
**ASSESSMENT OF MATHEMATICS CURRICULUM IMPLEMENTATION ON THE
ENHANCEMENT OF CRITICAL THINKING SKILLS AMONG SECONDARY SCHOOL
STUDENTS IN DUTSE EDUCATION ZONE OF JIGAWA STATE**

Dr. SULE SAMUEL SARDAUNA

**Department of Science Education, Faculty of Education,
Yobe State University, Damaturu Nigeria.**

E-mail: profsam8@gmail.com,

Abstract

This study investigated the assessment of mathematics curriculum implementation strategies on the enhancement of students' critical thinking skills among senior secondary school students in Dutse Education Zone of Jigawa State. A descriptive survey design was used for the research. The population consisted of all senior secondary school two (SSS2) students in public schools in Dutse Education Zone of Jigawa State. A sample of 400 students (200 males and 200 females) was selected using purposive random sampling technique. Data was collected through a questionnaire titled "Students' Critical Thinking Skill Questionnaire (SCTSQ)". The questionnaire included 20 structured items and was validated by two experts from the Department of Science and Technology Education, Faculty of Education, University of Jos, representing mathematics education, measurement and evaluation,. The internal reliability coefficient of 0.83 was achieved using inter-rater reliability. The collected data were analyzed using mean and standard deviation and independent t-test was used to test the null hypothesis at a 0.05 significance level. The findings revealed among others that; students agreed with the particular method of assessment used by their teachers in mathematics instruction. This indicates that the assessment approach employed was perceived by students as appropriate, relevant, and supportive of learning process. Based on these findings, it was recommended that mathematics teachers should strictly follow the current curriculum, as it has been shown to effectively enhance students' critical thinking skills. Teachers should maintain gender inclusive practices by providing equal participation in problem solving.

Keywords: Mathematics Curriculum, Content Delivery, Teaching Materials, Curriculum Implementation, Thinking skills

Introduction

Technological innovation and solutions to society's most pressing challenges hinge on deep understanding of science and mathematics. Consequently, mathematics is often referred to as the gateway to science and technology. Mathematics is a product of the human mind, viewed as a collection of knowledge, methods, and techniques essentially both the product of human activity and the activity itself (Odili, 2006). Ogbu (2016) highlighted that mathematics can be seen as both a process and a product. As a process, it focuses on problem-solving activities, whereas as a product, it involves techniques and procedures that lead to distinct outcomes. Mathematics is also regarded as a foundational tool for achievement, providing necessary skills for learners.

In the study's context, curriculum refers to the organized and planned educational experiences and expected learning outcomes. It is developed through a structured reorganization of knowledge and experiences by the school, aimed at supporting learners' ongoing personal and social growth (Odili, 2006). Essentially, the curriculum serves as a framework for instructional planning.

The mathematics curriculum is a compilation of mathematical content along with instructions on its implementation. The current curriculum, designed and developed by NERDC in 2016, aims to cultivate critical thinking and problem-solving skills essential competencies for 21st-century students. Odili (2006) explained that curriculum implementation is the phase where the curriculum is translated into practice. This process involves the collective efforts of students, teachers, and other relevant parties. For the mathematics curriculum to succeed, teachers must possess the necessary skills to ensure students master the subject (Ukwueze, Edukwu & Eke, 2013). Researchers have pointed out that insufficient problem-solving and critical thinking abilities in students may be a significant concern.

Critical thinking is a fundamental skill that students need to navigate the challenges of the modern world, regardless of their location. These skills are vital in shaping students into successful individuals. Mathematics education is particularly effective in developing critical thinking skills due to its logical structure and the clear connections between its concepts, which help students become rational, logical, and critical thinkers (Rajendran, 2010; Aizikovitsh & Amit, 2011). Odebode (2019) also emphasized that mathematics enhances cognitive abilities, fosters creativity, and promotes innovation in students.

Critical thinking is an essential skill used daily for decision-making, systematic reasoning, analyzing information, and communicating ideas. Strengthening independent learning abilities is central to this skill, which is crucial in today's world, irrespective of one's gender or geographical location. Mastery of critical thinking is essential for improving knowledge across different fields of study, such as mathematics (Kevin, Artuz, & Dennis, 2021). Therefore, it is important to develop critical thinking skills for effective mathematics learning, as mathematics plays a key role in our everyday lives.

Despite its importance, many students continue to struggle with solving mathematical problems. According to Nurkaeti (2018), students often lack cognitive and critical thinking skills when they face challenges that require applying what they have learned to solve specific problems (Olaniyan, Omosewo, & Nwankwo, 2015). This is particularly evident when students enter higher education institutions. Given the importance of critical thinking skills, it is essential to examine how different approaches to implementing the mathematics curriculum impact the development of critical thinking skills among senior secondary school students in the Obollo-Afor Education zone of Enugu State.

Statement of the Problem

Over time, efforts have been made to design mathematics curriculum implementation in a way that helps students develop essential skills. One of the key skills emphasized is critical thinking, which is necessary for success in all areas of life. However, poor performance in mathematics remains a persistent challenge and thus affecting graduation rates, progression in STEM fields, and overall academic achievement. Engineering students showed an ever increasing rate of failure in engineering mathematics over four academic sessions (Godwin & Okere, n.d)

This problem is often linked to a societal tendency to prioritize passing exams over cultivating critical thinking skills among secondary school students. This mindset is widespread, with many students focusing more on finding shortcuts to pass exams rather than fostering their critical thinking abilities, leading them to rely on rote memorization. As a result, students are encouraged to memorize information instead of tapping into their natural thinking abilities. It is based on this understanding that the researcher decided to evaluate the impact of different approaches to mathematics curriculum implementation on the development of students' critical thinking skills. This study, therefore, aimed to explore how various methods of implementing the mathematics curriculum affect the development of critical thinking skills among senior secondary school three students.

Purpose of the Study

The primary aim of this study was to investigate the mathematics curriculum implementation on the enhancement of critical thinking skills among senior secondary school students in Dutse Education zone of Jigawa State. Specifically, the study aimed to:

1. assess the mathematics curriculum implementation on students' critical thinking skills in Dutse Education Zone of Jigawa State
2. ascertain the influence of gender on the mathematics curriculum implementation on students' critical thinking skills in Dutse Education Zone of Jigawa State

Research Questions

The study was structured around the following research questions:

1. What are the students' mean ratings in assessing mathematics curriculum implementation and their critical thinking skills in Dutse Education Zone of Jigawa State?
2. What are the mean rating differences between male and female students in assessing mathematics curriculum implementation and their critical thinking skills in Dutse Education Zone of Jigawa State?

Hypothesis

This study was based on a single null hypothesis, tested at a 0.05 level of significance.

There is no significant difference between the mean rating scores of male and female students in assessing mathematics curriculum implementation and their critical thinking skills in Dutse Education Zone of Jigawa State.

Methodology

The study employed a survey research design, specifically a descriptive survey. The population included all senior secondary school students in second year (SS2) from the forty-seven public schools within Dutse Education Zone of Jigawa State. A sample of 400 students (200 male & 200 female) was drawn using purposive random sampling technique.

Data were collected through a questionnaire designed to address research questions related to content delivery assessment methods, and teaching materials used by mathematics teachers during classroom instruction. The Students' Critical Thinking Skill Questionnaire (SCTSQ) was the instrument used for data collection in the study. The questionnaire consisted of structured items with response options, thus: Strongly Disagree (SD=1), Disagree (D=2), Agree (A=3), and Strongly Agree (SA=4), with the midpoint being used to

determine the cut-off point, computed by taking the average or mean and divide by the number of occurrence. Thus, $1+2+3+4 = 10$ divide by $4 = 2.5$. This indicates that any mean score equals to 2.5 and above is accepted while the mean score below 2.5 is rejected. The SCTSQ was face-validated by two experts from the Department of Science, Technology, and Education at the University of Jos—one from the Mathematics Education unit and one from the Measurement and Evaluation unit. The reliability coefficient of the SCTSQ was 0.83, established using the inter-rater reliability method.

In order to analyze the data, means and standard deviations were used to answer the research questions, while an independent t-test was employed to test the hypothesis at a 0.05 level of significance.

Results

Data analysis was carried out according to the research questions and a null hypothesis

Research Question One:

What are the students' mean ratings in assessing mathematics curriculum implementation and their critical thinking skills in Dutse Education Zone of Jigawa State?

Table 1: Mean rating scores and Standard deviation of Students on effect of Mathematics Curriculum Implementation approaches on their critical thinking skills.

S/N	Item	Mean	SD	Decision
1	Mathematics instructions are fully of fun in my schools.	2.36	0.53	Disagreed
2	Our learning of mathematics in our classroom is practically oriented.	2.47	0.42	Disagreed
3	Our teachers' approaches to instruction develop critical thinking skills in us.	3.03	0.74	Agreed
4	Students' success in mathematics is determined by the method of teaching used by the teachers in the classroom.	3.01	0.63	Agreed
5	The methods used by our teachers improve our critical thinking skills.	2.94	0.45	Agreed
6	Good methods of teaching promote our learning skills in and outside the classroom.	3.46	0.34	Agreed
7	No matter how our teachers teach critical thinking skills are developed.	1.75	0.46	Disagreed
8	Project and performance tasks promote critical thinking skills in learners.	3.21	0.51	Agreed
9	Competent based instruction does not develop the traits of critical thinking and reasoning skills.	3.13	0.66	Agreed
10	Competent teachers' instruction, motivate students' critical thinking skills in mathematics.	3.10	0.45	Agreed
11	Our instructors always assist us in reflecting on our future and evaluating our learning experiences in mathematics.	2.43	0.64	Disagreed
12	The usage of teaching aids help in developing mathematical skills in students.	3.38	0.43	Agreed
13	Mathematical laboratory play a key role in the development of skills needed in mathematics.	3.81	0.34	Agreed
14	Frequent assessments promote critical thinking in the students.	3.48	0.63	Agreed
15	Regular teachings promote critical thinking in the students.	2.85	0.74	Disagreed
16	Morning classes helps in the development of mathematical skills in the students than afternoon classes.	3.05	0.45	Agreed
17	Team teaching develops critical thinking ability in the students.	2.14	0.52	Disagreed
18	Group work is not good for the development of mathematical skills.	3.45	0.53	Agreed

19	Collaborations are needed both within and outside the classroom for critical thinking skills to be developed.	2.70	0.63	Agreed
20	Friendliness of the mathematics teacher improves students' skills in mathematics.	3.53	0.61	Agreed

Source: Field Survey (2026).

The results on table 1 indicated that only five students disagreed that the use of certain methods of teaching and regular assessment of instruction in mathematics improves students' critical thinking skills. Also, the result showed that fifteen students agreed 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 differences between male and female students in assessing mathematics curriculum implementation and their critical thinking skills in Dutse Education Zone of Jigawa State?

Table 2: Mean rating scores and standard deviation of students on the effect of mathematics curriculum implementation on their critical thinking skills according to gender.

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Innitiative	Male	200	3.1600	.97152	.09716
skills	Female	200	2.9500	.95744	.09575

The results in table 2 showed the mean and standard deviation of male and female students on the effect 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. A further t-test analysis was conducted to determine whether this difference is statistically significant

Hypothesis One: There is no significant difference between the mean rating scores of male and female students in assessing mathematics curriculum implementation and their critical thinking skills in Dutse Education Zone of Jigawa State.

Table 3: Independent Sample Test

A t-test summary was conducted to compare the mean scores of male and female students regarding the assessment of mathematics curriculum implementation on their critical thinking skills.

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

Variances			1,540	197.	.125	.2100	,31062	-18674	.379962
Tot				958					
assumed									

Table 3 displayed the results of the independent sample t-test on the mean scores of male and female students regarding the assessment of mathematics curriculum implementation on their critical thinking skills. As shown in Table 3 test value of 0.125 was significantly greater than the 0.05 level of significance, indicating that the null hypothesis was not rejected. Therefore, there was no significant difference in the mean rating scores of male and female students in assessing the mathematics curriculum implementation on their critical thinking skills.

Discussion of the Findings

Discussion was done in accordance with the research questions and a null hypothesis:

The results in Table 1 on the research question one revealed that most students agreed with the usage of certain aspects of assessing the mathematics curriculum implementation on their critical thinking skills. Students' agreement means that the assessment practice employed was perceived as fair relevant, and aligned with how they learn mathematics. This is significant because assessment communicates what teachers value as mathematical knowledge (Boyd & Ash 2018). When students endorse an assessment method, it often indicates that the method allows them to demonstrate understanding beyond rote recall. Also, students' agreement therefore implies that a "particular method" likely incorporated features that support critical thinking opportunities to explain reasoning, apply concepts to real contexts, or receive formative feedback.

For curriculum implementation, this finding reinforces that assessment is not separate from instruction. When assessment aligns with curriculum goals of critical thinking skills or development, students recognize its value. In contrast, where curricula remain "exam driven" and focus on "product instead of process," students often resist assessment. Thus, teachers' choice of assessment mediates whether curriculum implementation translates into perceived critical thinking gains. This finding aligns with Darling-Hammond (2013)'s argument that high quality assessment should emphasize deep knowledge of core concepts, problem solving, collaboration, analysis, synthesis, and critical thinking rather than rote recall through multiple choice formats. If teachers rely heavily on traditional, closed assessments, students are denied equitable opportunities to acquire critical thinking skills for scientific literacy.

When assessment is limited to closed, single answer items, it promotes a procedural view of mathematics and restricts students' opportunities to engage in reasoning, justification, and creative problem solving all of which are core components of critical thinking skills (Darling-Hammond, 2013). Students' disagreement could reflect frustration with assessment practices that do not align with higher order learning goals.

The results in Table 2 on the research question two showed that male students had higher mean scores than their female counterpart. From the result of null hypothesis one in Table 3, it was confirmed that there is no significant difference in the mean rating scores of male and female students in assessing mathematics curriculum implementation on their critical thinking skills. This finding challenges stereotypes that mathematics is a "male domain" and indicates that when curriculum implementation provides equal access to problem based, inquiry oriented, and active learning strategies, male and female students perceive similar impacts on their critical thinking skills or development. It supports strategies for inculcating gender equity in mathematics classrooms, which evidence shows improves critical thinking skills for all learners.

However, the finding does not mean gender equity is fully achieved. Females remain more sensitive to teacher practices; autonomy supportive practices have positive effect on mathematics interest for females only, with no effect on males. Therefore, while perceptions of curriculum impact on critical thinking may be similar, the mechanisms that engage males and females can differ. Curriculum implementation should remain equitable pedagogy while attending to practices that sustain females' interest and self-concept in mathematics.

This finding aligns with previous researches conducted by Ukwueze, Edukwu & Eke (2013), Adeniran & Odebode (2017), and Odebode (2019), who found that the way mathematics is taught, as a result of the new curriculum, did not impact critical thinking skills. They concluded that critical thinking skills contribute to a thriving economy and that mathematics plays a role in enhancing critical thinking and creativity in tertiary education in Oyo State, Nigeria.

Conversely, the findings contrast with the studies of Ayotola and Ajani (2019) and Tela (2019), which highlighted changes in mathematics teaching, learning, and evaluation tools as a result of the sustainable development goals in education. The discrepancy may be attributed to the lack of sufficient teaching resources in many classrooms, particularly in rural or local areas.

Conclusion

This study investigated the assessment of mathematics curriculum implementation on improvement of critical thinking skills among secondary school students in Dutse Education Zone of Jigawa State. Conclusively, students agreed with the particular method of assessment used by their teachers in mathematics instruction. This indicates that the assessment approach employed was perceived by students as appropriate, relevant, and supportive of learning process. Also, there was no significant difference in the mean rating scores of male and female students in assessing the mathematics curriculum implementation on critical thinking skills. This means both genders reported similar perceptions of how the curriculum influenced their critical thinking development

Recommendations

Based on the findings and conclusion, the following recommendations are made:

1. Mathematics teachers should strictly follow the current curriculum, as it has been shown to effectively enhance students' critical thinking skills.
2. Teachers should maintain gender inclusive practices by providing equal participation in problem solving.
3. Teachers and students should to integrate 21st-century critical skills into the teaching and learning of mathematics.
4. Both teachers and students should engage mathematics in ways that align with 21st-century critical skills and to become proficient in the use of ICT tools.

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