



## Exploring the State of Mathematics Curriculum Implementation in Attainment of 21<sup>st</sup> Century Skills among Students in Obollo-Afor Education Zone of Enugu State

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### Abstract

The research explores the state of mathematics curriculum implementation in attainment of 21<sup>st</sup> century skills among students in Obollo-Afor education zone of Enugu State. One Research question and hypothesis guided the work. Descriptive survey design was employed in the work. Five thousand three hundred and twenty, four (5, 324) Senior Secondary School three students' constituted the populations. The instrument for data collection was the use of questionnaire that consists of 34 items, and was validated by expert in the faculty of education University of Nigeria, Nsukka. To ensure the reliability of the instrument, it was trial tested and yielded an index of 0.82, established using Cronbach's Alpha reliability coefficient. The data collected were analyzed using mean and standard deviation to answer the research question and independent t-test was used to test the null hypothesis at .05 level of significance. The results revealed that there was no significant difference in the mean rating scores of male and female students on the attainment of the 21<sup>st</sup> century skills among students as result of the implementation of mathematics curriculum in usage now. Based on the findings, it was recommended that teachers should use all the teaching and learning activities that would enhanced the acquisitions of 21<sup>st</sup> century skills among learners.

**Keywords:** Acquisition, Attainment, Mathematics Curriculum, Mathematics Instruction, 21<sup>st</sup> Century Skills, Implementation

### Introduction

The technological advancement of any nation cannot be achieved without the knowledge of mathematics which is regarded as the mother of all subjects. However, the learners' performance in mathematics and acquisition of skills among senior secondary school students in Obollo-Afor education zone over the years have been low. This has been attributed to many factors among which the implementation of mathematics curriculum in usage is one of them, and this necessitated the need to explore the state of mathematics curriculum implementation in the attainment of 21<sup>st</sup> century's skills. Mathematics has been described as an instrument that eases or facilitates the learning of other subject (Koawole & Popoola, 2009). It contributes a significant part in the national advancement of Nigeria as well as other nations of the world in actualization of modern skills of the new era. This era is marked by increasing changes, evolving technologies, phenomenal growth of information.

According to Nwagbo (2022) 21<sup>st</sup> century skills refer to abilities or competences needed by students to succeed and thrive in today's society. Acquisition of these skills could help to engage, develop and maximize the intellectual potential of citizens. In this note, the learning environment should be organized around conditions in which humans learn best. For society to be effective in this modern ages the skills of 21<sup>st</sup> century should be attained by our students in secondary schools.

It is expected that on graduation from secondary school, students should show signs of possessing skills that will help them to thrive well in order to be useful in their career (Ukwueze & Abugu, 2024). In addition to that, for any candidate to get admission to study any course in the Nigerian universities, such candidate must have showed evidence of mastering of mathematics curriculum or its equivalent at secondary school level (Ukwueze, 2024). In spite of this fact, students' achievement in

mathematics is still low compare to other subjects indicating students' inability to acquire skills needed in different careers (Salami & Spangenberg, 2024; Ahmad et al. 2023). Many factors have been identified as the main cause of poor achievement in mathematics (Ukwueze, 2024). Among them are the usage of traditional methods of teaching and poor implementation of current mathematics curriculum by teachers of mathematics (Ukwueze & Abugu, 2024). Based on this view point, the present research wants to explore the state of mathematics curriculum implementation in the attainment of 21<sup>st</sup> century skills among students, i.e. do the teaching and learning activities exhibited by teachers of mathematics lead to students' acquisition of 21<sup>st</sup> century skills. Do the curriculum document when competently implemented lead to the attainment of 21<sup>st</sup> century skill among secondary school learners.?

Curriculum is the planned and guided learning documents formulated for learners' progress (Odili, 2006). In the area of implementation of curriculum, Odili (2006) noted that implementation of mathematics curriculum is the instructional phase in curriculum process. That is, the task of relating the document by the combined effort of the students, teachers, and others concerned with the intention of attaining certain goals. One aspect of this goal is ensuring that students acquire 21<sup>st</sup> century skills. Mathematics teacher in this era (21<sup>st</sup> century) ought to be competent with innovative methods of instructions with the motive of getting better academic performance among learners. The most innovative methods that mathematics educators should be competent with are: Cooperative learning, Gamification, flipped classroom, Project based learning, Problem based learning, thinking based learning, Design thinking, Competency based learning methods. With these, the mathematics instructors should use real examples in the classroom that enhances the acquisition of 21<sup>st</sup> century skills among students (Ukwueze & Abugu, 2024).

Meanwhile, the reverse has been the case as it is noted that students in mathematics classroom tend to respond to problems on the subjects by memorization (Siahann, Suryani, Kaniawati, Suhendi, & Samsudin, 2017) which is not helping in achieving 21<sup>st</sup> century skills. In line with this, students have difficulty in solving problems that need reasoning and analyzing problem which is generally a component of 21<sup>st</sup> century's mathematics skills. However, as noted by Nurkaeti (2018), many students are still struggling to solve mathematical problems that involves showcasing

individual skills. The effect of this is that students were found to be deficient in 21<sup>st</sup> century skills when they are faced with situations where they are expected to apply what they have learned to solve a specific problem (Olaniyan, Omosewo, & Nwankwo, 2015). This necessitated the researchers to explore the state of mathematics curriculum implementation in attainment of 21<sup>st</sup> century skills in Obollo-Afor education zone of Enugu State. That is, does the curriculum document of senior secondary school mathematics when implemented lead to learners' acquisitions of 21<sup>st</sup> century skills which are needed in the various work places. This research, intends to investigate among senior secondary school three learners the extents to which mathematics teaching and learning activities meet up in development 21<sup>st</sup> century skills among the students.

### Research Question

The question that was posed for the study is:

What are the mean rating scores and standard deviation of students based on gender on the extent to which the teaching and learning activities used in mathematics classroom are in attainment of students 21<sup>st</sup> century skills?

### Hypothesis

A single null hypothesis was posed thus:

There is no statistically significant difference in the mean rating scores of students based on gender on the extent to which the teaching and learning activities used in mathematics classroom are in attainment of students 21<sup>st</sup> century skills.

### Methods

The research adopted a survey research design, specifically descriptive survey. Five thousand three hundred and twenty, four (5,324: M=2275, F=3175) senior secondary school three students found in all public schools in Obollo- Afor Education Zone of Enugu State in (2023/2024) academic session constituted the population. The sample of three hundred and fifty (350: M=150, F=200) SS 3 students gotten through Taro Yamane formula, which states that the proportion or margin of error of 5% (0.05) was taken from the target population were used for the study. Two schools were randomly selected from each LGAs that made up the zone using purposive sampling techniques making it a total of 350 students.

The instrument titled "Mathematics Teaching and Learning Activities to Classroom Instruction"

(MTLACI) for attainment of the 21<sup>st</sup> century skills questionnaire was employed in the work. The MTLACI for attainment of the 21<sup>st</sup> century skills were adapted from 21<sup>st</sup> century and mobile learning guides designed in two sections which address the research question. Section A deals with the respondents' biodata information, and B a structured items focused on teaching and learning activities that took place in classroom for the attainment of 21<sup>st</sup> century skills. Section B consists of 34 structured items statement as follow Strongly Disagree (SD=1), Disagree (D=2), Agree (A=3), Strongly Agree (SA=4) questions. MTLACI for attainment of the 21<sup>st</sup> century skills questionnaire was validated facially by experts in the Faculty of Education University of Nigeria, Nsukka

(UNN), one from measurement and evaluation unit, one from mathematics education unit and the other one from educational psychology unit. MTLACI yielded reliability co-efficient index of 0.82 established using Cronbach's Alpha reliability coefficient which was deemed okay for the research.

Generated data for the study were done using SPSS version 20. It was used in providing descriptive (mean and standard deviation) statistics for research question and using independent t test in testing the null hypothesis at 0.05 significant levels. In taking decision for mean, the range values of 1.00-1.49 for SD, 1.50 – 2.49 for D, 2.50 – 3.49 for A and 3.50 -4. 00 for SA were adopted.

## Results

**Table 1: SPSS Group for Descriptive Statistics based on gender on Mathematics Teaching and Learning Activities to Classroom Instruction” (MTLACI) for attainment of the 21<sup>st</sup> century skills questionnaire.**

| Group  | N   | Mean Ratings | SD   | Std. Error Mean |
|--------|-----|--------------|------|-----------------|
| Male   | 150 | 2.88         | 0.96 | 1.6149          |
| Female | 200 | 2.76         | 0.93 | 2.6624          |
| Total  | 350 |              |      |                 |

The results display in the table 1 above showed that male students had the mean rating scores of 2.88 and 0.96 as standard deviation whereas, the female students had the mean rating scores of 2.76 and 0.93 as standard deviation, the standard error mean of 1.6149 and 2.6624 respectively for male and female students. Implying higher mean rating scores with higher standard deviation for male than female students on

Mathematics Teaching and Learning Activities to Classroom Instruction” (MTLACI) for attainment of the 21<sup>st</sup> century skills questionnaire. The average mean rating scores reached the bench mark scores for acceptance as can be seen from the criteria for agreement. With this standard deviation, it implies that the variation in the students' responds is almost similar.

**Table 2: Independent Sample t-test analysis for differences' in male and female rating scores on MTLACI for attainment of the 21<sup>st</sup> century skills questionnaire.**

| Group  | N   | X    | SD   | Df  | t     | p    |
|--------|-----|------|------|-----|-------|------|
| Male   | 150 | 2.88 | 0.96 | 348 | 2.105 | .094 |
| Female | 200 | 2.76 | 0.93 |     |       |      |

Table 2 above showed that the difference in with  $t(348) = 2.105 = .094$ ,  $P > .05$ . Indicating none rejection if the hypothesis, thus no significance variation on the mean respondents scores based on gender on the teaching and learning activities questionnaire among learners.

## Discussion

The results of the research indicated that both male and female learners agreed that mathematics teachers implement the curriculum document to the attainment of 21<sup>st</sup> century skills among learners in Obollo-Afor education zone of Enugu state. Though not

all the items in teaching and learning activities towards 21<sup>st</sup> century skills were agreed upon. The analysis of t-test from the Table 2 showed no significant changes in the mean rating scores of based on gender on MTLACI for attainment of 21<sup>st</sup> century skills questionnaire.

The finding might be the fact that there were several efforts made by the state government in enhancing education at primary and post primary levels by initiating ideas and facilities to be employed by the mathematics instructor in the classroom especially in the state. It was only few students that complained of their mathematics teachers' failure to embrace teaching and learning activities which might hinder the attainment of 21<sup>st</sup> century skills among students. The few could be attributed to in efficiency on the side of the said instructors.

The above finding is in harmony with the previous research results which were reported by Ukwueze, Edukwu & Eke (2013), Adeniran & Odebo (2017) and Odebo (2019) respectively, who confirmed no significant changes among instructors and learners in ways mathematics are taught as a result of new curriculum geared towards attainment of 21<sup>st</sup> century skills among learners. They believed that students skills were developed as result of efficient implementation of curriculum and these skills build up a viable economy to our dear nation. This is similar to this finding as it is only quality teachers that can effectively implements the curriculum document towards attaining the 21<sup>st</sup> century skills among learners. The major contributory factors in attaining 21<sup>st</sup> century skills are by first having a good mathematics curriculum and quality implementers which will amount to quality education and achievement of its objectives. Thus, with the implementation guideline supported by the State governments in line with the implementation of the curriculum to achieve its objectives. This is in concordance with, the findings of Ukwueze and Abugu (2024) who confirmed that mathematics curriculum implementation was adequate in enhancing critical thinking skills among learners in the area. The agreement in the findings could be as result of employing similar method of carrying the investigation and on a similar variable of study which is curriculum implementations for both research.

The finding of the research is in disagreement with the reports of Ayotola and Ajani (2019), and Tela (2019) with respect to changes in mathematics instructions, and evaluation tools as a result sustainable development goals in education. They asserted that there were no changes in the teaching and learning

towards attaining the sustainable development goals. The disagreement could be as a result of the fact that reported finding incorporated evaluation tools used in mathematics classroom in the work while this reports used on mathematics curriculum implementations.

The study unveiled that certain teaching and learning activities done in the mathematics classroom could be helpful to the students in attaining the 21<sup>st</sup> century skills to meet the global challenges of the modern age. The study has some limitations that should be noted. The generalization of our findings to a wider population should be done with caution since this study made use of only SS3 students. Similar study could be replicated using other students for further study.

### Conclusion

The study sought to explore the state of mathematics curriculum implementation in attainment of 21<sup>st</sup> century skills among students in Obollo-Afor Education Zone of Enugu State. Result from the work showed that, both gender agreed that there was no significant variation on mathematics teachers' implementation of curriculum to the attainment of 21<sup>st</sup> century skills among learners. The study concludes that all the teaching and learning activities that would enhance the acquisition of 21<sup>st</sup> century skills among students should be employed in the classroom in order to meet up with the global challenges of the modern age.

### Recommendation

The research recommends among others that:

1. There should be a solid effort to educate all students together with all mathematics teachers at all levels of secondary school through seminars, workshops conferences and so on, on the need to embrace all the teaching and learning activities design to be used in mathematics classroom.
2. There should be adequate provision of 21<sup>st</sup> century learning materials for mathematics instruction by the NERDC through the government.
3. Instructors and learners must be encouraged by way of incentives to learn mathematics while in-cooperating 21<sup>st</sup> century skills and familiarized themselves with ICT facilities.

### References

- Adeniran, S.A. & Odebo, A.O. (2017). Achieving Sustainable Development and Self-Reliance through Science and Technology and





- Mathematics Education. A book of reading pp 1-10. Publisher peerless, Nigeria
- Aguokogbuo, C.N., (2000). Unmasking some aversive aspect of school methods and strategies for averting them. *Inaugural Lecture*, 5<sup>th</sup> July.
- Ahmad, M.U., Liman, M.A & Shehu, L.A (2023). Inquiry-based learning and secondary school students' performance in the concept of mensuration in Minna educational zone, Niger State, Nigeria. Faculty of Natural Science and Applied Science. *Journal of Mathematics and Science Education*, 5(1), 1-7. Retrieved from <https://fnasjournals.com/index.php/FNAS-JMES/article/view/232>
- Enuwah, E.C., (2013). Effect of material and non-material reinforcement on junior primary school pupils' achievement and interest on number and numeration. *An unpublished M.Ed. Thesis, University of Nigeria, Nsukka.*
- Koawole, F.B. & Popoola, G. E., (2009). Critical Race Theory and Education: History, *Theory, and Implication in M. Apple (ed.) Review of Research in Education*, (22). Washington D.C.: American Educational Research Association.
- Nurkaeti, S.G., (2018). Gender differences and the effect on cooperative learning in college level mathematics. *An Unpublished Ph.D Thesis, Perth: Curtin University of Technology.*
- Nwagbo, C.R. (2022). Teaching or Cheating in Science Education Practice: The twenty first Century Experience. *An Inaugural Lecture of the University of Nigeria delivered on 10<sup>th</sup> Feb. 2022.*
- Odebode, A.O. (2019). Impact of mathematics in Enhancing Creativity and Critical Thinking skills in Tertiary Education in Oyo State. *Proceedings of 56<sup>th</sup> Annual National Conference of Mathematical Association of Nigeria September 2019, pp. 515-519*
- Odili, G.A. (2006). *Mathematics in Nigeria Secondary School: A Teaching Perspective*. PortHarcourt: Anachuna Educational books.
- Olaniyan, H.S., Omosewo, T. & Nwankwo, S., (2015). Attaining the Target of Sustainable Development Goals in education through effective implementation of mathematics curriculum in Nigeria secondary schools: *Proceedings of 56<sup>th</sup> Annual National Conference of Mathematical Association of Nigeria September 2019, pp. 498-503.*
- Salami, O.D. & Spangenberg, E.D. (2024). Impact of Co-operative learning on teaching mensuration to Secondary School Students. *Interdisciplinary Journal of Education Research*. <https://doi.org/10.38140/ijer-2024>
- Siahann, T. Suryani, W.J. Kaniawati, P. Suhendi, R. Y & Samsudin, W.I., (2017). Effect of Mathematics Games on Students' Achievement and Interest in Mathematics. *Journal of Mathematical Association of Nigeria* 12, no; 3, pp 151-157.
- Tela, A.B. (2019). Attaining the Target of Sustainable Development Goals in education through effective implementation of mathematics curriculum in Nigeria secondary schools: *Proceedings of 56<sup>th</sup> Annual National Conference of Mathematical Association of Nigeria September 2019, pp. 498-503*
- Ukwueze, T. C., & Abugu, G.N. (2024). The Impact of Mathematics Curriculum Implementation on Development of Students' Critical Thinking Skills among Secondary School Students in Obollo-Afor Education Zone of Enugu State. *Journal Publication of Federal University of Wukari Centre for Research & Publication, Taraba State, Nigeria. 1 (1), September, 2024.*
- Ukwueze, T.C. (2024). Efficacy of Differentiated Based Learning Instructional Approach and Scaffolding Based Learning Instructional Approach on Senior Secondary Students' Task Persistence and Achievement in Mensuration. *An unpublished P.hD Thesis, University of Nigeria, Nsukka.*
- Ukwueze, T.C., Edukwu, F. & Eke, C.A. (2013). Impact of UBE Programme on JSS Mathematics Curriculum implementation. *An Unpublished B.Sc Project Submitted to Department of Science Education, University of Nigeria, Nsukka.*