance reduces motivation, and inhibits learning. Research has linked low achievement and engagement in mathematics with attitudes (Yáñez-Marquina & Villardón-Gallego, 2016). Some pupils in high school have the misconception that mathematics is uninteresting and irrelevant to their lives because of its perceived difficulty in understanding it and its perceived lack of concrete application. Students in elementary and secondary school often perform well at first but develop a dislike for and anxiety about mathematics with time. This can make them feel uninspired and undermine their confidence as they attempt to solve problems. For some, the prospect of sticking with and mastering more complex mathematical concepts is terrifying. Some pupils, it seems, do not see the value in continuing their math education beyond the basics. When students have a negative outlook on mathematics, they may (or may not) be able to apply what they learn in the classroom to real-world situations. Nonetheless, adverse attitudes about mathematics are widespread and have been reported in the post-primary education of River state (Adolphus, 2011; Arokoyu, 2018; Obomanu & Adaramola, 2011). Thus, the trend reflects a significant challenge in the development of mathematics education in the state. The present study examines Metacognition as a strategy for enhancing negative mathematics attitudes in the post-primary education of River state, Nigeria.

Metacognition is increasingly becoming an essential factor in the teaching and learning of mathematics. Metacognition is the ability to represent, monitor, and control ongoing cognitive processes (Heyes et al., 2020). It is the set of processes people adopt in monitoring ongoing cognition to checkmate their behavior (Rhodes, 2019). (Fleming & Lau, 2014) stated that metacognition is the ability to recognize one's successful cognitive processing in perceptual or memory tasks. Indeed, metacognition enables an individual to use explicit reasoning (Shea, 2020). Previous studies have established a link between metacognition and increased learning performance (Al-jarrah et al., 2019; Kane et al., 2014; Millis, 2016; Persky & Dinsmore, 2019; Schleifer & Dull, 2009). Strong metacognition skills are associated with learning outcomes and student performance (Stanton et al., 2015). The benefits of metacognition and active learning on student performance are well understood (Mutambuki et al., 2020). However, evidence that metacognition impacts learning mathematics is still growing.

Following the relevance attached to mathematics and the observed low achievement in mathematics, various instructional strategies have been explored by scholars. For example, strategies such as motivational and enhancement of academic self-efficacy (Fehintola, 2020), problem-based teaching (Fatade et al., 2013), flipped classes (Makinde, 2020), peer tutoring strategy (Muhammad Sani Abdurrahman et al., 2015), improvisation (Okori & Jerry, 2017), multimedia presentations (Nwaocha, 2010), and student-problem skills (Nenty, 2001) has been deployed in enhancing mathematical learning, and the results are all positive. For instance, (Ofem et al., 2017) used the diagnostic and feedback assessment approach. The outcome effectively enhanced mathematics achievement among secondary school students in Nigeria. The present study is aimed to explore metacognition as an instructional approach to enhance students' attitudes toward

mathematics among students in the River state post-primary education system. The study's primary purpose is to examine whether there would be a significant difference between the student's thoughts with metacognition and those not exposed to Metacognition on attitude towards mathematics. Thus, the study hypothesized as follows:

H^I: there is a difference between students exposed to Metacognition and students not shown the metacognition approach on attitude towards mathematics.

Method

A quasi-experimental design with pre-test and post-tests and two groups (experimental and conditions) was adopted in this present study. Secondary school students in River State made up the population of the study. Ninety-one ($n = 91$) students comprising males and females between the ages of 10 and 14 years with a mean age of ($M=9.14$) and ($SD= 1.24$) were randomly selected from different public secondary schools in River State as the study participants. The students selected primarily from the junior classes were assigned to groups, with group A as the experimental condition. On the other hand, group B represents the control condition. Before the main study's commencement, students' attitude towards mathematics was established (pre-test) using an attitude towards mathematics questionnaire. The student in the treatment group was exposed to a mathematical task containing metacognitive questions. The control group students were given the same mathematical task without the metacognitive questions in the post-test study. After that, the performance was assessed using a structured questionnaire.

Ethical considerations

The researcher tried to abide by the research ethics in the study process. With the heads of the schools and teachers' aid, the participants were made to understand the study's purpose. They were told that the study was not a must and that they could withdraw anytime they wanted.

Result

Before the commencement of the experiment, the respondent's attitudes toward mathematics were measured.

Table 1: shows the mean and standard deviation scores of the student's attitudes toward mathematics for both conditions.

Group	N	Mean	SD
Group A	43	22.19	3.18
Group B	48	22.33	2.96

Table 1**:** shows the mean scores of the two conditions in the pre-test study. Thus, it indicates no significant mean difference between the conditions on attitude towards mathematics ($M= 22.19$, $SD=3.12$) and ($M= 22.33$, $SD= 2.98$). Thus, it signifies that attitude towards the subject for both conditions is on the same level.

Table 2: showing the mean and standard deviation scores of the two conditions (A and B) following the Post-test study

Group	N	Mean	SD
Group A	43	46.83	9.64
Group B	48	33.18	5.26

A post-study analysis was conducted to ascertain the difference in attitude towards mathematics. The mean scores for both conditions were ($M = 46.83$, $SD = 9.64$, and $M = 33.18$, $SD = 5.26$), as shown in Table 2 below. The data established a high mean score for the experimental conditions (46.831) compared to the control condition (33.18). The standard deviation scores also revealed an increased score of 9.64 for the study group and a lower score of 5.26 for the control group. Thus, it indicates that the mean scores increased significantly following the students' exposure to the metacognitive process.

Table 3: showing the t-test comparison of the differences in attitude towards mathematics.

Source of variation	N	Mean	SD	df	t	Sig
Group A	43	46.83	9.64			
Group B	48	33.18	5.26	89	6.328	001

An independent-samples t-test was conducted to determine if there were differences between the experimental and the control groups' attitudes toward mathematics in the post-test study. The result of the analysis established an increased positive attitude towards mathematics for the experimental condition (46.83 ± 9.64) when compared to the control condition (33.18 ± 5.26); a statistically significant difference was established at 13.65 (95% CI, 8.91 to 16.17), t (89) = 6.328, p = .001.

Discussion

The current study determined whether Metacognition as a teaching strategy would enhance primary school students' attitudes toward mathematics. Indeed, the independent t-test conducted on the data following the pre-test and post-test studies proved that Metacognition enhanced the participants' mathematical attitudes at MD = 13.65 (95% CI, 8.91 to 16.17), t (89) = 6.328, p = .001. Thus, the result supported the assumption of the study that there is a difference between

students exposed to Metacognition and those who were not taught the metacognitive measure of attitude toward mathematics. The study's result is consistent with the previous studies (Nett et al., 2012; Veenman et al., 2006). For instance, (Desoete et al., 2019) reported that metacognitive skills were significant predictors of mathematical accuracy. This indicates that applying the metacognition approach in teaching and learning mathematics in the post-primary education of River state, Nigeria, will significantly promote students' attitudes and improve mathematics-related tasks. The study provides insight into the effectiveness of Metacognition in the classroom and suggests its adoption in all spheres of education. Indeed, research suggests that students lagging in metacognitive development may be at risk of underdevelopment in mathematics (Desoete & de Craene, 2019). A similar study conducted using secondary school students found that math metacognitive strategy improved pupils' achievement in fractional mathematics (Onu et al., 2012). Although research in Metacognition is increasing in Nigeria, it is reported that students are not fully aware of the importance of the strategy in teaching (Okoza et al., 2013). Thus, there is still a need for a robust step-up in metacognition literature. In line with similar studies utilizing Metacognition in other learning domains (Owo & Ikwut, 2015; Oyelekan et al., 2019), the present study is proof of the relevance of Metacognition in enhancing learning in Nigeria. However, according to (Stanton et al., 2015), using a metacognitive strategy in learning is helpful for some students. However, most students may need help with metacognitive knowledge to execute their learning strategies. It is suggested that teachers recognize differences in students' responses to metacognitive instruction packages to establish differences and solutions.

Conclusion

In response to the study hypothesis, the result revealed, in line with (Nett et al., 2012) and (Desoete et al., 2019), that Metacognition predicted the variance in students' mathematical attitudes. Thus, it was concluded that Metacognition is an indispensable tool in combating negative mathematical attitudes in the school system. In math instruction, metacognition involves active learning that helps students become aware of, reflect upon, and consciously direct their thinking and problem-solving efforts. In order words, the study suggests that a student who tries to solve a problem without metacognitive awareness and regulation might rush towards finding a solution without comprehensively analyzing and understanding the problem from the outset. Therefore, metacognition matters in building a mathematical attitude in the students. The study contributes to the mathematics literature by supporting the use of Metacognition in enhancing students' performance in mathematics in Nigeria. Nevertheless, the present study encountered specific limitation that needs to be addressed. First, the sample size was small and may not be reliable for generalization. Also, the design of the study did not allow for cause-effect determination. Future researchers are advised to include more representative samples and adopt pure experimentation to ascertain cause-effect relationships. However, we recommend regular training teachers on using the metacognitive approach. The use of Metacognition should be embedded in the school curriculum.

References

[1]. Aburime, F. E. (2007). How manipulatives after the mathematics achievement of students in Nigerian schools. *Educational Research Quarterly*, *31*(1).

[2]. Adebule, S. O. &, & Ayoola, O. O. (2015). Evaluation of instructional materials commonly used in mathematics teaching in junior secondary schools in Ekiti state. *Online)*, *5*(18).

[3]. Adedeji, T. (2018). Revitalizing mathematics education preparation in Nigeria for national development: an innovative view. *International Electronic Journal of Mathematics Education*, *13*(3). https: //doi. org/10. 12973 /iejme/3923

[4]. Adesoji, F. A., & Yara, P. O. (2008). Some student factors as correlates of achievement in mathematics in Southwestern Nigeria—*European Journal of Scientific Research*, *19*(3).

[5]. Adolphus, T. (2011). Problems of Teaching and Learning of Geometry in Secondary Schools in Rivers State, Nigeria. *International Journal of Emerging Sciences*, *1*(2).

[6]. Afolabi, B. Y., Wakili, L. B., Afolabi, A. O., Onwuegbunam, N. E., & Ademuwagun, A. A. (2020). An Investigation of Class Size on Teaching and Learning of Mathematics in Secondary Schools (A Case Study of Chikun Local Government Area) of Kaduna State, Nigeria. *Journal of Education, Society, and Behavioural Science*. https://doi.org/10.9734/jesbs/2020/v33i1030263

[7]. Agnes, P. A., & Mathew, O. O. (2019). Does Math Anxiety Affect Senior School Students' Mathematics Performance? Evidence from Ekiti State, Nigeria. *Journal of Mathematics Education*, *4*(2), 43–51. https:/ /doi.org/ 10.31327/jomedu. v4i2.895

[8]. Al-jarrah, T. M., Mansor, N., Talafhah, R. H., & Al-jarrah, J. M. (2019). The application of Metacognition, cognitivism, and constructivism in teaching writing skills. *European Journal of Foreign Language Teaching*, *3*(4).

[9]. Arokoyu, A. A. (2018). Analytical survey of students' attitudes towards teaching and learning mathematics and chemistry in senior secondary schools in the Emohua education zone. International Journal of Scientific Research and Innovative Technology, 5(9). www.ijsrit.com

[10]. Charles-Ogan, G. (2015). Mathematics as a Tool for Achieving the Vision 20:2020 Goal of National Transformation. *International Journal of Education, Learning, and Development*, *3*(8).

[11]. Dada, O. A., & Akpan, S. M. (2019). Discriminant analysis of psychosocial predictors of mathematics achievement of gifted students in Nigeria. *Journal for the Education of Gifted Young Scientists*, *7*(3). https:/ /doi. org/ 10.174 78/ jegys.605981

[12]. Dele-Ajayi, O., Strachan, R., Pickard, A. J., & Sanderson, J. J. (2019). Games for Teaching Mathematics in Nigeria: What Happens to Pupils' Engagement and Traditional Classroom Dynamics? *IEEE Access*, *7*. https://doi.org/ 10.1109/ACCESS.2019.2912359

[13]. Desoete, A., Baten, E., Vercaemst, V., de Busschere, A., Baudonck, M., & Vanhaeke, J. (2019). Metacognition and motivation as predictors for mathematics performance of Belgian elementary school children. *ZDM - Mathematics Education*, *51*(4). https://doi.org/10.1007/s11858-018-01020-w

[14]. Desoete, A., & de Craene, B. (2019). Metacognition and mathematics education: an overview. *ZDM - Mathematics Education*, *51*(4). https://doi.org/10.1007/s11858-019-01060-w

[15]. Etuk, E. D., & Bello, D. O. (2016). Challenges and Prospects of Mathematics Education in Nigeria. *Journal of Assertiveness*.

[16]. Fatade, A. O., Mogari, D., & Arigbabu, A. A. (2013). Effect of Problem-Based Learning on Senior Secondary School Students' Achievements in Further Mathematics. *Acta Didactica Napocensia*, *6*(3).

[17]. Fehintola, J. O. (2020). Motivational Enhancement Therapy and Academic Self-Efficacy Training in Enhancing Academic Performance of Underachievers in Junior Mathematics in Ibadan, Nigeria. *Journal of Humanities Therapy*, *11*(1). https://doi.org/10.33252/jht.2020.06.11.1.33

[18]. Fleming, S. M., & Lau, H. C. (2014). How to measure Metacognition. In *Frontiers in Human Neuroscience* (Vol. 8, Issue JULY). https://doi.org/10.3389/fnhum.2014.00443

[19]. Heyes, C., Bang, D., Shea, N., Frith, C. D., & Fleming, S. M. (2020). Knowing Ourselves Together: The Cultural Origins of Metacognition. In *Trends in Cognitive Sciences* (Vol. 24, Issue 5). https: //doi.org/ 10.1016 /j.tics. 2020 .02.007

[20]. Idowu, O. O. (2016). An Investigation of Mathematics Performance of High School Students in Lagos State, Nigeria: External Factors. *Urban Education Research & Policy Annuals*, *4*(1).

[21]. Joseph Ofem, U., Idika ii, D. O., & Ovat iii, S. v. (2017). Effect of Diagnostic and Feedback Assessment Approaches in Enhancing Achievement in Mathematics among Secondary School Students in Calabar Municipality. *International Journal of Scientific Research in Education*, *10*(2).

[22]. Joseph Owan, V., Asuquo Bassey, B., Omorobi Omorobi, G., & Uwase Esuong, U. (2020). Poll Everywhere E-Learning Platform, Test Anxiety, and Undergraduates' Academic Performance in Mathematics: Empirical Evidence from Nigeria. *American Journal of Social Sciences and Humanities*, *5*(1). https://doi.org/10.20448/801.51.141.150

[23]. Josiah, O., & Olubunmi Adejoke, E. (2014). Effect of Gender, Age and Mathematics Anxiety on College Students' Achievement in Algebra. *American Journal of Educational Research*, *2*(7). https://doi.org/10.12691/education-2-7-7

[24]. Kane, S., Lear, M., & Dube, C. M. (2014). Reflections on the role of Metacognition in student reading and learning at the higher education level. *Africa Education Review*, *11*(4). https://doi.org/10.1080/18146627.2014.935001

[25]. Makinde, S. O. (2020). Impact of Flipped Classroom on Mathematics Learning Outcome of Senior Secondary School Students in Lagos, Nigeria. *African Journal of Teacher Education*, *9*(2). https://doi.org/10.21083/ajote.v9i2.6182

[26]. Millis, B. J. (2016). Using Metacognition to promote learning. *Idea*, *63*.

[27]. Muhammad Sani Abdurrahman, Faruk Abdullahi, Mustapha Ibrahim, & Mukttar Muhammad Sani. (2015). Research Article Teachers' Perception of the causes of student's poor mathematics performance in secondary schools of Kebbi State, Nigeria. *Asian Journal of Science and Technology*, *6*(2).

[28]. Musa, M., & Dauda, E. S. (2014). Trends analysis of students' mathematics performance West African Senior School Certificate Examination from 2003 to 2013: Implications for Nigerian's vision 20:2020. *British Journal of Education*, *2*(7).

[29]. Mutambuki, J. M., Mwavita, M., Muteti, C. Z., Jacob, B. I., & Mohanty, S. (2020). Metacognition and Active Learning Combination Reveal Better Performance on Cognitively Demanding General Chemistry Concepts than Active Learning Alone. *Journal of Chemical Education*, *97*(7). https://doi.org/10.1021/acs.jchemed.0c00254

[30]. Nenty, H. J. (2001). Student-Problem (S-P) Skill Analysis of Pupils' Mathematics Performance: A Strategy for Enhancing Quality in Education. *IFE PsychologIA*, *9*(1). https://doi.org/10.4314/ifep.v9i1.23609

[31]. Nett, U. E., Goetz, T., Hall, N. C., & Frenzel, A. C. (2012). Metacognitive Strategies and Test Performance: An Experience Sampling Analysis of Students' Learning Behavior. *Education Research International*, *2012*. https://doi.org/10.1155/2012/958319

[32]. Nwaocha, V. O. (2010). Enhancing students' interest in mathematics via multimedia presentation. *African Journal of Mathematics and Computer Science Research*, *3*(7).

[33]. Obomanu, B. J., & Adaramola, M. O. (2011). Factors Related to Under Achievement in Science, Technology and Mathematics Education (STME) in Secondary Schools in Rivers State, Nigeria. World Journal of Education, 1(1). https://doi.org/10.5430/wje.v1n1p102

[34]. Ogochukwu, N. V. (2010). Enhancing students' interest in mathematics via multimedia presentation. *African Journal of Mathematics and Computer Science Research*, *3*(July).

[35]. Okori, O. A., & Jerry, O. (2017). Improvisation and utilization of resources in the teaching and learning of science and mathematics in secondary schools in Cross River state. *Global Journal of Educational Research*, *16*(1). https://doi.org/10.4314/gjedr.v16i1.4

[36]. Okoza, J., Aluede, O., & Owens-Sogolo, O. (2013). Assessing students' metacognitive awareness of learning strategies among secondary school students in Edo State, Nigeria. *Research in Education*, *90*(1). https:/ /doi.org/ 10.7227/RIE.90.1.6

[37]. Olanrewaju, M. K., & Suleiman, Y. (2019). Effects of collaborative learning technique and mathematics anxiety on mathematics learning achievement among secondary school students in Gombe State, Nigeria. *Asian Journal of University Education*, *15*(1).

[38]. Onu, V., Eskay, M., Igbo, J., Obiyo, N., & Agbo, O. (2012). Effect of Training in Math Metacognitive Strategy on Fractional Achievement of Nigerian Schoolchildren. *Online Submission*.

[39]. Owan, V. J. (2018). Some Causes of Poor Performance Of Pupils in Primary School Mathematics. A Case Study in Akamkpa Local Government Area of Cross River State, Nigeria. *SSRN Electronic Journal*. https:/ /doi. org/ 10. 2139 /ssrn.3221784

[40]. Owo, W. J., & Ikwut, E. F. (2015). Relationship Between Metacognition, Attitude And Academic Achievement Of Secondary School Chemistry Students In Port Harcourt, Rivers State. *IOSR Journal of Research & Method in Education*, *5*(6).

[41]. Oyelekan, O. S., Jolayemi, S. S., & Upahi, J. E. (2019). Relationships among senior school students' self-efficacy, Metacognition, and their achievement in chemistry. *Cypriot Journal of Educational Sciences*, *14*(2). https:/ /doi.org /10.18844/cjes.v14i2.2564

[42]. Persky, A. M., & Dinsmore, D. L. (2019). Metacognitive changes and sources of confidence judgments in health professions classroom learning. *Currents in Pharmacy Teaching and Learning*, *11*(4). https:/ /doi.org/ 10.1016/ j.cptl .2019.01.005

[43]. Rhodes, M. G. (2019). Metacognition. *The teaching of Psychology*, *46*(2). https:/ /doi.org /10.1177 /0098 6283 198 34381

[44]. Salami, I. A., & Okeke, C. I. O. (2017). Transformation and decolonization of mathematics education for sustainable development: A case study of its learning trend in Nigeria. *Perspectives in Education*, *35*(2). https: //doi.org /10. 188 20/2519593X/pie. v35i2.4

[45]. Schleifer, L. L. F., & Dull, R. B. (2009). Metacognition and performance in the accounting classroom. *Issues in Accounting Education*, *24*(3). https://doi.org/10.2308/iace.2009.24.3.339

[46]. Shea, N. (2020). Concept-metacognition. *Mind and Language*, *35*(5). https://doi.org/10.1111/mila.12235

[47]. Stanton, J. D., Neider, X. N., Gallegos, I. J., & Clark, N. C. (2015). Differences in metacognitive regulation in introductory biology students: When prompts are not enough. *CBE Life Sciences Education*, *14*(2). https:/ /doi.org/ 0.1187/cbe.14-08-0135

[48]. Sunday Oche, E. (2014). The Influence of Poor Handwriting on Students' Score Reliability in Mathematics. *Mathematics Education Trends and Research*, *2014*. https://doi.org/10.5899/2014/metr-00035

[49]. Ugodulunwa, C., & Okolo, U. P. (2015). Effects of Formative Assessment on Mathematics Test Anxiety and Performance of Senior Secondary School Students in Jos, Nigeria. *IOSR Journal of Research & Method in Education Ver. II*, *5*(2).

[50]. Veenman, M. V. J., van Hout-Wolters, B. H. A. M., & Afflerbach, P. (2006). Metacognition and learning: Conceptual and methodological considerations. In *Metacognition and Learning* (Vol. 1, Issue 1). https:/ /doi.org/ 10.1007/s11409-006-6893-0