EXPLORING TEACHERS' KNOWLEDGE, PRACTICE, AND READINESS FOR A NEW MATHEMATICS CURRICULUM IMPLEMENTATION

Desmond Asiniba Atiah[1)], Clement Ayarebilla Ali[*2)]
[1]CKT Tedam University of Technology Applied Sciences
[2]University of Education, Winneba
[2*] aliclement83@gmail.com

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Abstract. The objectives of this study were to explore teachers' knowledge, practice, and readiness for the implementation of a new mathematics curriculum at the senior high school level. The researchers adopted the quantitative research approach and a cross-sectional survey research design. The research sample was 76 teachers out of 506 teachers selected through simple random sampling (table of random numbers) across six Senior High Schools. The instruments were questionnaires to measure the respondents' behaviour, attitudes, preferences, opinions, and intentions. The questionnaires contained closed-ended items in the form of yes/no, true/false, and Likert scale multiple-choice responses. The researchers used Kendall's tau-b correlation to establish correlations of the teachers' knowledge in the components of the mathematics curriculum, means to examine teacher practices, and Chi-square analysis to identify factors. The results showed strong positive correlations with teachers' knowledge of the components of the mathematics curriculum. However, teachers' practices of the new curriculum were abysmal, and not adequately prepared to implement the mathematics curriculum. It was therefore concluded that even though the high positive correlation values indicated their knowledge of the curriculum components, stakeholders still required cogent and effective measures to help teachers practice and get adequately prepared for the curriculum implementation.
Keywords: *Curriculum Implementation; Knowledge; New Mathematics; Practice; Readiness*

1. INTRODUCTION

Mathematics curriculum implementation refers to how the planned or officially designed course of study is translated by the teacher into syllabuses, schemes of work and lessons to be delivered to students [1]. Many forces that drive mathematics vis-à-vis teachers' knowledge, experiences, and readiness [2]. The implementation then brings into existence the anticipated changes, and these changes occur in both rapid and slow changes [3]. However, due to inadequate knowledge, a teacher who has not been well trained in the teaching of the mathematics curriculum is going to either shelve the learning of the content or teach aspects of the subjects that they can conveniently handle [4]. Therefore, knowledge is one of the measures of learning outcomes [3].

Again, another problem is developing a well-thought-through, challenging school mathematics curriculum is central to the running of any school [5]. An effective mathematics curriculum provides experiences for teachers, students, school leaders, and community stakeholders with a measurable plan and structure for delivering a quality education. The mathematics curriculum identifies the learning outcomes, standards, and core competencies

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students must demonstrate before advancing to the next level. [6] agree that teachers play a key role in developing, implementing, assessing, and modifying the mathematics curriculum. An evidenced-based mathematics curriculum acts as a road map for teachers and students to follow on the path to academic success [7]. This creates active interaction in the classroom [8]. In addition, the planned and guided learning knowledge and experiences for intended learning outcomes, formulated through the systematic reconstruction of knowledge and experience, under the auspices of the school, for the learner's continuous and wilful growth in personal-social competence has NOT provided catalysts for readiness. Research recommends four components that seek to solve the problem in the disciplines: goals and objectives, content and subject matter, learning experiences, and Assessment [4].

1.1 The Solution of Mathematics Curriculum Implementation

Implementation, as an essential part of mathematics curriculum development, brings into existence the anticipated changes. These changes can occur in several ways but there are two main ways---rapid and slow changes. If the teacher is not well trained or has not updated themselves in the teaching of the content of the mathematics curriculum, they may either shelve the teaching of the content or teach aspects of the subjects. Senior High School is the level of secondary education that provides a bridge between basic and tertiary education. It is a post-basic education programme that prepares students for middle-level jobs as well as provides the platform for others to progress to tertiary education [7]. Therefore, secondary education provides comprehensive, general, and technical/vocational education to students [9].

The Ministry of Education through the National Council for Mathematics Curriculum and Assessment (NaCCA) introduced the Standard-based Mathematics curriculum to replace the objective-based mathematics curriculum in 2017. This was to respond to international best practices. In February 2019, the government of Ghana launched the new Standard-based Mathematics curriculum and implemented it in September 2020 [9], [10]. The standard-based Mathematics curriculum presented a paradigm shift from the Objective-based Model [10]. This was to address the objective-based mathematics curriculum's penchant for preparing students for only examinations at the expense of the acquisition of essential skills for human capital development, content overload, and the inability of the assessment system.

Mathematics curriculum implementation is the course of action of putting into practice the programme of Subjects and the ability to produce the programme result rationally [11]. Understanding the beliefs and concerns of teachers can provide insights into whether mathematics curriculum implementation will meet with success or failure. Teachers' beliefs significantly influence their decisions for instruction. If beliefs play such a vital role, then learning about teachers' concerns, values, and perceptions should improve the implementation process by proactively addressing these areas [10]. To ensure that curricular innovations are implemented with fidelity, instructional practices should align with the specific learning goals in the mathematics curriculum. Curricular implementation

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encompasses different components, including the delivery of the mathematics curriculum through resources and instructional practices. To implement curricula with fidelity, instructional practices must align with the mathematics curriculum as well as support the individual needs of the students [12]. In addition, teacher Readiness for mathematics curriculum implementation plays a vital role. Specifically, found a positive correlation between the readiness and quality of mathematics instruction. The findings supported the need for teachers to know the mathematics curriculum well to strengthen instructional practices [12].

Research proposed teaching experience to have a positive effect on the implementation of the mathematics curriculum [13]. There are positive effects of teacher professional characteristics on student achievement. These can be achieved through positive attitudes of teachers and head teachers to the requisite knowledge and skills to teach. Experienced teachers exhibit negative attitudes toward mathematics curriculum reform than their counterparts with less work experience. Even the majority of basic school teachers who had served for many years in the teaching profession showed a negative attitude toward a new mathematics curriculum [12].

1.2 LITERATURE REVIEW

1.2.1 Theoretical Framework

This study adopted behaviourism to address the research problem [14]. According to this model, education and learning are about a person changing their behaviours, and until a good outcome occurs, this process entails some exploration and trial and error. This requires teacher knowledge, practice, and readiness to realize their goals [14].

1.2.2 Conceptual Framework

The following figure shows the interplay of teachers' knowledge, practices, and readiness that the researchers adopted to address the problem.

Figure. 1. Conceptual Framework of the Study

1.2.2.1 Teachers' Knowledge of the New Mathematics Curriculum Implementation

It is essential as a part of the comprehensive theory of organization to show what elements of the mathematics curriculum will serve satisfactorily as organizing elements. The appropriate coordination of elements of the mathematics curriculum would guarantee the success of a mathematics curriculum. There is no consensus among the experts on elements of mathematics curriculum, but the most four common points of view concerning this issue

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are Goals, Content or subject matter, Methods or learning experience, and Assessment and report [15].

The designing and formulation of objectives in mathematics curriculum development is a multifaceted and methodical process and there has been the development of different models of mathematics curriculum design to make this multifaceted activity understandable and manageable. It was supported by [16] that objectives must serve as a navigating tool that directs the lesson in its way without getting lost in the system. Formulation of objectives based on the current needs of the learners.

The preparation of objectives is one way in which a teacher or an educationist can begin to think clearly and critically about the educational processes and the contribution that they have made towards these processes. The growth and development of the students is considered to be the main objectives of educational institutions and the preparation of objectives should take into account [17].

1.2.2.2 Teacher Practices of New Mathematics Curriculum Implementation

The need for in-service education of teachers cannot be underestimated. It is a necessity to enhance the work performance and motivation of teachers in the field. The absence of in-service training of teachers will retard the professional growth of teachers as well as “missing gaps” between demands and actual achievement levels. In-service education allows for activities that may include seminars, workshops, conferences, classes, and exhibitions that are designed to develop and improve teaching in the field from the initial employment stage to retirement. From the foregoing, it becomes imperative that every attention should be devoted to the in-service education of teachers to promote their professional growth and development. Finally, relevant suggestions have to be put forward to achieve better staff development programs aimed at helping teachers update their knowledge, expertise, skills, and competence in the teaching profession [10].

Teacher training programs offer educators the perfect setting to express their natural creativity, exchange their expertise, and grow with one another in a supportive and encouraging atmosphere [18]. It increases instructors' productivity and efficacy, cultivates perfectionism in their working methods, and expands their horizons as educators A mathematics curriculum document is a tool that assists in planning and implementing a high-quality instructional program [19]. It outlines the philosophy, goals, objectives, learning experiences, instructional resources, and assessments that comprise a specific educational program [20]. Additionally, it represents an articulation of what students should know and be able to do and supports teachers in knowing how to achieve these goals. In Mathematics, the documents include lesson plans, schemes of work, student registers, syllabi, textbooks, course outlines, and teacher guides [20].

1.2.2.3 Teacher Readiness of New Mathematics Curriculum Implementation

The roles of teachers remain instrumental in the success or failure of a mathematics curriculum, and of the many roles, teacher fidelity is important [21]. Instead of the relevance of competency, convenience, and discretion of administrators dominate the posting and transfer decisions. In some cases, any teacher from a school or college can be posted, irrespective of the relevance of their qualification, experience, and aptitude for the new professional task [22].

Another measure of readiness is teacher preparation. There is a need to prepare and train teachers to meet the objectives of a mathematics curriculum to design developmentally appropriate learning tasks that are aligned with curricular expectations [4]. The focus of training and professional development requires an emphasis on teaching how best to interpret the mathematics curriculum to align students with appropriate instructional practices. One way to support this situation includes allowing teachers primary involvement in mathematics curriculum development and the process of alignment as it pertains to knowing student needs and then instructing accordingly. Teachers perceive their little roles in mathematics curriculum development and implementation provides insight into teachers' concerns about implementing a new mathematics curriculum [4].

In addition, resource utilization is paramount in teacher readiness. Resources are regarded as the most important support structure because mathematics curriculum management depends largely on resources available in schools. Implementation of a mathematics curriculum change without the relevant resources to teach it would cause stress and strain leading to dire consequences and impacting the teachers' morale to implement the planned mathematics curriculum changes [7]. The lack of resources necessary for the execution of teaching and learning affects the proper implementation of the mathematics curriculum.

Furthermore, resource management is a necessary. Managing human resources is the most important and yet most difficult because people have needs, beliefs, norms, and cultures that they bring with them to work [23]. These individual differences can make or break the school. To ensure the effectiveness of the mathematics curriculum, the head should mentor, manage the absenteeism of educators, and relate to parents in a way that promotes mathematics curriculum goals. Mentoring is when an experienced educator in a learning area assists inexperienced teachers. The new teacher observes and learns from the experienced teachers in the process of teaching; hence skills are passed on from the experienced to the less experienced teacher. This is done so that the mathematics curriculum standards of a school are not compromised [24].

Last but not the least is technology. Ideally, a mathematics curriculum change should take effect or initiated as a result of research in the schools, findings of assessment studies, trends of examination results, or job market analysis. Normally, mathematics curriculum change is a top-down phenomenon. There is a complete disconnect between those who design curricula and those who implement the mathematics curriculum [22]. To explore for the implementation of a new mathematics curriculum at the senior high school level, the following Research Questions were derived:

1. Teachers' Knowledge and Perception of Components of New Curriculum

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2. Training for Implementation of New Mathematics Curriculum
3. Teacher practice on the implementation of the new mathematics curriculum

2. RESEARCH METHOD

The methodology presents the different methods that have been used in the study. It describes the philosophical stance, research approach, research design, study area, study population, sample size, sampling techniques and procedures, instrument of data collection, instruments of data analysis, reliability, validity, and ethical consideration of the research.

2.1 Research Design

The research design adopted was the cross-sectional survey design. This involved collecting data one time from the respondents and performing the analysis based only on this one-time data collection. Longitudinal survey design involves collecting data several times over a given period, usually at fixed intervals. This helped the researchers to identify trends over time [25].

2.2 Population and Sample

The research targeted all six secondary schools, their administrators, and subject teachers. The entire teacher population in all the six institutions was 505. This comprised 384 male (76%) and 121 female (24%) teachers. The sample size for a study needs to be estimated at the time the study is proposed, too large a sample is unnecessary and unethical, and too small a sample is unscientific and unethical. A sample population should be taken within 10-30% of the entire population [26]. Therefore, the researchers sampled 15% of the population through a simple random sampling technique.

2.3 Sampling Procedure

The researchers used procedures since the interest was to generalize the findings. Two key assumptions underpin this procedure. Each unit/person in the population has a non-zero chance of being chosen and that one unit/person's selection is unrelated to the selection of another [27].

They were selected based on two sampling units namely school heads and administrators, and subject teachers. Every member of the population was given an equal opportunity to be chosen from the categories provided. Putting the schools in the same category helped the study to fairly select secondary schools that have an advanced level in the study sample. The researchers ensured that the size of the sample selected was representative of the population. This reduced sample bias.

2.4 Instrument of Data Collection

Data collection required the researchers to maintain research integrity for accurate data collection. Quantitative instruments consist of different types of questionnaires, surveys, structured interviews, and behavioural observation which are based on explicit coding and categorization schemes [28]. This study used questionnaires as the instrument for the data collection.

The questionnaire is a popular method of collecting primary data, particularly when the researcher wants to carry out a comprehensive investigation of a phenomenon or a variable [28]. The questionnaires provided a relatively cheap, quick, and efficient way of obtaining large amounts of information from a large sample of people. The Questionnaire was an effective means of measuring the behaviour, attitudes, preferences, opinions, and intentions of relatively large numbers of subjects. The closed-ended questions were in the form of yes/no, true/false, and other Likert scale multiple-choice responses [13].

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The questionnaire was piloted to estimate the time and resources required for the completion rate [29]. This helped the researcher to identify potential confounding variables that were not previously known and evaluate the strength of relationships. In addition, the pilot test helped to refine training strategies to determine whether preliminary findings support a larger, more rigorous investigation. This was prudent in estimating the test hypotheses regarding the effectiveness or efficacy of the interventions.

The researchers then distributed the questionnaire online using a link that allowed the respondents to access the questionnaire. The online data collection covered travel restrictions, distancing guidelines, and cost-effective and faster data collection [27]. The respondents were guided on how to access, fill, and submit the questionnaire online and this allows the respondents the opportunity to participate willingly without any fear or problem.

2.5 Validity of the Research Instrument

The concept of validity represented the degree to which the results of the research were truthful [29]. In this research context, the questionnaire was valid because it measured what it was supposed to measure. The research instrument ably measured accurately and efficiently the objectives and the outcome so meaningfully and truthfully.

2.6 Reliability of the Research Instrument

Reliability represents repeated measurements on the same measurements or experiments at different time intervals, under different conditions [30]. Conceptually, the participants answered the first set of questions on the same set of questions for the second time approximately 14 days between the measurement occasions. The ratio between the test and retest scores was an indication of the reliability of the instrument. The greater the value of the ratio, the higher the reliability of the instrument [30].

In particular, the researchers employed the Pearson's product-moment correlation coefficient. This coefficient measured the association between a dichotomous (yes or no, male or female) and an interval/ratio variable, as well as the point-biserial correlation [27]. The Pearson coefficient was 0.851, showing a strong positive correlation between the two test scores, and showing a strong positive relationship between the two test scores.

2.7 Tools of Data Analysis

The data analysis utilized charts, graphics, tables, and graphs to identify, transform, support decision-making, and bring a conclusion to the research [25]. The quantitative analysis can be generalized to a larger population, and direct comparisons can be made between two corpora, so long as valid sampling and significance techniques have been used [25].

In addition, correlation coefficients, means, and Binomial tests helped to answer correlational relationships between variables without controlling or manipulating any of them. It reflected the strength and/or direction of the relationship between two or more variables either positive or negative. Since it was a nonparametric measure, the alternative to Pearson's product-moment of the strength and direction of the association, it was best suited for the ordinal scale [31].

Furthermore, in computing for the practice of teachers, the mean of their responses was computed for and interpreted. Chi-square analysis was used by the study to establish a strong relationship between the implementation of the new mathematics curriculum [31.

2.8 Ethical Consideration

The researchers sought permission from the University through the Department and its ethical clearance committee. The researchers obtained an introductory dispatch from the University to the Municipal District to conduct this study. There was also a cover letter from

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the University to the headmasters of the various schools and their teachers to allow the researchers to collect data.

2.8.1 Voluntary participation

All participants can withdraw from, or leave, the study at any point without feeling an obligation to continue. Your participants don't need to provide a reason for leaving the study. The researchers therefore did not interfere with the participants' willingness to participate in the data-gathering process. It was clear to the participants that there were no negative consequences or repercussions to their refusal to participate.

Also, all the participants were equipped with all the relevant information about the purpose of the study, the risks and benefits of taking part, how long the study will take the studies supervisor's contact information, and the institution's approval note for their participation.

2.8.2 Anonymity

All the participants were assured that their identities were well protected and the information provided was free from data pseudonymization, harmless, highly confidential, and for research purposes only. Anonymity ensures a great deal of cooperation and coordination among many different people in different disciplines and institutions. This ethical standard promotes values that are essential to collaborative work, such as trust, accountability, mutual respect, and fairness [27].

2.8.3 Human rights

Finally, many of the norms of research promote a variety of other important moral and social values, such as social responsibility, human rights, animal welfare, compliance with the law, and public health and safety. The researchers ensured that such ethical lapses in research could not significantly harm human and animal subjects, students, and the public [27].

3. RESULTS AND DISCUSSION

3.1 Results

This section focuses on the analysis and presentation of the data. This was done by both descriptive and inferential statistics. The analysis was organized according to objectives and further into the constructs and variables measured. The data generated from questionnaires were presented in percentages, graphs, charts, and correlational comparisons of the variables.

Table 1. Teachers' Knowledge of the New Curriculum

Kendall Tau's	**Notes**	**Objectives**	**Content**	**TLMs**	**Assessment**	**Knowledge**	**Learners**
Notes	1						
Objectives	.158 .180	1					
Content	.205 .077	.223 .518	1				
TLMs	-.039 **.732**	.346 .402	.286 .610	1			

Mathematics Research and Education Journal, Vol. 9, No.1, April 2025, 1-18
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Assessment	.037 **.757**	.115 **.828**	.286 .610	-.077 .501	1		
Knowledge	-.068 .565	.234 .342	.130 .256	.158 .164	.347 .404	1	
Learners	.126 .285	.092 .425	.259 .024	.235 .238	.279 .019	.537 .4100	**1**

The results in Table 1 revealed that teachers' knowledge of the components of the new mathematics curriculum was statistically significant for the implementation of the new mathematics curriculum in Senior High Schools. Evidence of the results was supported by Kendall Tau's correlations in exploring the relationships between teaching notes, teaching objectives, subject content, teaching and learning materials, assessment strategies, knowledge of the subject, and knowledge of learners [32].

The Kendall Tau's correlations were also statistically significant. This means that teachers have adequate knowledge of the aforementioned components of the new curriculum and can help to successfully implement it [33]. In fact, in five cases, the correlations were strong. The strong positive correlations indicated strong agreement that teachers have good knowledge of the components of the mathematics curriculum [33].

Table 2. Necessity of Curriculum Components

	Scheme (%)	**Plans (%)**	**Register (%)**	**Syllabi (%)**	**Books (%)**	**Guides (%)**	**Outlines (%)**
SA	36 (59.0)	27 (44.3)	27 (44.3)	30 (49.2)	40 (65.6)	35 (57.4)	37 (60.7)
A	19 (31.1)	22 (36.1)	22 (36.1)	26 (42.6)	16 (26.2)	22 (36.1)	15 (24.6)
SD	2 (3.3)	8 (13.1)	4 (6.6)	1 (1.6)	3 (4.9)	2 (3.3)	2 (3.3)
D	2 (3.3)	2 (3.3)	5 (8.2)	2 (3.3)	1 (1.6)	1 (1.6)	6 (9.8)
U	2 (3.3)	2 (3.3)	3 (4.9)	2 (3.3)	1 (1.6)	1 (1.6)	1 (1.6)
Total	**61 (100)**	**61 (100)**	**61 (100)**	**61 (100)**	**61 (100)**	**61 (100)**	**61 (100)**

Note: SA = Strongly Agreed, A = Agreed, UD = Undecided, D = Disagreed, SD = Strongly Disagreed.

The results in Table 2 show that 90.1% of the teachers agreed that the scheme of work is a necessary curriculum component, 80.4% agreed lesson plan and student register are equally necessary, 91.8% agreed to the necessity of the syllabus and the textbooks, 93.5% agreed that the teacher's guide is equally necessary, and 85.3% of them agreed that the course outline is also a necessary component of the curriculum.

Only 1.6% of the teachers were undecided about the necessity of the textbook, teacher's guide, and course outline, 3.3% were undecided about the scheme of work, lesson plan, and syllabus, and 4.9% were undecided about the necessity of the student's register. These results have supported the results of Table 1 that these seven components must be taken seriously and addressed by stakeholders for the smooth take-off of any mathematics curriculum.

Table 3. Teachers' practices of the new mathematics curriculum

Practice	**Number**	**Mean**	**Std. Deviation**	**Description**

Mathematics Research and Education Journal, Vol. 9, No.1, April 2025, 1-18
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Integration of teaching methods	61	3.33	1.012	High Average
Use of teaching aids	61	2.97	1.197	High Average
lesson planning	61	2.62	1.293	Low Average
Assessment	61	2.48	1.120	Low Average
ICT integration	61	2.31	1.455	Low Average
Mean of means		2.742	1.255	Moderate average

The results in Table 3 revealed that teacher's knowledge of the practice of the new mathematics curriculum was generally low. Teaching methods as opportunities to make learning engaging, inspiring, and fun for students obtained the highest mean (M = 3.33, SD. = 1.012). These teaching methods included differentiated instruction, lecture-based instruction, technology-based learning, group learning, individual learning, inquiry-based learning, game-based learning, and expeditionary learning. The mathematics teacher needs to integrate a lot of teaching methods to be able to explain certain concepts for the students to understand.

The second most influential teacher practice is the use of teaching aids with a mean of 2.97. The respondents stated that "without teaching aids, the teaching of mathematics becomes abstract and very difficult to comprehend. Teaching aids are instructional aids that the teacher uses in their teaching-learning process. It conveys the maximum quality of knowledge with less effort and time than the teacher requires using teaching aids that facilitate teaching effectiveness. These teaching aids range from audio aids, visual aids, and audio-visual aids in the teaching and learning of mathematics. These aids can facilitate the learning process by making it interesting, and less time-consuming and enables learners to use their hearing or seeing abilities and actively perform something while teaching [17].

Lesson preparation is the third technique used by teachers, with a mean value of 2.62. Without a prearranged curriculum, teaching is blind labour, and without execution, creating is a pointless endeavour that will merely fill paper pages [17]. A lesson plan makes it possible to access the materials more quickly, anticipate the best ways to teach them, and allocate resources including time, money, and facilities to the goals by the significance of each task [17].

The fourth teacher practice is Assessment with a mean value of 2.48. The main purpose of assessment and Assessment is to provide feedback on teaching and learning and to appraise the quality/suitability of a resource. In the current new curriculum, there are three main assessment types: assessment for learning, assessment of learning, and assessment as learning. Assessment for Learning (AfL) takes care of all activities undertaken by teachers and/or by their learners, which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged [34]. Through reflective activities, Assessment as Learning fosters and maintains students' feeling of agency and efficacy toward their education.

This type of self-assessment aids in the development of learners' abilities to get a

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better comprehension of both what they are taught and their learning. Assessment as Learning encourages and sustains students' sense of agency and efficacy toward their education through reflective activities. This self-evaluation assessment helps students improve their ability to understand what they are being taught as well as what they have learned on their own [34]. The majority of respondents either strongly agreed or agreed that they always examine their lessons after instructing to ensure that their students are replicating every learning activity taking place in the classroom.

The fifth teacher's knowledge of practice is ICT integration. ICTs are networks that provide new opportunities for teaching, learning, and training through the delivery of digital content [35]. The components of ICT tools necessary for integration are the use of computers, the internet, and communications networks in teaching and learning, including voice over internet protocol (VOIP), video conferencing, synchronous and asynchronous online communication and collaboration tools, email, and online courses. Teachers' knowledge and familiarity are essential for ICT preparation for the implementation of the new mathematics curriculum [24].

Table 4. Teachers' readiness for the new mathematics curriculum

Factors	**Chi-square**	**DF**	**Asymp. Sig.**
Insufficient time hinders the full implementation of the new mathematics curriculum	45.951	3	0.00
Inadequate in-service training affects the implementation of new mathematics curriculum	40.705	3	0.00
Overloaded mathematics curriculum content hampers implementation of new mathematics curriculum	34.803	3	0.00
Insufficient instructional materials hinder the implementation of the new mathematics curriculum	58.803	3	0.00
Inadequate textbooks hamper the implementation of new mathematics curriculum	17.492	3	0.00
Insufficient human capacity hinders the implementation of a new mathematics curriculum	17.492	3	0.01

The results of Table 4 confirmed that insufficient time hinders the full implementation of the new mathematics curriculum. The results show that students spend a lot of time at home more than they spend in school. The findings revealed that students who spent only two weeks in school before the break for Christmas did not learn anything and a lot of the students did not even report at all. Also, when they resumed in January, much of the time was spent registering and orientating the students on the codes and conducts of the schools and all these things affected the time greatly for proper academic work.

Another factor that hindered the smooth implementation of the new mathematics curriculum was inadequate in-service training. Although teachers were given training for the implementation of the new curriculum, the training is not preparing teachers adequately for the programme. Many training sessions occur at a time when most of the teachers are on vacation. The training was organized without 21st-century teaching and learning materials to practice the 21st-century learning skills at the training centres. Teachers with little training had too little knowledge of the subjects they would teach, thus denying their students the most basic learning resources [10].

Furthermore, an overloaded mathematics curriculum content hampered the smooth implementation of the new mathematics curriculum. An overloaded curriculum refers to a situation where the amount of content or activities in a curriculum exceeds the available time or resources for effective teaching and learning [36]. The implications of an overloaded curriculum include the need for curriculum mapping to reduce redundancies and the prioritization of core content [37]. The overloaded curriculum tends to overwhelm students and teachers with excessive content and activities.

Again, the findings revealed insufficient instructional materials hindered the implementation of the new mathematics curriculum. One essential technique that improves quality teaching and learning, particularly in mathematics, is the utilization of instructional materials [7]. The purpose of instructional materials is to help students understand concepts and to guarantee that they will remember the concepts and subjects they are taught for a long time. These instructional materials were grouped into audio materials, visual materials, and audio-visual materials.

The visual aids were materials, such as pictures, charts, and diagrams that help people understand and remember information shared in an oral presentation [28]. The audio materials were radio, tape recording, and gramophone used by teachers to enhance smooth lesson delivery. The various audio-visual materials ranged from filmstrips, microforms, slides, projectors opaque materials, tape recording, and flashcards [38]. In these current digital and artificial intelligence worlds, audio-visual materials have grown to encompass educational DVDs, PowerPoint, television educational series, YouTube, and other online materials. The goal of audio-visual materials was to enhance the teacher’s ability to present the lesson in simple, effective, and easy-to-understand ways for students to learn more permanent content [38].

In addition, inadequate textbooks hampered the smooth implementation of the new mathematics curriculum. Textbooks have been transitioned from printed text to digital and online formats to facilitate interactive functionalities and link them with external resources. As a result, new research challenges and opportunities emerge that call for the application of artificial intelligence methods to enhance digital textbooks and students’ interaction with them [39].

Lastly, inadequate human capacity was revealed as a factor that hampered the smooth implementation of the new mathematics curriculum. Human capacity explains the ability of a human being to execute their knowledge, skills, dedication, competence, resilience, and perseverance [40]. It was revealed majority of mathematics teachers hold a minimum of bachelor's degrees but are not adequately prepared to implement some mathematics content. Even some mathematics teachers lack the requisite professional qualification needed to teach at the senior high level.

Table 5. Binomial Test for Readiness of Teachers for New Curriculum Implementation

	Gp	C	N	O. P	T. P	Sig
Is the new curriculum too loaded for your teachers	Gp1	Yes	5	.83	.50	.219
	Gp 2	No	1	.17		
	Total		**6**	**1.00**		
Do your teachers teach subjects of their choice	Gp 1	Yes	5	.83	.50	.219
	Gp 2	No	1	.17		
	Total		**6**	**1.00**		
Challenges you face during implementation and management of new curr.	Gp 1	insufficient textbooks	1	.20	.50	.375
	Gp 2	inadequate in-service training	4	.80		
	Total		**5**	**1.00**		
Do you have enough teachers in your school	Gp 1	Yes	4	.67	.50	.688
	Gp 2	No	2	.33		
	Total		**6**	**1.00**		
Do you have enough resources to implement the new curriculum	Gp 1	No	6	1.00	.50	.031
	Total		6	1.00		
Are you ready for the curriculum implementation	Gp 1	No	5	.83	.50	.219
	Gp 2	Yes	1	.17		
	Total		**6**	**1.00**		

Note: C = category, N = number of responses, GP = Group, E. Sig = exact significant value, T = Test and O.P = Observed Proportion

In Table 5, the binomial test was run to test the frequency distribution of conducive schools, environment, teacher readiness, subject choice, teacher adequacy, and curriculum load. It was revealed that five of the respondents representing 83% strongly agreed that the content of the new curriculum was overloaded and only one representing 17% said otherwise. Table 5 showed an expected value of 50%, the significant values of all the variables exceed the 1% level of significance (0.001). This implies that the respondents did not differ from the overall senior high schools.

Only one teacher believed their school had a conducive environment for the implementation of the new mathematics curriculum. Nonetheless, five teachers were ready for the implementation of the new curriculum, and five teachers taught subjects of their choice. Two teachers had enough teachers to champion the implementation of the new curriculum. Unanimously, all teachers did not have enough resources to implement the new curriculum even though they believed that the curriculum was not too loaded.

3.2. Discussion

The findings were connected to B. F. Skinner and Ivan Pavlov's behavioural theory of learning. According to behaviourism theory, education and learning are about a person's changing their behaviour, and until a good outcome occurs, this process entails some exploration and trial and error [14]. Behaviourist believe that Reinforcers and punishers are the two basic categories of behavioural modifiers used in operant conditioning. Additionally, there are two categories of reinforcement and punishment: positive and negative without which teachers' knowledge, experiences, and readiness can be a mirage [14].

In mathematics curriculum implementation, the teacher is always at the centre of the implementation process and should be equipped with the ideas and information needed for proper implementation [41]. The research findings reveal that most teachers involved in the implementation process were trained with a minimum qualification as Bachelor of Education and held prominent positions such as form masters/mistress, house masters/mistress, and dining hall masters. Many of these teachers had taught mathematics for five years or more, making them gain knowledge, experience, and readiness for the implementation of the new mathematics curriculum.

Knowledge of the components of the mathematics curriculum was essential for the implementation of the new mathematics curriculum, as it is obtained through practice and adaptation [24]. Kendall Tau's correlation analysis showed a strong positive correlation between teachers' knowledge of lesson plan and teaching notes, their ability to achieve objectives, and their understanding of the entire program [33]. Teacher practices that facilitate the implementation of the new mathematics curriculum include integration of teaching methods, using instructional aids, and assessment [8]. Integrative learning connects theory and practice while teaching aids to improve problem-based instruction and engagement [3]. Assessment provides feedback on teaching and learning, and there are three main types: assessment for learning, assessment of learning, and assessment as learning [5].

Factors that may hinder teachers' readiness for the smooth implementation of the new mathematics curriculum include time constraints, inadequate in-service training, and the lack of support from parents and community members [4]. Many mathematics teachers hold bachelor's degrees but have completed accelerated distance learning programs, which may not be sufficient for the successful implementation of the new mathematics curriculum [2]. However, teachers have adequate knowledge of the components of the new mathematics curriculum for Senior High Schools [6]. The onus lies on policymakers to get them adequately prepared and ready to implement effective teaching practices to ensure the successful implementation of the new mathematics curriculum.

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4. CONCLUSION

It could be concluded that teachers' knowledge of the new mathematics curriculum significantly influenced its implementation. So, the high positive correlation values indicate good prospects for the curriculum. However, abysmally low teacher practices of and readiness for mathematics curriculum point to growing fear of the success of its implementation. It was therefore recommended that stakeholders pay more attention to the integration of teaching methods, incorporation of lesson plans, use of assessment and evaluation, and, integration of ICT to consulate teachers' practice. These could come after giving teacher-trainees sufficient time, adequate in-service training, optimum mathematics curriculum content, sufficient instructional materials, sufficient human capacity-building, and adequate textbooks.

REFERENCES

[1] P. Johnson and O. Fitzmaurice, "Navigating mathematics curriculum reform: teachers' efforts and implementation challenges", Journal of Curriculum Studies, pp.1–25, 2025. https://doi.org/10.1080/00220272.2025.2495973.

[2] M. M. Khoza A. Z. Ngcobo, "Forces Influencing Technical Mathematics Curriculum Implementation: Departmental Heads' Understanding of their Practices to Enact Roles and Responsibilities", *Education Sciences,* vol. 15, no. 1, pp.103-113, 2025. https://doi.org/10.3390/educsci15010103.

[3] F. A. Hamzah, "Improving mathematics learning outcomes through the implementation of problem-based learning approach in elementary schools Pekanbaru". *Mathematics Research and Education Journal,* vol.8, no. 1, pp.42–52, 2024
Retrieved from https://journal.uir.ac.id/index.php/JPM/article/view/16831/6430

[4] E. Aboagye and J. A. Yawson, "Teachers' Perception of the New Educational Curriculum in Ghana", *African Educational Research Journal*, vol. 8, pp.6-12, 2020.
https://eric.ed.gov/?id=EJ1242678

[5] K. K. Agbozo, E. Bonyah and L. J. Clark, "Changes in the Ghanaian schools' mathematics curriculum – Exploring the need to raise awareness in the integration of the history of mathematical concepts as a pedagogical tool", *Educational Innovations and Emerging Technologies,* vol. 4, no. 1, pp.1-12, 2024. https://doi.org/10.35745/eiet2024v04.01.0001

[6] N. Ntereke and M. Mphunyane, "Perceptions of secondary school mathematics teachers and the challenges faced in implementing grade 9 curriculum: A case of two schools in Lesotho", *Journal of Mathematics and Science Teacher,* vol. 5, no. 2, pp.em080, 2025. https://doi.org/10.29333/mathsciteacher/16060.

[7] E. K. Davis, F. D. Ntow and C. Beccles, "Factors influencing Ghanaian public junior high school students' performance in English language, mathematics and science and its implications on the national policy on progression", *Sage Open,* vol. 12, no. 3, 2022. https://doi.org/10.1177/21582440221123912.

[8] N. Elenawati, S. Rezeki, E. Istikomah, L. A. Effendi and M. Susanti, M. "Development of mathematics learning evaluation instruments based on wordwall for phase e students", *Mathematics Research and Education Journal,* vol. 8, no. 2, pp.30–

43, 2024. Retrieved from https://journal.uir.ac.id/index.php/JPM/article/view/18250/7252
[9] Ministry of Education, *New Mathematics Curriculum for Primary Schools*, Accra: National Council for Curriculum and Assessment (NaCCA), 2019. https://nacca.gov.gh/wp-content/uploads/2019/04/MATHS-UPPER-PRIMARY-B4-B6.pdf
[10] K. N. Mpuangnan and O. Adusei, O. "Implementation of standards-based curriculum in Ghana: The concerns of basic school teachers", *International Journal of Education and Research,* vol. 9, no. 3, pp.53-66, 2021. https://ijern.com/journal/2021/March-2021/04.pdf
[11] B. Koichu, M. S. Aguilar and M. Misfeldt, "Implementation-related research in mathematics education: the search for identity", *ZDM Mathematics Education, vol. 53*, no. 5, pp.975–989, 2021. https://doi.org/10.1007/s11858-021-01302-w
[12] L. Thibaut, H. Knipprath, W. Dehaene and F. Depaepe, "Teachers' attitudes toward teaching integrated STEM: The impact of personal background characteristics and school context", *International Journal of Science and Mathematics Education,* vol. 17, no. 5, pp.987-1007, 2019. https://doi.org/10.1007/s10763-018-9898-7
[13] F. K. Sarfo, F. Amankwah, S. Baafi-Frimpong and J. Asomani, "Concerns of teachers about the implementation of information and communication technology curriculum in basic education in Ghana", *Contemporary Educational Technology,* 8(2), 103-118, 2017. https://doi.org/10.30935/cedtech/6190
[14] N. A. N. Burhanuddin, N. A. Ahmad, R. R. Said and S. Asimiran, "Learning Theories: Views from Behaviourism Theory and Constructivism Theory", *International Journal of Academic Research in Progressive Education and Development,* vol. 10, no. 1, pp.85–98, 2021. http://dx.doi.org/10.6007/IJARPED/v10-i1/8590
[15] M. Tagoe, D. Addae and D. Amuzu, "Lifelong education trajectories and futures in Ghana: issues of policy, ideology and practice. *International Journal of Lifelong Education*, vol.41, no.3, pp.327-342, 2022. https://doi.org/10.1080/02601370.2022.2072011.
[16] L. A. Quines and F. E. A. Tubo, "The mediating effect of work ethics on the relationship between transformative learning and professional development of teachers", *European Journal of Education Studies*, vol.10, no.3, 2023. https://doi.org/10.46827/ejes.v10i3.4706.
[17] M. Hudson, H. Leary, M. Longhurst, J. Stowers, T. Poulsen, C. Smith and R. L. Sansom, "Technology-mediated lesson study: a step-by-step guide", *International Journal for Lesson and Learning Studies*, Vol. 13, no. 5, pp. 1-14, 2024. https://doi.org/10.1108/IJLLS-07-2023- 0094
[18] R. Kaur and G. Randhawa, "Supervisory Support and Job Involvement: An Exploratory Study of Government School Teachers in Amritsar", *Journal of Organization and Human Behaviour*, Vol. 8, No. 1, pp. 10-15, 2019. https://www.researchgate.net/publication/333444269_Kaur_R_and_Randhawa_G_2019_
[19] R. A. Khan, A. Spruijt, U. Mahboob, M. A. Eraky and J. J. van Merrienboer, "Curriculum viability indicators: A Delphi study to determine standards and inhibitors of a curriculum", *Evaluation & the health professions,* vol. *44*, no. 3, pp.210-219, 2021. https://doi.org/10.1177/0163278720934164
[20] K. Le Roux, J. Murugan, S. Marquard and P. Adams, "Undergraduate Mathematics Students' Reported Use of Learning Resources towards Accessing

Mathematics", *African Journal of Research in Mathematics, Science and Technology Education, vol.27, no.* 1, pp.25-35, 2023. https://doi.org/10.1080/18117295.2023.2180189

[21] H. N. Hamunyela, J. Makaye and K. C. D Cruz, "Implementation of the revised biology curriculum in selected junior secondary schools in Namibia", *Creative Education,* vol.13, no.9, pp.2958-2972, 2022. https://doi.org/10.4236/ce.2022.139187

[22] Z. Ali, N. Ullah, N. Ahmad, N. Yaqoob and F. Saba, "Teachers' Perceptions of Curriculum Change and the Need for Professional Development for Effective Teaching Practices", *Multicultural Education,* vol.9, no.1, pp.83-90, 2023. https://www.researchgate.net/publication/370003818/

[23] A. T. Azumi, E. A. Asante and A. Dickson, "A socio-cultural enquiry into Chuchuru: The 'spirit child' phenomenon among Kasena-Nankana people in the Upper East Region of Ghana", *International Journal of African Society, Cultures and Traditions*, Vol.6, No.3, pp.1-17, 2018. https://www.researchgate.net/publication/325767260

[24] E. Yeng, C. A. Ali and N. S. Adzifome, "Relationship between familiarity and competency in integrating information and communication technology into mathematics instruction", *Contemporary Mathematics and Science Education,* vol.4, no.2, ep23022, 2023. https://doi.org/10.30935/conmaths/13405

[25] H. Taherdoost, "Different Types of Data Analysis; Data Analysis Methods and Techniques in Research Projects", *International Journal of Academic Research in Management (IJARM),* vol.9, no.1, pp.1-9, 2020. https://hal.science/hal-03741837/document

[26] S. P. Gumpili and A. V. Das, "Sample size and its evolution in research", *IHOPE Journal of Ophthalmology,* vol.1, no.1, pp.9-13, 2022. https://doi.org/10.25259/IHOPEJO_3_2021

[27] L. Cohen, L. Manion and K. Morrison, *Research Methods in Education (8th ed.)*. London, Routledge, 2018. https://doi.org/10.4324/9781315456539

[28] C. A. Ali, S. Acquah and K. Esia-Donkoh, "A comparative study of SAM and ADDIE models in simulating STEM instruction", *African Educational Research Journal*, vol.9, no.4, pp.852- 859, 2021. https://doi.org/10.30918/AERJ.94.21.125.

[29] K. M. Salleh, N. L. Sulaiman and G. Gloeckner, "Exploring Test Concept and Measurement through Validity and Reliability Process in TVET Research: Guideline for the Novice Researcher", *Journal of Technical Education and Training,* vol.15, no.1, pp.257-264, 2023. https://doi.org/10.30880/jtet.2023.15.01.022

[30] B. Ghadrdoost, P. Sadeghipour, A. Amin, H. Bakhshandeh, F. Noohi, M. Maleki, et al. Validity and reliability of a virtual education satisfaction questionnaire from the perspective of cardiology residents during the COVID-19 pandemic. *Journal of Education and Health Promotion*, vol.10, no.291, pp.1-5, 2021. https://doi.org/10.4103/jehp.jehp_32_21

[31] D. D. Alem, "An Overview of Data Analysis and Interpretations in Research", *International Journal of Academic Research in Education and Review,* vol.8, no.1, pp.1-27, 2020. https://doi.org/10.14662/IJARER2020.015

[32] R. H. A. Shiekh and E. F. El-Hashash, "A comparison of the Pearson, Spearman rank and Kendall tau correlation coefficients using quantitative variables", Asian

Journal of Probability and Statistics, vol.*20*, no.3, pp.36-48, 2022. https://doi.org/10.9734/AJPAS/2022/v20i3425
[33] M. B. Ghalibaf, "Relationship between Kendall's tau correlation and mutual information", *Revista Colombiana de Estadística,* vol.43, no.1, pp.3-20, 2020. http://dx.doi.org/10.15446/rce.v43n1.78054
[34] H. Yulianto, "Implementation of learning assessment model on the curriculum of Merdeka Belajar", *Technical and Vocational Education International Journal (TAVEIJ)*, vol.2, no.2, pp.22-34, 2022. https://doi.org/10.556442/taveij.v2i2.227
[35] K. Das, "Role of ICT for Better Mathematics Teaching", *Shanlax International Journal of Education,* vol.7, no.4, pp.19-28, 2019. https://doi.org/10.34293/education.v7i4.641
[36] J. D. Eduwem and V. U. Ezeonwumelu, V. "Overloaded curriculum, excessive daily academic activities and students' learning effectiveness", *Journal of Education*, *Society and Behavioural Science,* vol.33, no.8, pp.70-75, 2020. https://doi.org/10.9734/jesbs/2020/v33i830252
[37] E. J. Dianabasi and E. V. Ugochukwu, "Overloaded Curriculum, Excessive Daily Academic Activities and Students' Learning Effectiveness", *Journal of Education, Society, and Behavioural Science*, vol.33, no.8, pp.70–75, 2020. https://doi.org/10.9734/jesbs/2020/v33i830252
[38] A. Kwegyiriba, R. O. Mensah and E. Ewusi, "The Use of Audio-Visual Materials in Teaching and Learning Process in Effia Junior High Schools", *Technium Social Sciences Journal*, vol.31, no.1, pp.106–114, 2022. https://doi.org/10.47577/tssj.v31i1.6399
[39] M. M. Masango, L. Van Ryneveld and M. A. Graham, "Barriers to the implementation of electronic textbooks in rural and township schools in South Africa", *Africa Education Review,* vol.17, no.6, pp.86-118, 2020. https://doi.org/10.1080/18146627.2022.2064310
[40] Y. Pratikno, E. Hermawan, and A. L. Arifin, "Human Resource 'Kurikulum Merdeka' from Design to Implementation in the School: What Worked and What not in Indonesian Education", *Jurnal Iqra*, vol. 7, no. 1, pp. 326–343, 2022. https://doi.org/10.25217/ji.v7i1.1708
[41] S. Inganah, R. Darmayanti and N. Rizki, "Problems, solutions, and expectations: 6C integration of 21st century education into learning mathematics", *JEMS: Jurnal Edukasi Matematika Dan Sains*, vol.11, no.1, pp.220-238, 2023. https://doi.org/10.25273/jems.v11i1.14646