Teachers' Role in the Design and Implementation of the Basic Science and Technology Curriculum in Junior Secondary Education

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Abstract

This study investigates teachers' role in the design and implementation of the basic science and technology curriculum in junior secondary schools within the Mikang Local Government Area. Using a survey design, 50 teachers were selected through random sampling. Data were collected via structured questionnaires. Mean scores were used to address the research questions while Chi-square test of independence was used to test hypotheses at a 0.05 level of significance. Findings revealed that teachers felt excluded from the curriculum development process, despite playing critical roles in its implementation. Challenges included insufficient training, limited access to resources, overcrowded classrooms, curriculum complexity, and poor communication. These issues align with challenges identified in recent studies from Nigeria and other developing countries. The study recommends involving teachers early in the curriculum design process and offering ongoing professional development, such as workshops and seminars, to improve implementation

Keywords: Teachers' Role, Curriculum Design, Implementation, Basic Science and Technology, Junior Secondary Education.

Introduction

In Nigeria, education is seen as a tool for national development, as outlined in the National Policy on Education (FRN, 2014). Science and technology play a key role in this, prompting the development of the nine-year Basic Science and Technology curriculum under Universal Basic Education (Stenhouse, 2018). The curriculum, developed by NERDC (Igwebuike, 2018), is designed for continuous education, with objectives that include fostering interest in science and technology and preparing students for further studies. However, the success of this curriculum depends on teachers, who are critical in both its design and implementation (Wokocha, 2017).

Despite their importance, teachers have often been excluded from curriculum design, leading to implementation challenges. According to Nwadiani (2017), teachers' lack of understanding of policy reforms contributes to this issue. Curriculum implementation involves technical and managerial components, both of which require teacher involvement for success (Nwadiani, 2017). Teachers shape the curriculum through their expertise and interaction with

students, and their role in delivering lessons and assessing progress is crucial for effective learning outcomes (Hitanshu, 2023). The marginalization of teachers in the curriculum design process has created a gap between the curriculum's goals and its actual implementation in classrooms, leading to low student achievement and a mismatch between graduates' skills and job market demands. The study aims to investigate the extent of teacher involvement in curriculum development, their readiness for implementation, and the challenges they encounter.

Purpose of the Study

The main objective of this study is to investigate the role of teachers in the design and implementation of the Basic Science and Technology curriculum in junior secondary schools in Mikang Local Government Area (LGA) of Plateau State. The specific objectives are:

1. To determine the level of teachers' involvement in the design and development of the Basic Science and Technology curriculum.
2. To examine the roles of teachers in the design and implementation of the Basic Science and Technology curriculum.
3. To identify the challenges faced by teachers in the design and implementation of the Basic Science and Technology curriculum in secondary schools.

Research Questions

The following research questions were raised to guide the study:

1. What is the level of teachers' involvement in the design and development of the Basic Science and Technology curriculum?
2. What are the roles of teachers in the design and implementation of the Basic Science and Technology curriculum?
3. What challenges do teachers face in the design and implementation of the Basic Science and Technology curriculum in secondary schools?

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05(5%) level of significance:

H_{01}: There is no significant relationship between teachers' involvement in curriculum design and effective implementation of the basic and technology curriculum in Mikang LGA of Plateau State.

H_{02}: There is no significant relationship between challenges faced by teachers and effective implementation of the basic and technology curriculum in Mikang LGA of Plateau State.

Methodology

The researchers employed a survey research design. The study population comprised Basic Science and Technology teachers from 27 secondary schools in Mikang LGA, totaling 87 teachers (Mikang Area Directorate of Education, 2022). A sample of 50 teachers was randomly selected from 15 schools using Simple Random Sampling to ensure equal selection chances.

Data were collected using a structured questionnaire titled "Role of Teachers in Design and Implementation of Basic Science and Technology Curriculum Questionnaire (RTDIBSTCQ)." The questionnaire contained both closed-ended Likert scale items to measure attitudes toward the

research topic. It was divided into two sections: Section A covered respondent biodata, while Section B addressed the research questions with 16 items.

The questionnaire was validated by an expert in research measurement, and reliability was established using a test-retest method over two weeks. The Pearson correlation coefficient for reliability was 0.90, indicating high stability. Data were analyzed using arithmetic means and Chi-square tests, with hypotheses tested at a 0.05 significance level.

Results

Research Question One: What is the level of teachers' involvement in the design and development of the Basic Science and Technology curriculum in Mikang LGA?

Table 1: Mean scores of levels of teachers' involvement in the design and development of the Basic Science and Technology curriculum in Mikang LGA

ITEM	SA	A	DA	SD	Total Freq.	Total Score	Mean Score	Remark
1. Teachers are actively involved in the initial stages of designing the Basic Science and Technology curriculum	8	11	14	17	50	110	2.20	Rejected
2. Teachers are consulted for their input when changes are made to the Basic Science and Technology curriculum.	3	6	26	15	50	97	1.94	Rejected
3. Teachers regularly participate in workshops or seminars aimed at developing the Basic Science and Technology curriculum.	7	9	19	15	50	108	2.16	Rejected
4. Teachers are given opportunities to collaborate with curriculum designers in developing the Basic Science and Technology curriculum.	11	8	13	18	50	112	2.24	Rejected
5. Teachers are not involved in the design and implementation of Basic Science and technology curriculum.	17	23	7	3	50	154	3.08	Accepted

From table 1 above, analysis of data shows that respondents disagreed with a mean score of 2.20 that teachers are actively involved in the initial stages of designing the Basic Science and Technology curriculum. Respondents also disagreed that teachers are consulted for their input when changes are made to the Basic Science and Technology curriculum with a mean score of

1.94. Likewise, a mean score of 2.16 indicates that respondents disagreed that teachers regularly participate in workshops or seminars aimed at developing the Basic Science and Technology curriculum. Respondents rejected the notion teachers are given opportunities to collaborate with curriculum designers in developing the Basic Science and Technology curriculum with a mean score of 2.24. However, respondents accepted with a mean score of 3.08 that teachers are not involved in the design and implementation of Basic Science and technology curriculum.

Research Question 2: What are the roles of teachers in the design and implementation of the Basic Science and Technology curriculum in Mikang LGA?

Table 2: Mean scores of roles of teachers in the design and implementation of the Basic Science and Technology curriculum

ITEM	SA	A	DA	SD	Total Freq.	Total Score	Mean Score	Remark
6. Teachers play a key role in the design of the Basic Science and Technology curriculum.	12	23	8	7	50	140	2.79	Accepted
7. Teachers are responsible for tailoring the Basic Science and Technology curriculum to meet the needs of their students.	13	18	12	7	50	137	2.54	Accepted
8. Teachers are actively involved in creating instructional materials for the implementation of the Basic Science and Technology curriculum.	18	21	10	1	50	156	3.12	Accepted
9. Teachers collaborate with other stakeholders during the design process of the Basic Science and Technology curriculum.	15	25	7	3	50	152	3.04	Accepted
10. Teachers are directly involved in implementing the Basic Science and Technology curriculum through instructional delivery.	20	22	4	4	50	158	3.16	Accepted

From the table above, it was observed that respondents agreed with a mean score of 2.79 that teachers play a key role in the design of the Basic Science and Technology curriculum. Respondents also agreed with a mean score of 2.54 that teachers are responsible for tailoring the Basic Science and Technology curriculum to meet the needs of their students. A mean score of 3.12 indicates that researchers agreed that teachers are actively involved in creating instructional materials for the implementation of the Basic Science and Technology curriculum. Respondents also agreed with a mean score 3.04 that teachers collaborate with other stakeholders during the design process of the Basic Science and Technology curriculum. Similarly, respondents agreed with a mean score of 3.16 that teachers are directly involved in implementing the Basic Science and Technology curriculum through instructional delivery.

Research Question Three: What are the challenges faced by teachers in the design and implementation of the Basic Science and Technology curriculum in secondary schools in Mikang LGA?

Table 3: Mean scores of challenges faced by teachers in the design and implementation of the Basic Science and Technology curriculum in secondary schools in Mikang LGA

ITEM	SA	A	DA	SD	Total Freq.	Total Score	Mean Score	Remark
11. Insufficient training on curriculum implementation makes it difficult for teachers to deliver the Basic Science and Technology curriculum effectively.	17	19	6	8	50	145	2.90	Accepted
12. Limited access to teaching materials and resources hampers the successful implementation of the curriculum.	21	15	11	3	50	154	3.08	Accepted
13. Overcrowded classrooms make it challenging for teachers to implement the Basic Science and Technology curriculum effectively	19	22	9	0	50	160	3.20	Accepted
14. The curriculum content is too complex for students to easily understand, which affects its implementation	16	15	8	11	50	136	2.72	Accepted
15. Poor communication between curriculum developers and teachers is a significant challenge in curriculum implementation.	18	18	11	3	50	151	3.02	Accepted

From table 7 above, analysis of data shows that respondents agreed with a mean score of 2.90 that insufficient training on curriculum implementation makes it difficult for teachers to deliver the Basic Science and Technology. Respondents also agreed that limited access to teaching materials and resources hampers the successful implementation of the curriculum with a mean score of 3.08. Likewise, respondents agreed with mean scores of 3.20 that overcrowded classrooms make it challenging for teachers to implement the Basic Science and Technology curriculum effectively. It was a agreed with a mean score of 2.72 and 3.02 that the curriculum content is too complex for students to easily understand, which affects its implementation and poor communication between curriculum developers and teachers is a significant challenge in curriculum implementation respectively.

Testing of Hypotheses

The following hypotheses are tested at 0.05 (5%) level of significance:

H_{01}: There is no significant relationship between teachers' involvement in curriculum design and effective implementation of the basic and technology curriculum in Mikang LGA of Plateau State.

Table 8: Summary of Chi-Square Test of Independence for the relationship between teachers' involvement in curriculum design and effective implementation of the basic and technology curriculum in Mikang LGA of Plateau State.

Cell	F_o	F_e	d_f	$_X^2$Cal	X^2Critical
1	14	19.67			
2	17	18.00			
3	8	7.67			
4	11	4.67			
5	26	19.67			
6	15	18.00	12	31.6	21.03
7	6	7.67			
8	3	4.67			
9	19	19.67			
10	22	18.00			
11	9	7.67			
12	0	4.67			

Table 8 above shows the chi-Square calculated value 316.3 is greater than the chi-square critical value 12.59 that is (X^2-calc. = 31.6> X^2 – Crit. = 21.03). The researcher therefore rejects the null hypothesis and accepts the alternative hypothesis. There therefore sufficient evidence to conclude

that there is significant relationship between teachers' involvement in curriculum design and effective implementation of the basic and technology curriculum in Mikang LGA of Plateau State.

H_{02}: There is no significant relationship between challenges faced by teachers and effective implementation of the basic and technology curriculum in Mikang LGA of Plateau State.

Table 9: Chi-Square Test of Independence for relationship between challenges faced by teachers and effective implementation of the basic and technology curriculum in Mikang LGA of Plateau State

Cell	F_o	F_e	d_f	t. Sig.	_X^2Cal	X^2Critical	Decision
1	9	9.33					
2	12	13.33					
3	6	4.33					
4	3	3.00					
5	7	9.33					
6	16	13.33	6	0.05	14.03	12.60	H_{01} Rejected
7	3	4.33					
8	4	3.00					
9	12	9.33					
10	12	13.33					
11	4	4.33					
12	2	3.00					

Table 9 above indicates that at df= 6 and α-0.05 level of significance, the chi-Square calculated value is greater than the chi-square critical value that is (X^2-calc. = 14.03> X^2 – Crit. = 12.60). The researcher therefore rejects the null hypothesis and accepts the alternative hypothesis. There is therefore sufficient evidence to conclude that there is significant relationship between challenges faced by teachers and effective implementation of the basic and technology curriculum in Mikang LGA of Plateau State.

Discussion

The study examined teachers' involvement in the design and development of the Basic Science and Technology curriculum in Mikang LGA, revealing that teachers are largely excluded from this process. This aligns with Aina (2017), who noted that teachers in Nigeria are often seen merely as implementers, resulting in a disconnect between curriculum design and classroom realities. Lawal (2016) emphasized that excluding teachers from development hampers effective implementation, as they lack understanding of the rationale behind changes. Although teachers may be consulted, their contributions are often overlooked (Ogunniyi &Oriaifo, 2016). Involving

teachers in curriculum revision has been shown to enhance motivation and effectiveness (Adeyemi & Shumba, 2017).

The study also found that teachers' participation in curriculum development workshops is infrequent, highlighting a key barrier to their involvement in the process. This finding agrees with Umar and Balogun's (2018) assertion that inadequate training is a significant barrier. Musa and Omoregie (2019) also noted limited collaboration between teachers and developers, a finding echoed in the current study. While there are indications of a gradual shift towards more teacher involvement in some Nigerian regions (Obi & Suleiman, 2021), this has not been widely implemented in Mikang LGA.

Regarding implementation, teachers are responsible for adapting the curriculum to meet student needs, consistent with Abimbola and Kola's (2015) view on adapting content to local contexts. They also create instructional materials, as highlighted by Adedeji and Olaniyan (2019), who noted that teachers often adapt materials due to resource constraints. The study supported the notion that effective curriculum design requires collaboration among teachers, administrators, and experts, with teachers playing a key role in instruction delivery (Obanya, 2016).

Challenges identified in curriculum implementation included insufficient teacher training, limited access to teaching materials, overcrowded classrooms, and complex content. These challenges—insufficient professional development, resource shortages, overcrowded classrooms, and complex curricula—align with previous research (Igbokwe & Nwachukwu, 2017; Ogundele & Ojo, 2016; Olaleye & Olorundare, 2018; Omoifo, 2015). Additionally, poor communication between curriculum developers and teachers was highlighted as a significant challenge, echoing Abolade and Olasehinde's (2017) findings.

Conclusion

The study highlights that teachers were largely excluded from the curriculum design process, limiting their participation in workshops and collaboration with curriculum designers. This exclusion creates a disconnect between curriculum objectives and classroom realities, negatively impacting effective implementation.

Despite their limited role in design, teachers are essential for adapting the curriculum to meet student needs and for creating instructional materials. However, their contributions primarily focus on practical delivery rather than input in the design phase, echoing literature that stresses the importance of teacher engagement in curriculum development for better implementation.

Additionally, the study identifies several challenges teachers face in implementing the curriculum, including insufficient training, lack of resources, overcrowded classrooms, complex content, and poor communication with curriculum developers. These challenges hinder effectiveness and underline the need for improved resources, training, and collaboration to enhance implementation outcomes.

Recommendations

The following recommendations are proposed to improve the design and implementation of the Basic Science and Technology curriculum.The recommendations emphasize key strategies to enhance curriculum effectiveness:

1. **Teacher Involvement:** Include teachers in the early stages of curriculum design to ensure practicality and adaptability, utilizing their classroom experience.

2. **Professional Development:** Provide ongoing professional development through workshops and seminars to keep teachers informed about curriculum changes and effective teaching methods.

3. **Resource Allocation:** Allocate more funding for essential teaching materials, laboratory equipment, and instructional aids to ensure effective curriculum delivery.

4. **Classroom Size:** Tackle overcrowding by expanding school infrastructure and hiring additional qualified teachers.

5. **Communication Channels:** Establish formal communication between curriculum developers and teachers to align curriculum goals with classroom practices, bridging the gap between theory and application.

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