



## **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.**

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### **Abstract**

This study assessed the impact of mathematics curriculum implementation approaches on development of students' critical thinking skills among senior secondary school students in Obollo-Afor zone of Enugu State. To achieve the purpose of the study, two research questions and one null hypothesis guided the study. The design of the study was a descriptive survey design. The population of the study comprised all the SSS3 students in public schools in obollo-Afor Education zone of Enugu state. The sample of 400 hundred students (200 males and 200 females) was drawn using purposive random sampling technique. The instrument for data collection was the use of questionnaire designed for collection of data on students' critical thinking skills developed by the researchers. The instrument consisted of 20 structured items. The instrument was validated by three experts in Faculty of Education one from measurement and evaluation unit one from mathematics education unit and one from educational psychology unit. The internal reliability coefficient of 0.80 using inter-raters reliability coefficient was obtained. The data collected were analyzed using mean and standard deviation to answer the research questions and independent t-test was used to test the null hypotheses at .05 level of significance. The results of the study revealed that the current mathematics curriculum if implemented well impacted positively on students' critical thinking as most learners are becoming ICT compliance and can interact with colleagues of the wider societies. The study also revealed that there was no significant difference in the mean scores of male and female on their ratings, implying that the mathematics curriculum is gender friendly on students' critical thinking skills. Based on the findings, it was recommended that mathematics teachers should adhere to the current curriculum and always consider the 21<sup>st</sup> century skills in their mathematics instruction. More so, both teachers and students should be reminded from time to time on their stance to the modern age expectation through conferences and seminars.

**Keywords:** Mathematics Curriculum, Content Delivery, Content assessment, Teaching Materials, Curriculum Implementation, Development, Critical Thinking, Digital skills.

## **Introduction**

Knowledge of sciences and mathematics are essential for advancements in technology and solutions to some of the problems of the society we live in. Hence, mathematics is said to be the gateway to science and technology. Mathematics according to

Odili (2006) is a creation of human mind which can be seen as a body of knowledge a collection of techniques and methods, the product of human activity and even the activity itself. Ogbu (2016) noted that mathematics can be seen, as both process and product. As a process, mathematics centers on problem solving

activities; as a product, mathematics involves procedures, techniques that result in unique outcomes. It is also regarded as document (curriculum) for the great achievers, in that it is a do without for the learners.

Curriculum is the planned and guided learning experiences and intended learning outcomes, formulated through the systematic reconstruction of knowledge and experience under the auspices of the school, for learners' continuous growth in personal and social competence (Odili, 2006). It is a document designed to be used as a point of departure for instructional planning.

Mathematic curriculum is a set of mathematical content, together with indications of how it should be implemented. The current mathematics curriculum was planned and developed by NERDC in 2016 with the intention of developing critical thinking and problem solving ability which is the bane of 21<sup>st</sup> century skills in the students. In the area of curriculum implementation, Odili (2006) noted that mathematics curriculum implementation is the instructional phase in curriculum process. It is the task of translating the curriculum document by the combined effort of the students, teachers, and others concerned. For the planned mathematics curriculum to achieve its purpose, the implementers of the curriculum (teachers) must show adequate mastery of all the skills necessary in helping the learners to be proficient in the subjects (Ukwueze, Edukwu & Eke, 2013). This stage is so important that if not handled well, the success and failure depend on the teachers who bring the learner on a face

to face or in online encounter with all adequate learning activities (Agwu & Akuma, 2001). Lack of or poor problem solving and critical thinking ability of students according to the researchers could be an issue of great concern.

Critical thinking skill is one of the core skills that the students need, in order to meet up with the challenges of the modern age irrespective of where one found himself. They are the needed skills capable of transforming students into a successful living in the world of today. Critical thinking skill can be developed through a process of mathematics learning because mathematics has a structure and a strong and clear connectivity between its concepts to students who learn mathematics potential to be rational, logical thinking and critical (Rajendran, 2010; Aizikovitch & Amit, 2011). Also, according to Odebode (2019) mathematics boosts cognitive and mental action in students, develop their mind of creativity and make them innovative.

Critical thinking is applied and used daily, specifically in decision making, systematic reasoning, analyzing information, and even in communicating ideas. Strengthening one's independent learning ability is paramount to this process skill which is needed in today's world irrespective of gender and location. Proficiency with this skill is vital in enhancing fundamental knowledge in different learning areas like mathematics (Kevin, Artuz, & Dennis, 2021). Thus, this skill is important to be developed in order to successfully learn mathematics which is a mother of everything in our daily lives. Developing students' critical

thinking skills is an educational goal common to perhaps every academic program or discipline (Soltis, Verlinden, Kruger, Caroll, & Trumbo, 2020).

However, in reality, many students according to Nurkaeti, (2018) are still struggling to solve mathematical problems. The effect of this is that students were found to be deficient in cognitive and critical thinking 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 is widely seen when students enter higher institutions in their first years. Due to the importance of critical thinking skills to the students, there is need to find out the impact of mathematics curriculum implementation approaches on development of students' critical thinking among senior secondary school three students in Obollo-Afor Education zone of Enugu state.

### Statement of the Problem

Over the years, attempts have been made to fashion out mathematics curriculum implementation in such a way that, it will help students in the development of skills in students. Among the prominent skills was the critical thinking skill which is needed in all spheres of life. Students' inability to cope with mathematics related courses in their first year of universities and other tertiary institutions is a pointer to this trend. The poor performance of students in their first years of studies especially in mathematics related courses has been an issue of great concern of lecturers and parents.

This has been attributed to poor societal value of passing rather than developing critical thinking skills among secondary school students. This poor values are rampant as many students resorted to the usage of multiple ways that will facilitates passing than developing critical thinking skills among themselves, hence resorted to learning by cramming. In view of this learners are encourage to memorize than drawing the innate nature of the learners. It is on this premise that the researchers decided to assess the impact of mathematics curriculum implementation approaches on the development of students' critical thinking skills. This study therefore, intends to investigate among senior secondary school three students the extents to which mathematics curriculum implementation approaches impact on students critical thinking skills of the learners.

### Purpose of the study

The main purpose of this study assessed the impact of mathematics curriculum implementation approaches on development of students' critical thinking skills among senior secondary school students in Obollo-Afor zone of Enugu State. Specifically, the study seeks:

1. To determine the impact of mathematics curriculum implementation on students critical thinking skills.
2. To ascertain the influence gender on the impact of mathematics curriculum implementation on students critical thinking skills.

## Research Questions

The study was guided by the following research questions:

1. What are the mean rating scores and standard deviation of students on the impact of mathematics curriculum implementation on students critical thinking skills?
2. What are the mean rating scores and standard deviation of students on the impact of mathematics curriculum implementation on students critical thinking skills based on gender?

## Hypotheses

The study was guided by the hypothesis below and was tested at 0.05, level of significance.

**Ho<sup>1</sup>:** There is no statistically significant difference in the mean rating scores of male and female students on the impact of mathematics curriculum implementation on students' critical thinking skills.

## Methods

The study adopted a survey research design, specifically descriptive survey. The population of the study comprised all the entire students of senior secondary school three found in all the forty, nine public schools in Obollo-Afor education zone of Enugu state. The sample of, four hundred students (200 male and 200 female) were selected using purposive random sampling technique.

The instrument for data collection was by the use of questionnaire. The questionnaire was designed to address the research question on the area of content delivery, assessment methods, and teaching materials used by mathematics teachers during their classroom instructions. Data were obtained using Students' Critical Thinking Skill Questionnaire (SCTSQ).

The questionnaire consists of structured items as follow Strongly Disagree (SD=1), Disagree (D=2), Agree (A=3), Strongly Agree (SA=4) questions. The SCTSQ, was face validated by three experts in the faculty of education, one from mathematics education unit, one from measurement and evaluation unit and one from educational psychology unit all from University of Nigeria, Nsukka (UNN). The reliability coefficients of SCTSQ, was 0.80, established using inter-raters reliability coefficient. Means and Standard deviations were used to provide answer to the research questions while the independent t-test was used to test the hypothesis at 0.05 level of significance.

## Results

### Research Question One:

What are the mean rating scores and standard deviation of students on the impact of mathematics curriculum implementation on students' critical thinking skills?

**Table 1:** Mean ratings and Standard deviation of response of students on the impact of mathematics curriculum implementation approaches on students' critical thinking skills.

<i>S/N</i>	<i>Item Statement</i>	<i>Mean</i>	<i>SD</i>	<i>Decision</i>
1	Mathematics instructions are fully of fun in my schools.	2.55	0.54	D
2	Our learning of mathematics in our classroom is practically oriented.	2.46	0.43	D
3	Our teachers' approaches to instruction develop critical thinking skills in us.	3.02	0.78	A
4	Students' success in mathematics is determined by the method of teaching used by the teachers in the classroom.	3.00	0.62	A
5	The methods used by our teachers improve our critical thinking skills.	2.93	0.45	A
6	Good methods of teaching promote our learning skills in and outside the classroom.	3.45	0.34	A
7	No matter how our teachers teach critical thinking skills are developed.	1.74	0.46	D
8	Project and performance tasks promote critical thinking skills in learners.	3.21	0.51	A
9	Competent based instruction does not develop the traits of critical thinking and reasoning skills.	3.12	0.65	A
10	Competent teachers' instruction, motivate students' critical thinking skills in mathematics.	3.10	0.45	A
11	Our instructors always assist us in reflecting on our future and evaluating our learning experiences in mathematics.	2.43	0.64	D
12	The usage of teaching aids help in developing mathematical skills in students.	3.39	0.43	A
13	Mathematical laboratory play a key role in the development of skills needed in mathematics.	3.81	0.34	A
14	Frequent assessments promote critical thinking in the students.	3.48	0.63	A
15	Regular teachings promote critical thinking in the students.	2.84	0.74	D
16	Morning classes helps in the development of mathematical skills in the students than afternoon classes.	3.05	0.45	A
17	Team teaching develops critical thinking ability in the students.	2.15	0.52	D
18	Group work is not good for the development of mathematical skills.	3.45	0.53	A
19	Collaborations are needed both within and outside the classroom for critical thinking skills to be developed.	2.70	0.63	A
20	Friendliness of the mathematics teacher improves students' skills in mathematics.	3.50	0.62	A

The result on table one indicated that a highly significant number of students agree that the use certain methods of teaching and regular assessment of instruction in mathematics improves students critical thinking skills.

Also, the result showed that a significant number of students disagree with the usage of particular method of assessment on them in the mathematics instructions by their teachers, such as portfolios and project methods.

**Research Question Two**

What are the mean rating scores and standard deviation of students on the impact of mathematics curriculum implementation on students’ critical thinking skills as a result of gender?

**Table2: SPSS Group Statistics**

Mean rating scores and standard deviation of students on the impact of mathematics curriculum implementation approaches on students’ critical thinking skills as a result of gender

Group Statistics					
	Grouping	N	Mean	Std. Deviation	Std. Error Mean
Initiative skills	Male	200	3.1600	.97151	.09715
	Female	200	2.9500	.95743	.09574

The table above showed the mean and standard deviation of male and female students on the impact of mathematics curriculum implementation approach on critical thinking skills. Male students had higher mean scores than their female counterpart 3.1600 and 2.9500 respectively. Further analysis of t-

test was conducted to see if this difference is statistically difference.

**Ho 1:** There is no statistically significant difference in the mean rating scores of male and female students on the impact of mathematics curriculum implementation approaches on students’ critical thinking skills.

**Table 3a: SPSS Group Statistic**

Group Statistics					
	Grouping	N	Mean	Std. Deviation	Std. Error Mean
Initiative skills	Male	200	3.1600	.97151	.09715
	Female	200	2.9500	.95743	.09574

**Table 3b:**

T- test summary on the difference between the mean scores of male students and mean scores of female

students on the impact of mathematics curriculum implementation on students critical thinking skills tested at 0.05 level of significance.

**Independent Sample Test**

	Levenen's test of equality of Variances		t-test for Equality of means						
	F	Sig	T	Df	Sig(2-tailed)	Mean difference	Stderror difference	95% confidence interval of the difference	
								Lower	Upper
Equal variances assumed	.768	.384	1,540	398	.125	.2100	,31062	-.37904	.395361
Variances not assumed			1,540	197.958	.125	.2100	,31062	-.18674	.379962

The result in the table 4 above showed that the significant (2-tailed) test of .125, was greater than the 0.05 level of significance, indicates that the null hypothesis was not rejected, thus there was no statistically significant difference in the mean rating scores of male and female students on the impact of mathematics curriculum implementation on students' critical thinking skills.

**Discussion**

The findings of the study with respect to the research questions and hypotheses as can be seen in table 1-4, showed that both the male and female students agreed on items on the impact of mathematics curriculum implementation on students' critical thinking skills and disagree on some item statements.

This was further strengthened by the analysis of t-test in the table 2 which showed no significant difference in the mean rating scores of male and female students on the impact of mathematics curriculum implementation approaches

on students' critical thinking skills This result is in agreement with the earlier research findings which were conducted by Ukwueze, Edukwu& Eke (2013), Adeniran & Odebode (2017) and Odebode (2019) respectively, who confirmed that there was no impact on the way mathematics are taught as a result of new curriculum, that critical thinking develops skills, and skills build up a viable economy and mathematics did have impact in enhancing critical thinking and creativity in tertiary education in Oyo state of Nigeria.

The finding is in disagreement with the findings of Ayotola and Ajani (2019), and Tela (2019) with respect to changes in the teaching and learning of mathematics, and mathematics evaluation tools as a result sustainable development goals in education. The finding could be attributed to the fact that there are no much facilities to be used in teaching and learning of mathematics in the classroom especially in the rural areas.

## Conclusion

The study sought to investigate among senior secondary school three students the extents to which mathematics curriculum implementation approaches impact on students critical thinking skills of the learners in Obollo-Afor education zone of Enugu state.

On the basis of the findings of this study showed that, both male and female students agreed that good curriculum implementations impacted on students critical thinking skills.

## Recommendations

The following recommendations are made based on the findings of this study.

1. Mathematics teachers should adhere to the current curriculum as it is found to be adequate in impacting students' critical thinking skills.
2. There is the need to be reminding both teachers' and students of mathematics to always consider 21<sup>st</sup> century critical skills in their learning process.
3. Both teachers and students must be encouraged to learn mathematics in compliance with 21<sup>st</sup> century critical skills and familiarized themselves with ICT facilities.

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