The Status of the Integration of Tecnology into Junior High School Science Teaching in Wa Municipality

Osman Froko Zakaria[1], Mohammed Issah[2], Prof John K. Eminam[3]

[1,2,3]NJA College of Education Post Office Box 71wa Upper West Region

ABSTRACT

The study employed descriptive survey research design. According to Smith et al. (2002) the main purpose of a descriptive survey design is to obtain information from a defined set of people so as to generalize the sample results to the population. This survey study sought to explore "the status of the integration of ICT in the teaching of integrated science in selected Junior High schools in the Wa Municipality". A sample size of 96 respondents were purposely selected to provide information regarding their perception and views on the use of ICT to facilitate teaching of integrated science in the Wa municipality through a questionnaire. Also interview schedule were used to support information obtained through questionnaire and to increase reliability of the findings. The key objectives of this study were: to explore teachers' perceptions on the benefits of using ICT in teaching, to explore the barriers that hinder teachers from using ICT to facilitate teaching and to identify the factors that determine the use of ICT to facilitate teaching. Teachers' attitude, teacher confidence and competence, unlimited access to ICT resources and facilities and lack of technical support, inadequate ICT infrastructure on ICT and lack of professional development were identified as the barriers hindering teachers to use ICT to facilitate teaching in junior high schools. On examining the factors determining the use of ICT in teaching integrated science in selected junior high schools in the Wa municipality, the study identified the following factors: - teachers' positive attitude, teachers' competence in ICT use, accessibility of ICT facilities, professional development and availability of technical support. The findings of the study established that Junior High school teachers teaching integrated science in the Wa municipality are qualified to teach in the Junior schools. The results show that there is a positive perception of science teachers in integrating ICT in teaching. Majority of teachers integrate ICT in their instructional practice with varied challenges. The study also identified a generation gap amongst teachers' junior teachers demonstrating much interest of learning how to and integrating ICT in teaching as compared to senior teachers, the study reveals there is a digital divide- the gap between schools who have access to ICT facilities and those who do not, which makes a huge difference in the use of ICT in teaching among schools. The study was concluded based on the barriers that hinder using of ICT in teaching and learning can be eliminated. For successful integration of ICT in teaching, the determining factors must be given consideration. The study recommends that teachers should develop positive attitude towards ICT, teachers should be trained on how to use ICT in teaching and not only on the general use of ICT tools. The study also recommends that schools authorities should empower teachers by facilitating in-service training, provide enough ICT facilities. The Ministry of education needs to give more funds to establish at least minimum ICT facilities to enable the school to have these infrastructures for teaching.

KEYWORDS: Information communication technology, Information communication technology for Accelerated Development, Instructional technology, Technology integration, Teachers knowledge.

INTRODUCTION

The rapid growth in Information Communication and Technologies (ICT) has brought profound changes in the twenty-first century, as well as affected the demands of modern societies. ICT has become increasingly important in our daily lives and in our educational system. Therefore, there is a growing demand on educational institutions to use ICT to teach the skills and knowledge students need for the 21st century. Realizing the effect of ICT on the workplace and everyday life, today's educational institutions try to restructure their educational curricula and classroom facilities, in order to bridge the existing technology gap in teaching and learning. This restructuring process requires effective adoption of technologies into existing environment in order to provide learners with knowledge of specific subject areas, to promote meaningful learning and to enhance professional productivity (Tomei, 2005). ICT has the potential to enable teachers and students to construct rich, multi-sensory, interactive environments with an almost unlimited teaching and learning potential (Balanskat etal. 2006). The International Conference on Teaching and Learning with Technology (2010) stressed the pivotal role that ICT can play in transforming teaching and learning. 'The Dakar Framework for Action' (2000), identified the use of ICT as one of the main strategies for achieving the world declaration of Education for All adopted at Jomtein in 1990 and called on all nations to harness new information and communication technologies to help achieve these goals (Rampersad, 2011).In the Hwa Chong Education Conference in (2010), it was recognized that developments in ICT have opened up exciting new possibilities for teaching practices in order to better engage and excite learners.

The International Conference on Teaching and Learning with Technology (2010) stressed the pivotal role that ICT can play in transforming teaching and learning. 'The Dakar Framework for Action' (2000), identified the use of ICT as one of the main strategies for achieving the world declaration of Education for All adopted at Jomtein in 1990 and called on all nations to harness new information and communication technologies to help achieve these goals (Rampersad, 2011). The Ghana ICT for Accelerated Development (ICT4AD) Policy (2003) recognizes the importance of integration of ICT into teaching and intends to:

- Transform Ghana into an information and knowledge-driven ICT literate nation
- Introduce computers into all primary, secondary, vocational and technical school
- Put in place special schemes to enable students, teachers and educational institutions to purchase computers through attractive packages, among other strategies.

STATEMENT OF THE PFROBLEM

Research points to the benefits that ICT integration brings to bear to the teacher as well as the learners. Talabi (2015) noted that when lessons are presented through computers, they give learners more control over their learning environment and they get access to a wider range of materials to use. Lessons become more interactive. Both the struggling and smarter students benefit since computers facilitate self-directed learning. Most JHS teachers in the Wa Municipality were provided with laptops in 2014 by government through the municipal education office with the view of encouraging them integrate technology into teaching. Since this intervention, little or no work has been done on the status of ICT integration into teaching integrated science in junior high schools in the municipality. Even though world organizations recognize the importance of integrating ICT into teaching and Ghana's ICT4AD supports ICT integration,

the knowledge and practices of integrated science teachers in integrating ICT into teaching in the Wa municipality is yet unknown. It is against this background that this study was conducted to investigate the perception of teachers of the integration of technology into teaching of integrated science and factors that affect science teachers' technology integration practices in junior high schools in the WA Municipality of the Upper West Region OF Ghana.

PURPOSE OF THE STUDTY

The purpose of the study was to explore the knowledge and practices of integrated science teachers in integrating technology into teaching at the JHS level in the Wa Municipality. And also ascertain the implementation challenges of the Ghana ICT4D program in the Wa Municipality.

RESEARCH QUESTIONS

The following research questions were formulated to guide the study:
1. What are the perceptions of science teachers on the integration of technology into science teaching in Wa Municipality?
2. What factors affect the science teachers' technology integration practices?

LITERATURE REVIEW
TEACHERS' BELIEF

Among the factors that influence successful integration of ICT into teaching is teacher's attitudes and beliefs towards technology (Hew & Brush, 2007; Keengwa & Onchwari, 2008). Many authors refer to teachers' beliefs as having a significant impact on the integration of ICT, as teachers' beliefs are reflected in their classroom practice (Ottenbreit-Leftwich et al, 2010). Attitude is an important concept in social judgments and behaviors and thus, is one of the most important concepts in decision making, (Venkatesh et al., 2003). Teacher attitude is one of the most critical factors that enhance or inhibit the integration of ICT into classroom instruction. However, teachers' beliefs are difficult to articulate, as they are often tacit and implicit in practice (Donnelly et al, 2011). This section will consider teachers' beliefs further, as well as their beliefs about pedagogy, attitude to the use of ICT, confidence and competence in using technology, and also the relationship between these aspects. It is encouraged that teacher integrate and use ICT in ways that support their existing beliefs in terms of learner-centered or teacher-centered pedagogies (Palak & Walls, 2009; Ertmer et al, 2012). Liu (2011) suggests that while some studies find that teachers use ICT in ways that support their beliefs in terms of teacher-centered or student-centered learning, beliefs in student-centered learning are not always translated into practice. This may be due to time-constraints or external pressures such as curriculum and assessment requirements (Conlon & Simpson, 2003; Ertmer et al., 2012).

Kim et al (2013) focus on teacher beliefs in investigating why technology is integrated differently by teachers. They identify variances in how teachers view the efficacy of ICT and beliefs about student-centered or teacher-centered pedagogy in terms of what is considered to be effective teaching and the nature of knowledge and learning. Kim et al. (2013) noted that these beliefs are connected, as how teachers view the nature of knowledge and learning affects their views of what is effective teaching and how ICT is used to support this. John (2005) noted how teachers of different secondary school subjects integrate and view ICT differently based on how they view their subject. Meyer et al. (2011) found that collaborative support from other teachers can develop positive beliefs in the use of ICT to support teaching and learning.

Teachers need to have a positive attitude towards ICT to make use of it in the classroom and teachers who develop their own skills often have a more positive attitude (Kreijns et al., 2013). Ertmer & Ottenbreit-Leftwich (2010) contended that teacher-level factors affecting ICT use include self-efficacy, but this takes time to develop. Teachers do not need high levels of personal ICT competence to use ICT in the classroom but need a high-level of personal confidence to make use of it (Loveless, 2003). ICT integration is affected by second-order barriers, in particular teacher beliefs about their attitudes to ICT and skills (Mueller et al, 2008). Teachers' personal use of ICT impacts on their professional use and ICT skills often take time to develop, particularly due to the changing nature of ICT. How teachers make use of ICT themselves directly relates to how they expect students to use it, for example teachers that use ICT to create multimedia content also set this as an activity for students whereas teachers who do not themselves use ICT to create multimedia content are unlikely to expect students to do this (Hsu, 2011). Teachers who choose to develop their own ICT skills often have a positive belief in the use of ICT to support teaching and teach (Meyer et al, 2011).

Hammond et al. (2011) identify teacher-level factors affecting ICT use including subject taught, self-efficacy, and beliefs in terms of whether ICT has a positive impact on learning. Teachers who are confident in their own skills make more use of ICT and teachers who believe that ICT will have a positive impact on learning make more use of ICT. Teacher confidence and ICT competence is positively related to how they make use of ICT in the classroom (Wastiau et al., 2013). Also, teachers who are more confident in their own ICT ability are more likely to make use of ICT in student-centered ways (Wastiau et al., 2013). Kreijns et al. (2013) find that teacher confidence and competence are linked but the causal relationship is unclear. Celik & Yesilyurt (2013) consider relationships between teachers' computer anxiety, self-efficacy, attitudes towards ICT use and use of ICT to support teaching and learning. They find that low anxiety, high self-efficacy and a positive attitude to ICT use are all indicators of likelihood to use ICT within the classroom and that teachers who develop positive attitudes to ICT also increase their confidence and decrease anxiety. In summary, developing the use of ICT to support teaching and learning across the curriculum places burdens on teachers in terms of developing required knowledge and skills. As discussed above, the SLT set out the policy and identify what makes 'good' teaching and learning within the school context but it is up to teachers to implement this in practice. In addition to interpreting school policy, teachers' own assumptions, beliefs and experience affect how they view ICT and subsequently how they make use of it. This study will investigate how teachers' beliefs affect their practice. The role of the teacher is complex and burdens are placed on teachers in developing knowledge of technology and pedagogy. Therefore, it is expected that CPD is important in developing teacher knowledge, as is described further in the next section. Various studies and media reports of education technology, such as the introduction of video and computer-based training, the micro-computer, multimedia and the World Wide Web, have identified expected benefits of technology in education (Oliver, 2006). However, there is still the need to develop an understanding of the relationship between education and ICT in terms of how and why ICT is actually used within educational settings, rather than concentrating on how it could or should be used (Selwyn, 2010).

THE CONCEPT OF TEACHING AND TEACHERS' KNOWLEDGE

Teaching is any situation in which one person tries to pass to another his knowledge, feeling, purpose or an action (Fleming, 1965). Also, Hunter (1984) in Beach and Reinhartz (1980) defines teaching as 'the constant stream of professional decisions that affects the probability of learning: decisions that are made

and implemented before, during and after interaction with the students". The major goal of teaching is to bring to bear, the expected and desired behavioral change in the learner. Nacino Brown *et al* (1990) emphasize the transfer of skills, attitude and knowledge from one person to another. Farrant (1980) defines teaching as "a process that facilitate learning". This implies that in order for teaching to take place, there must be the learner who is ready to be trained by a qualified professional.

According to Beach and Reinhartz (1989), teaching is a complex and multidimensional activity which include: telling, explaining, defining, giving example, stressing critical attributes, modeling and demonstration. Therefore, any activity involving a learner and a trained person that goes through the above activities could be deemed as teaching. From the point of view of Beach and Reinhartz (1980), the teaching from which students learn the most is one in which the teacher does the following:

a) Provides opportunities for students to participate actively and successfully.

b) Evaluate and provides feedback on students' progress during instruction.

c) Organizes materials and students.

d) Maximizes time for teaching.

e) Manages student behaviors.

f) Teaches for cognitive, effective and/ or psychomotor learning.

g) Uses effective communication skills.

According to Prestride (2012), ICT aided teaching is the most appropriate skill required of a teacher, unfortunately, it is the least possessed by many. This may be because it is barely been part of their training course. Prestride (2012) outlined some of ICT packages required of a secondary school teacher as data processing, word processing, use of internet, use of spreadsheet, use of presentation software like PowerPoint and e-mail. The role of the teacher embraces a number of responsibilities including the design of the learning environment, managing people and resources, mediating student learning, and improving practice. Teachers who are confident in their subject-specific curriculum knowledge are more likely to innovate within their practice (Hartnell & Young, 2009). However, developments in the use of ICT make the role of the teacher more complex and require specific skills relating to the technology and pedagogy, which take time to develop (Webb & Cox, 2004). There is a burden placed on teachers in terms of developing their knowledge, both of the technology and of appropriate pedagogy, thereby increasing teacher workload. In addition, teachers may see their role change as a result of technology integration and need support (Hennessy et al, 2010). ICT competence is defined as being able to handle a wide range of varying technologies for various purposes. Teachers make use of a range of knowledge in order to effectively do their job and the integration of technology into teaching and learning involves a knowledge base for teachers that is new and therefore needs to be developed through appropriate professional development (Mishra & Koelhar, 2006; Loveless, 2011).

Mishra and Koelhar (2006) explain this concept as the qualities of teacher knowledge required in order to integrate technology within pedagogy. For ICT to support teaching and learning, pedagogy and what teachers need to know to successfully incorporate the technology must be considered (Mishra & Koelhar, 2006). This is referred to as Technological Pedagogical Content Knowledge (TPCK). Pedagogical technological content knowledge (Mishra & Koehlar, 2006, pp10-25; Mishra & Koelhar 2006; Unwin, 2007; Voogt et al., 2013) describe this model of teacher knowledge as including content, the subject specialist knowledge; pedagogy, knowledge of techniques of teaching and learning; and pedagogical content knowledge, based on Shulman's definition (Shulman, 1986). This definition sets out the knowledge used to make the subject comprehensible to others and the requirements for teacher knowledge.

It includes an understanding of how ICT can be used to provide forms of representation not available without the technology, knowing the range of technologies available to support teaching and learning and being able to choose appropriate technologies and pedagogic strategies to use. Therefore, the rationale for CPD for teachers should focus on the technology alongside content and pedagogy, rather than see technology as a separate issue (Mishra & Koelhar, 2006; Price & Kirkwood, 2010; Chen et al, 2009). Harris et al (2009) also identify the added complexity of the rate of change of technology that makes keeping up with developments even more challenging and time consuming for teachers. Ertmer & Ottenbreit-Leftwich (2010) support this and emphasize the need for teachers to be given time to develop and establish new practices. This section has identified that the use of ICT to support teaching and learning places a burden on teachers to develop new knowledge and skills to be able to integrate ICT effectively.

BARRIERS THAT HINDER TEACHERS FROM USING ICT IN THE CLASSROOM TEACHING

The process of integrating ICT into teaching is a complex process and one that may not be free of a number of challenges or barriers. A barrier is any condition that makes it difficult to make progress or to achieve an objective (Schoepp, 2015). There are several factors that hinder the use of ICT into classroom instruction. Some factors are institutional (unavailability or limited access to ICT facilities), instructional and teacher's competence. Researches identify these factors as non-manipulative and manipulative factors. Non-manipulative refers to the factors, such as age, teaching experience, computer experience. Manipulative factors are availability of ICT infrastructures, support from the Municipal Education office, PTA and the availability of other external support services.

METHODOLOGY
RESEARCH DESIGN

Bryman (2008) stated that research design provides a framework for the collection and analysis of data. Burns and Grove (2001) described the research design as a blueprint for conducting a study that maximizes control over factors that could interfere with the validity of the findings. A descriptive cross-sectional survey design was employed in this study to investigate the perception of science teachers in integrating ICT in teaching integrated science in junior high schools in the Wa municipality in the Upper West Region. Descriptive study seeks to gather information so that a description of what is going on can be made and may be designed to discover whether there is any relationship between two variables (Agyedu et al., 2007). In this survey, questionnaire and interview were used to obtain the data for this study. The data were analyzed to arrive at the various findings after descriptive exercises were carried out on the data collected. A cross-sectional design. According to Bryman (2012), entails the collection of data on more than one case and at a single point in time in order to collect a body of quantitative or quantifiable data in connection with two or more variables which are then examined to detect patterns of association. Surveys are structured studies that analyze, interpret and report the present state or status of an institution, organization, community or school. The purpose of this design is to obtain information that can be analyzed by extracting patterns with which comparisons can be based and sound decisions made (Opoku, 2005).

POPULATION AND SAMPLING PROCEDURE

The target population is all the fifteen (15) circuits which consist of seventy-six (76) public junior high schools with nine hundred and seventeen (917) teachers in the Wa municipality in the upper west region

of Ghana. There are one hundred and fifty-four (154) science teachers in the seventy-six (76) public junior high schools in the municipality. Considering important factors such as finance, time and accessibility, it was practically impossible to access information from all the target population. It became appropriate therefore, to measure from a smaller group of the population in such a way that the information obtained will be representative of the total population under study. This accessible group from the population represented the sample. Purposive sampling was adopted to select ninety-six (96) science teachers from the fifteen (15) circuit for the study. A total sample size of ninety-six (96) teachers was used for the study. The ninety-six-sample size represent 62.34% of the accessible population of one hundred and fifty-four (154) science teachers in the seventy- six public junior high schools in the municipality.

RESEARCH INSTRUMENTS
This section describes the methods of collecting data for the study. Questionnaires and Interview schedules were used as instruments for data collection.

RELIABILITY
According to Crawley and Koballa (1994), people make evaluative judgments about a wide variety of targets and rely on these judgments in deciding among several possible courses of action in the future. With this view, the reliability of the questionnaire was determined using Cronbach's alpha of 0.73. This showed that the reliability of the questionnaire was quite high.

VALIDITY
To attain validity the instruments were sent to the supervisor during proposal writing for suggestions, recommendations and advice. The instruments were presented to experts in the area of study. The experts in the area of study helped in improving the instruments. The experts' feedback in form of recommendations to the researcher, were incorporated in the final instruments. Not only that the researcher conducted a pilot test of the instruments in Wa west District before using them in the study. The purpose of piloting the instruments was to test the appropriateness of the items to the respondents in order to improve the instruments and enhance the validity of the instruments. The researcher made use of the supervising experts to ensure proper guidance was given on the piloting of the instruments.

DATA COLLECTION PROCEDURE
The sources of data for this study were ninety-six selected basic school science teachers from fifteen circuits in the Wa municipality. Data collection for this study was done in two phases. Questionnaire and interview were employed to obtain primary data.

ETHICAL ISSUES
Ethical principles in conducting research include acquiring clearance from the University of Education Winneba and the informed consent of the respondents as well as maintaining confidentiality. The ethical issues associated with the study were discussed with the research subjects. They were assured of their anonymity and their right to withdraw from the study should they be offended or feel threatened in any way at any stage.

DATA PRESENTATION, ANALYSIS AND DISCUSSION

This chapter deals with the presentation and analysis of data for the study. Data was collected through the use of distributed Questionnaires and Interviews from ninety-six (96) teacher's respondents out of the one hundred and fifty-four (154) targeted respondents from fifteen (15) circuits in the Wa municipality. This gave a response rate of 62.34%. The findings of the study are presented as per the objectives of the study in the following sections. The data from the questionnaires were statistically analyzed by using a computer programmed known as SPSS version 20. The findings are discussed according to the sections of the questionnaire.

RQ 1: What are the perceptions of science teachers on the integration of technology into science teaching in Wa municipality?

Table 1: Perceptions of science teachers on the integration of technology in teaching science

		Strongly disagree/disagree	Undecided	Strongly Agree/Agree
1	Technology integration is learning about computers.	58(60.4%)	4(4.2%)	34(35.4%)
2	Technology integration is using computers and other tools in teaching.	6(6.3%)	0(0%)	90(93.7%)
3	Technology integration is using electronic tools and methods in teaching	12(12.5)	8(8.3)	76 (79.2)
4	Educational technology integration can improve the quality of teaching and learning that take place in schools.	32(33.3)	0(0)	64(66.7)
5	Educational technology resources are important learning tools.	4(4.2)	2(2.1)	90(93.7)
6	Students who have access to technological resources are more likely to do better than those who do not	6(6.3)	2(2.1)	88(91.7)
7	Educational technology resources should be available in each school.	2(2.1)	0(0)	94(97.9)
8	Educational technology tools should be available in each classroom.	2(2.1)	2(2.1)	92(95.8)
9	Access to computers should be limited to the school library for research.	72(75.1)	4(4.2)	20(20.9)
10	Having computers in my class is a waste	88(91.6)	4(4.2)	4(4.2)
11	If I integrate technology in my teaching, I will not have enough time to cover all the topics in the syllabus.	74(77.1)	10(10.4	12(12.5)

Technology integration is learning about computers.

From table 1, majority of the respondents 58 representing 60.4% disagree with this statement indicating an understanding of technology integration. Thirty-four (34) respondents representing 34.4% agree with

this statement indicating some misconception about technology integration in teaching. Some four (4) respondents representing 4.2%.
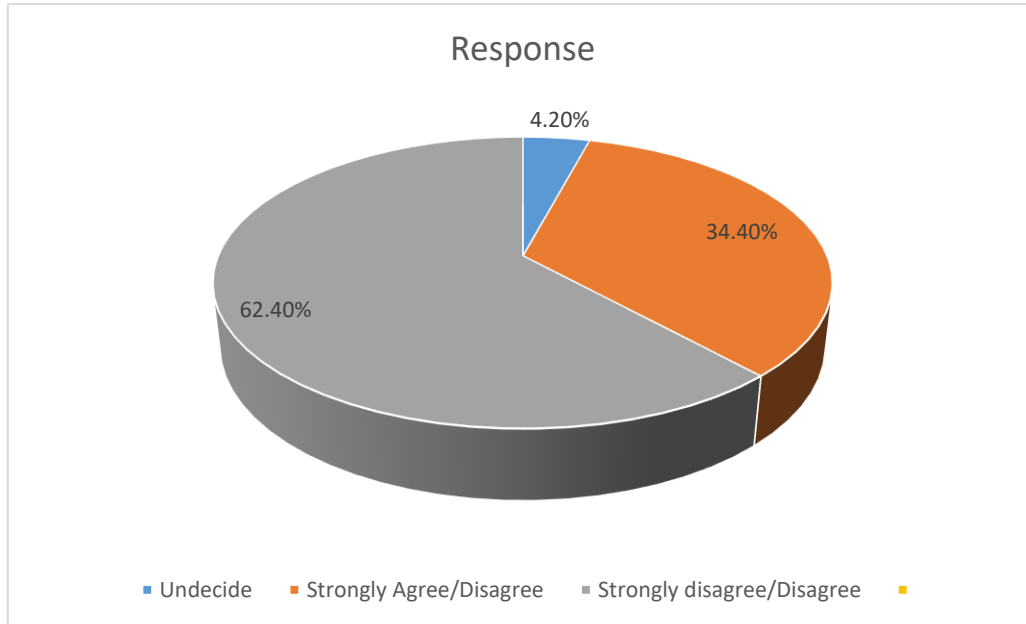

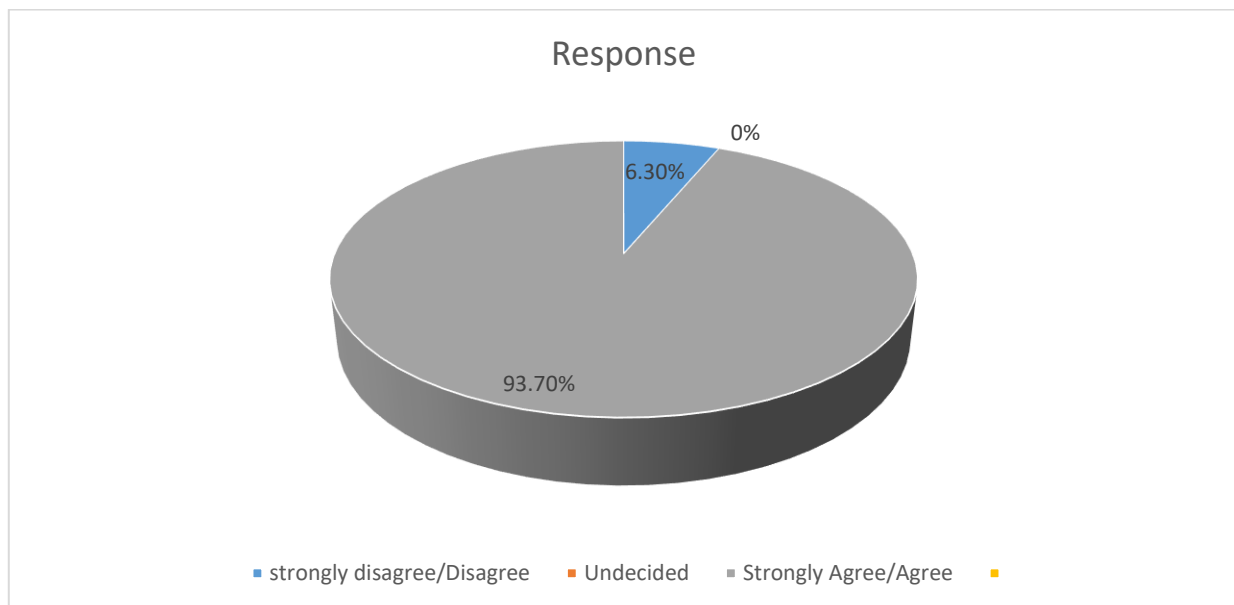**Figure 1: Respondents view of the meaning of technology integration.**
Source: Field Data (2022)

Technology integration is using computers and other tools in teaching.
On the above statement, ninety respondents representing (93.7%) of respondents strongly agree or agree with the statement while six (6) respondents representing 6.3% strongly agree/disagree with the statement. Below is a graphical presentation.

Figure 2: Respondents view of the meaning of technology integration.
Source: Field Data (2022)

Educational technology integration can improve the quality of teaching and learning that take place in the classroom.

Majority of respondents constituting 66.7% of the population agree/strongly agree with this statement while thirty-two (32) respondents representing 33.3% disagree/strongly disagree with the statement.
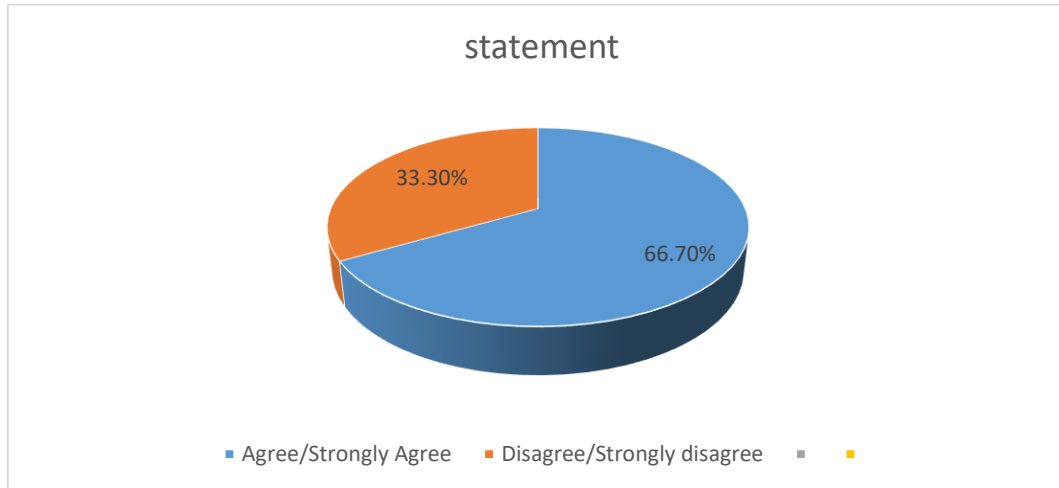

Figure 3: Respondents view of the meaning of technology integration.
Source: Field Data (2022)

Educational technology tools should be available in each classroom.

With the above statement majority of respondents agree/strongly agree with this statement which constitute 95.8% of respondents while 2.1% of respondents disagree or strongly disagree with the statement with 2.1% of respondent undecided.
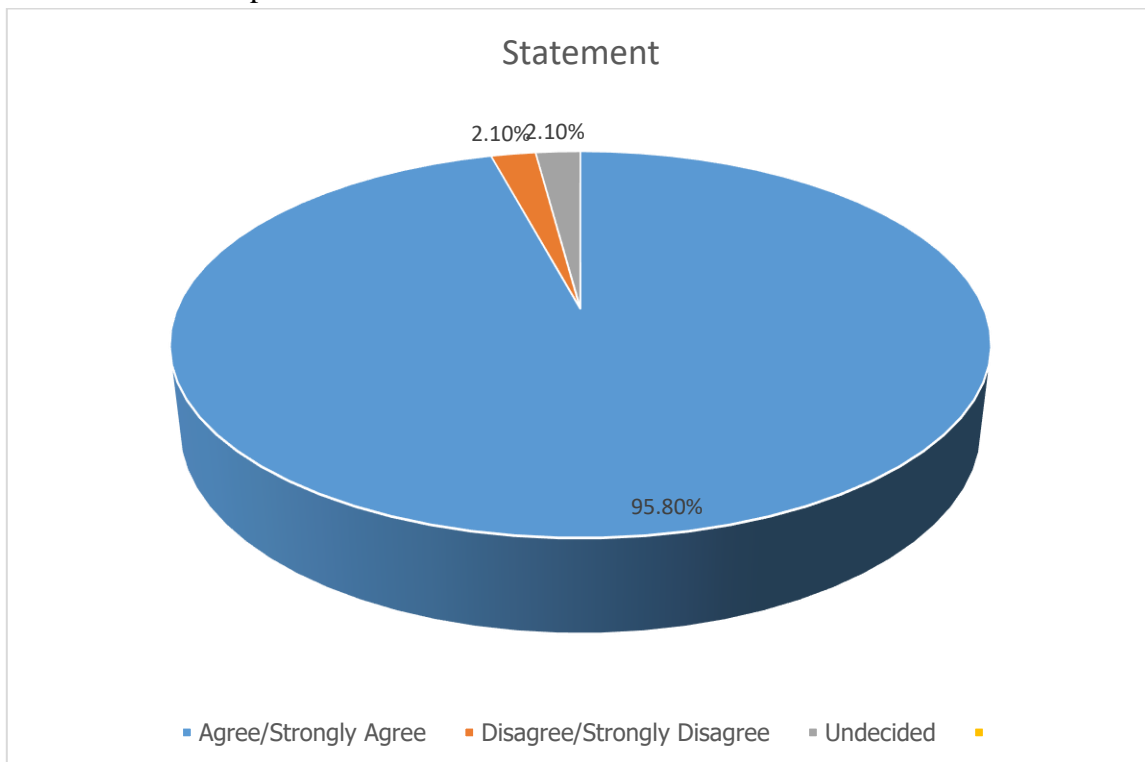

Figure 4: Respondents view of the meaning of technology integration.
Source: Field Data (2022)

If I integrate technology in my teaching, I will not have enough time to cover all the topics in the syllabus.

Seventy-four respondents representing 77.1% disagree/strongly disagree with this statement. Meanwhile, ten respondents representing 10.4% were undecided while twelve respondents representing 12.5% agree or strongly agree with the statement.
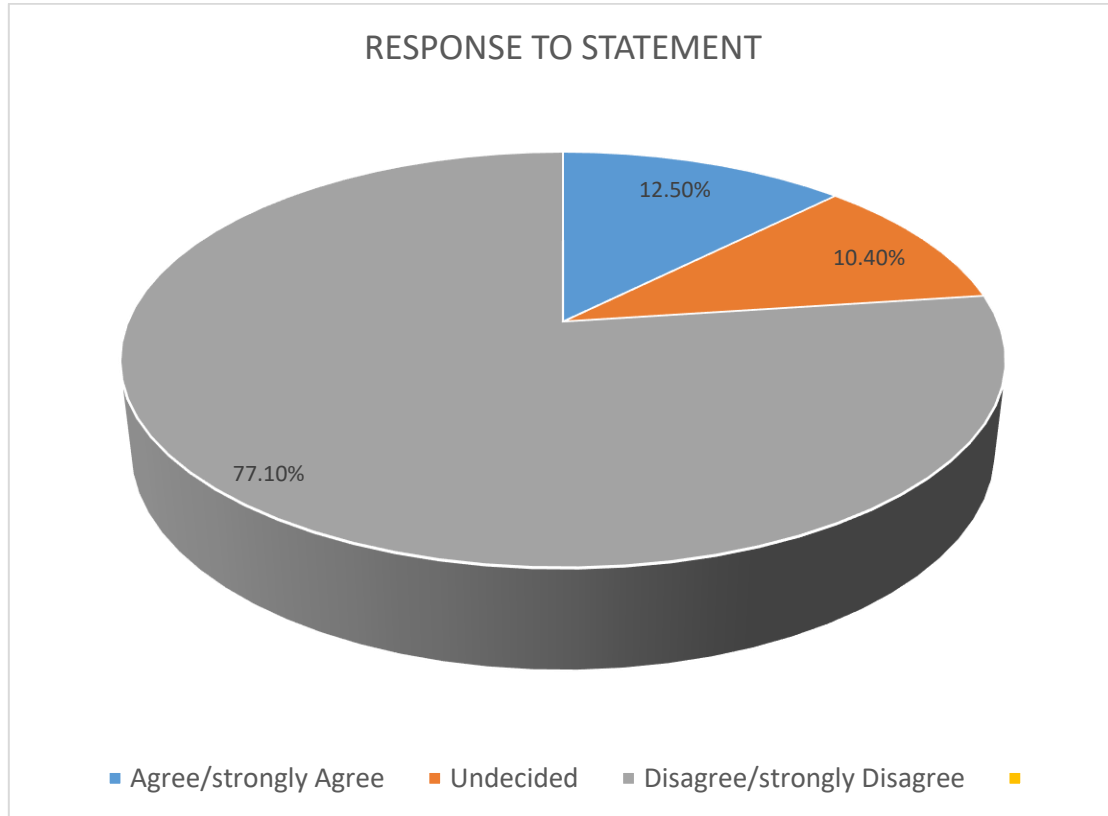

Figure 5: Respondents.

Source: Field Data (2022)

Generally, there is a positive perception of teachers concerning the usefulness of technology integration in teaching and learning, especially in the teaching and learning of integrated science at the junior high school level.

RQ 2: What factors affect science teacher's technology integration practice?

Table 2: Factors affecting science teacher's technology integration practice

	STATEMENT	Strongly Disagree/Disagree	Undecided	Strongly Agree/Agree
12	My school administration supports activities geared towards technology integration.	38(39.6%)	8(8.3 %)	50(52.1%)
13	My school administration /municipality encourages and supports teaching with technology.	30(31.3%)	6(6.3%)	60(62.6%)
14	There are enough educational technology tools in my school.	76(79.2%)	6(6.3%)	14(14.6%)

15	If I encounter problems when using technology, there is IT technician or someone to provide technical assistance.	42(43.8%)	6(6.3%)	48(50.0%)
16	Funds are made available for purchase of educational technology tools for my school.	74(77.1%)	6(6.3%)	16(16.7%)
17	Colleague teachers in my school encourage me to use educational technology in my teaching.	40(41.7%)	12(12%)	44(45.8%)
18	There are professional development sessions for teachers to develop their ICT competencies	54(56.3%)	8(8.3%)	34(35.4%)
19	My school is connected to the national grid.	62(64.6%)	0(0%)	34(35.4%)
20	My school has a constant power supply.	70(72.9%)	2(2.1%)	24(25.0%)
21	My school has a /thinking of having a standby generator to use in case of power failure.	74(77.1%)	8(8.3%	14(14.6%)

There are enough educational technology tools in my school.

Majority of respondents disagree/strongly disagree with this statement with a percentage of 74.2% indicating the level of lack of educational technology tools the basic schools. While 6.3 % of respondents were undecided, 14.5 % of respondents agree/strongly agree with the statement.
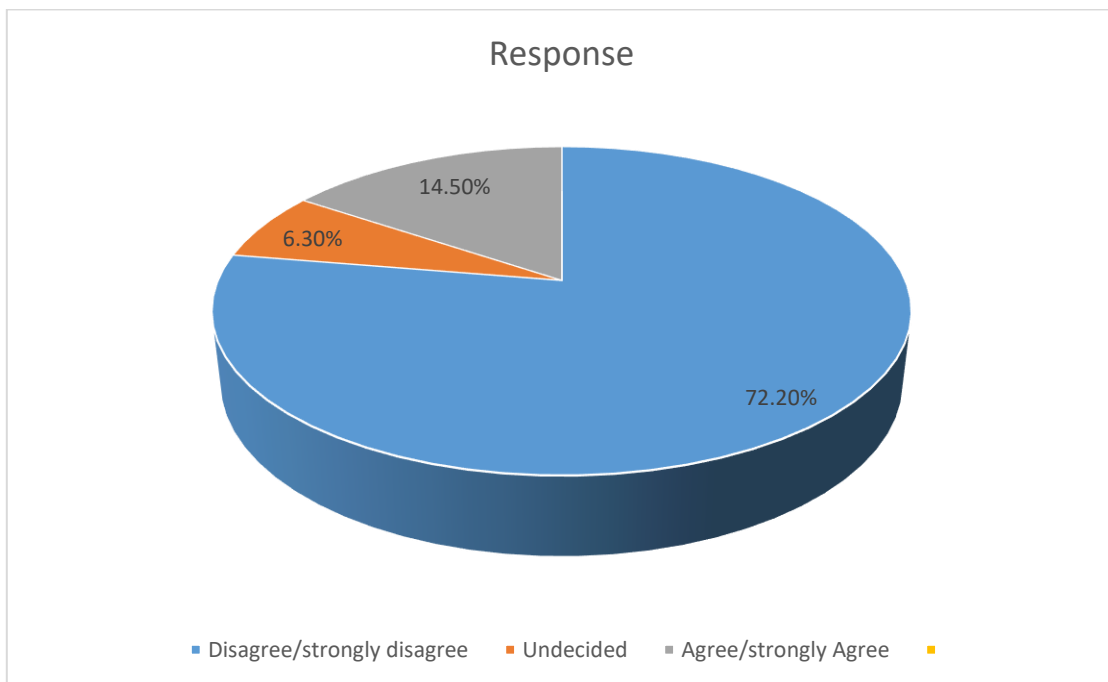

Figure 6: Respondents.

Source: Field Data (2022)

Funds are made available for purchase of educational technology tools for my school.

Majority of respondents representing 77.1% of the sample population strongly disagree or disagree with this statement. Sixteen respondents representing 16.6% of respondents strongly agree or agree with the statement while 6.2% were undecided.
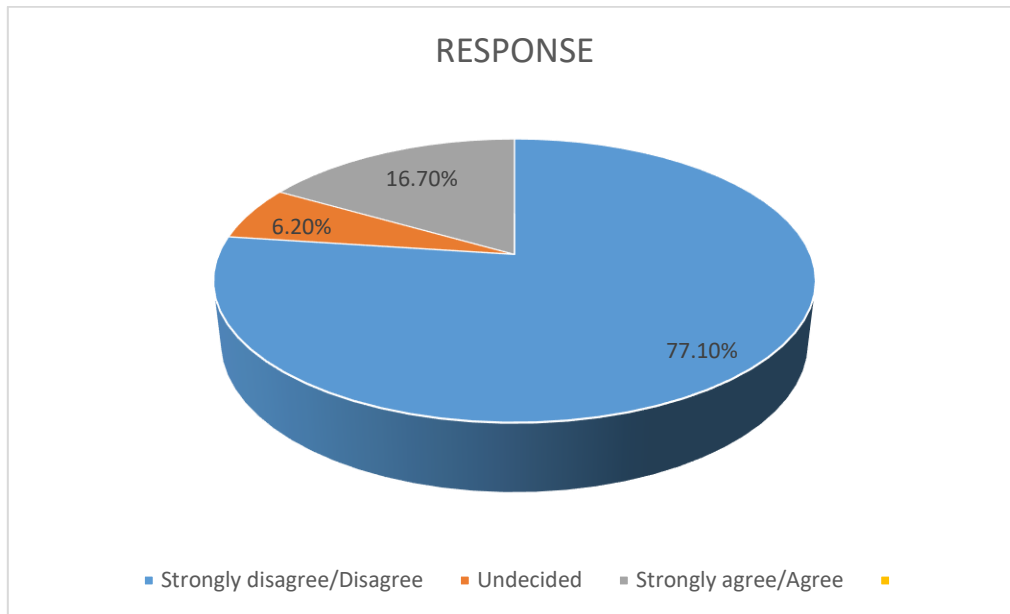

Figure 7: Respondents.

Source: Field Data (2022)

Colleague teachers in my school encourage me to use educational technology in my teaching.

From table 4.8, majority of respondents representing 45.8% of the sample population strongly agree or agree with this statement. Forty (40) respondents representing 41.7% of respondents strongly agree or agree with the statement while 12.5% were undecided.
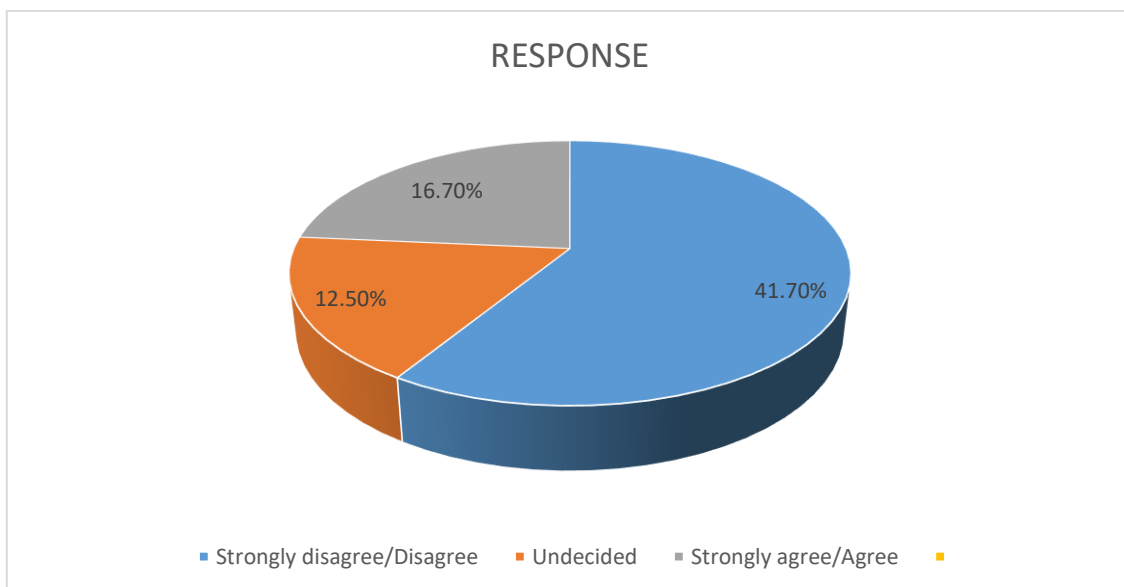

Figure 8: Respondents.

Source: Field Data (2022)

There are professional development sessions for teachers to develop their ICT competencies.

Majority of respondents representing 56.3% of the sample population strongly disagree or disagree with this statement. Thirty-four respondents representing 35.4% of respondents strongly agree or agree with the statement while 8.3% were undecided.
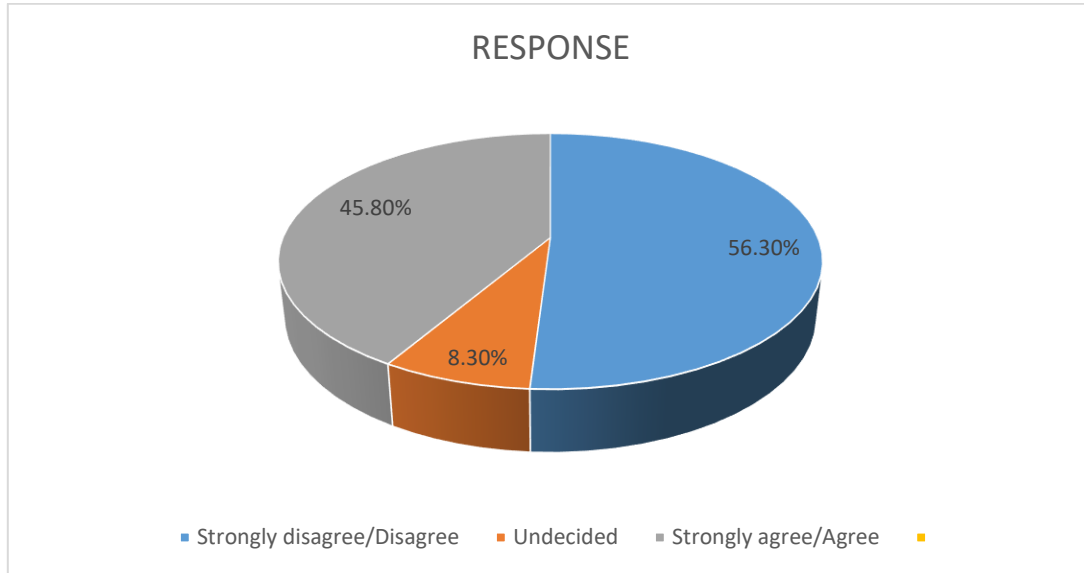

Figure 9: Respondents.
Source: Field Data (2022)

My school is connected to the national grid.

From table 4.8, majority of respondents representing 64.6% of the sample population strongly disagree or disagree with this statement. Thirty-four (34) respondents representing 35.4% of respondents strongly agree or agree with the statement while 00.0% were undecided.

Figure 10: Respondents.
Source: Field Data (2022)

My school has a constant power supply.

Majority of respondents representing 56.3% of the sample population strongly disagree or disagree with this statement. Thirty-four respondents representing 35.4% of respondents strongly agree or agree with the statement while 8.3% were undecided.
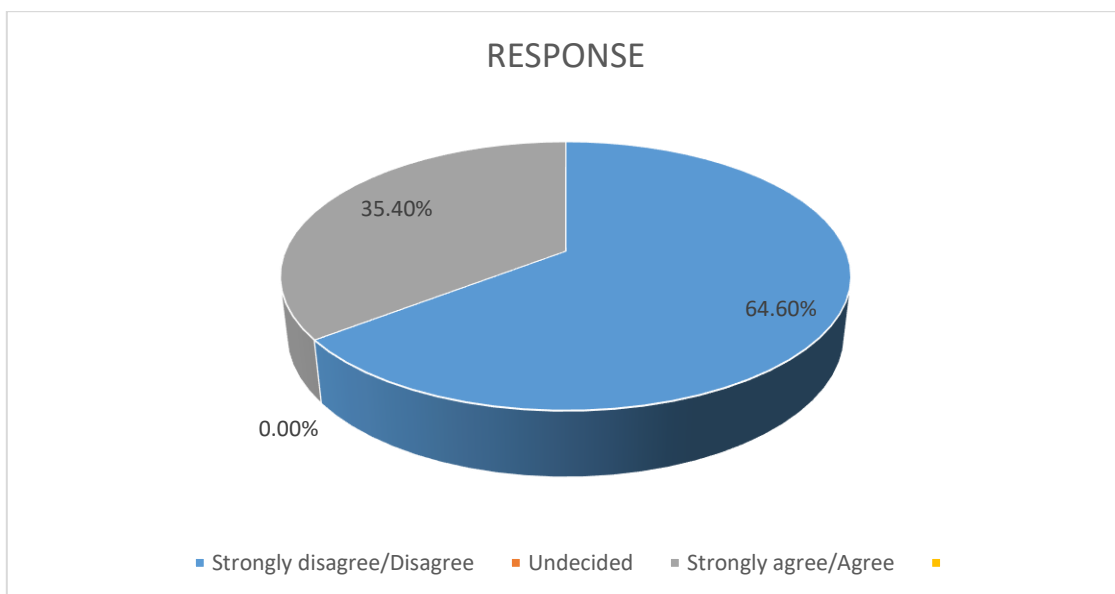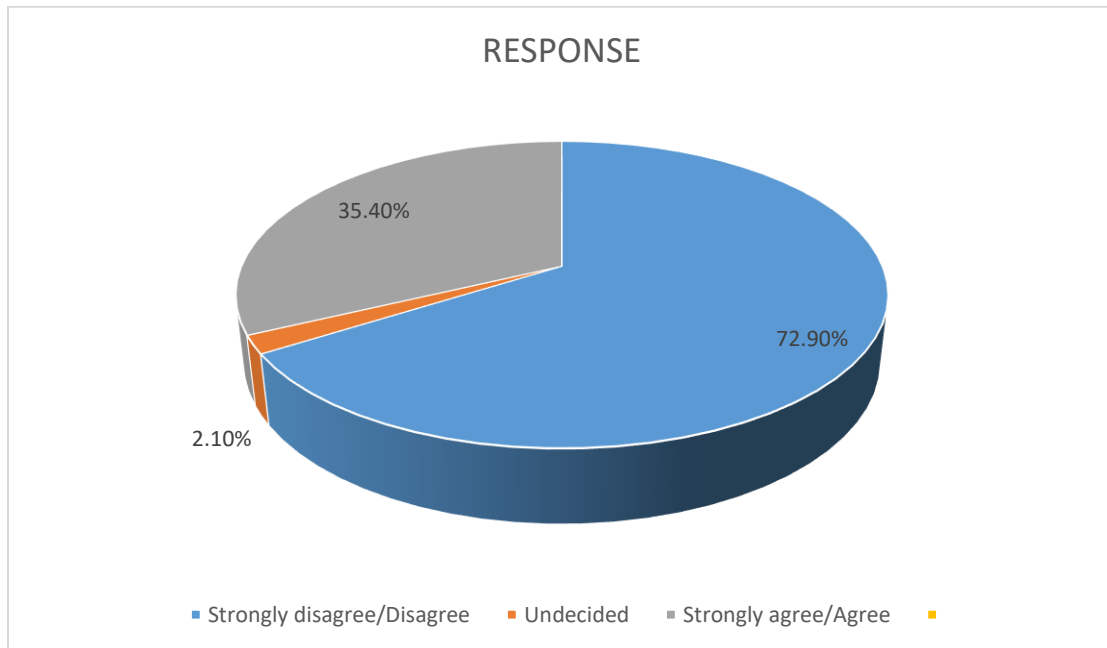

Figure 11: Respondents.

Source: Field Data (2022)

My school has a /thinking of having a standby generator to use in case of power failure.

From table 4.8, majority of respondents representing 77.1 % of the sample population strongly disagree or disagree with this statement. Fourteen (14) respondents representing 14.6% of respondents strongly agree or agree with the statement while eight (8) respondents representing 8.3% were undecided.
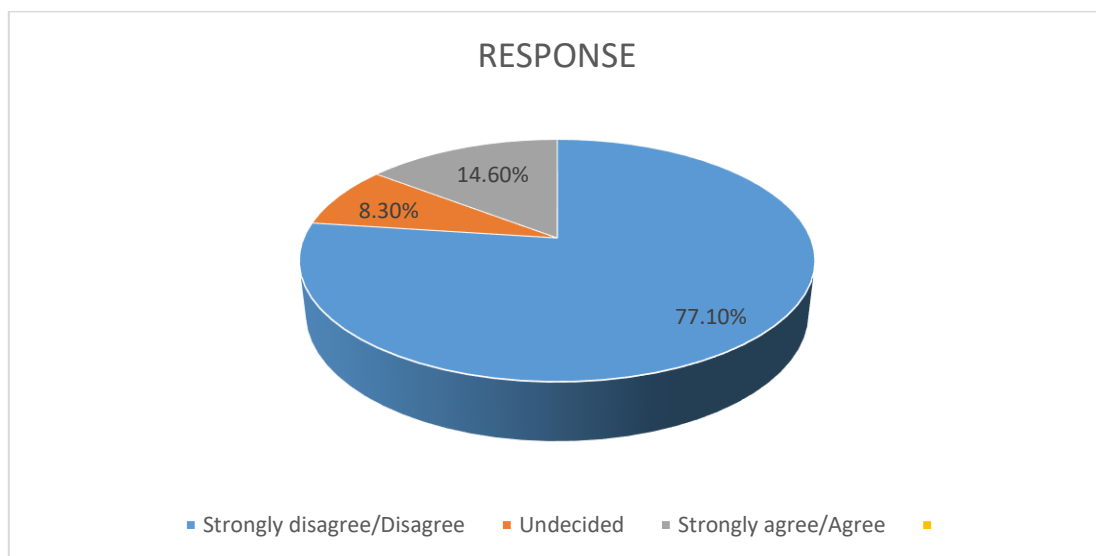

Figure 12: Respondents.

Source: Field Data (2022)

Presentation of Open-Ended Interview Questionnaires

The data obtained through face-to-face interview with respondents are presented according to the order of the objective of the study.

Question 2: What are the barriers that hinder the integration of ICTs to facilitate teaching and learning of integrated science?

Respondents responded verbally by enumerating the common barriers that hinders the use of ICT to facilitate teaching and learning. The barriers listed includes, inaccessibility and unavailability of ICTs resources, inadequacy of ICTs resources in schools, lack of training on the use of ICT affects its effective use in teaching, some teachers have negative attitude towards the use of ICTs in teaching, the unavailability of IT technical support staff. Respondents gave their views on the barriers of integrating ICT in facilitating teaching here are their views:

TEACHER (G) response: -

"As for me, everything boils down to Lack of ICT knowledge", I have no enough skills or competence to integrate ICT tools in my lesson at all"

A female respondent (teacher (H) said that:

"Integrating ICT in my lesson becomes hard because I am not knowledgeable on working with a computer, I find it hard to use it in class. In few occasions with the help of my students who are knowledgeable with ICT we have used videos and simulations from www.youtube.com to explain concepts like machines and respiratory system. I will give it a try"

Another respondent (teacher "I") said that:

"The use of ICT in teaching and learning is beneficial to both the teacher and the learner. As a teacher I can use website such as You Tube and Google to search for relevant materials for my lesson and use them to teach the students, everyone would like to integrated ICT in his/her lesson, the main challenge we face at our school is that we have only one classroom with about 7 computers and unreliable electricity"

Another respondent (teacher "J") commenting on the barrier of ICT he said

"I think there should be a program of providing basic ICT training to teachers not only on how to use them but also on how to integrate ICT in their teaching subjects. I really need to know how to use ICT to teach integrated and I believe if I have proper training on how to use internet and computer, I will be able to search relevant materials for my students"

Responding to the interview another teacher (teacher K) alleged that: -

"Not all teachers are capable of using ICT teach oooh, some of us don't know how to use one and they are not even available at our working environment, I have never thought that ICT can be used in classrooms also"

A comment from another teacher: -

"It would have been good if every teacher at my school had a personal computer that is connected to the internet so they can use for lesson preparation and teaching, but we are a government school we depend everything from the Ministry of Education budget, teachers as educators are supposed to be ahead with the changing technology and adopt innovative teaching through using ICT in classrooms"

Another teacher described: -

"There is no standby generator in this school to help when there is light out"

Furthermore, one respondent says: -

"One of the barriers that hinder us to use ICT in teaching is lack of access to ICT facilities and infrastructures, most of schools especially government school either have inadequate ICT infrastructures or don't have at all, Ministry of education should ensure that these infrastructures are available and train teachers to use them in classrooms.

The Barriers That Hinder the Use of ICT to Facilitate Teaching and Learning in the Wa municipality

This section discusses the barriers that have been identified as the barrier to the use of ICT in teaching processes in basic schools.

4.0 Teacher Competence and Confidence

In the study 85% of the respondents agreed that lack of training on the use of ICT in teaching is a barrier in integrating ICT in teaching. This study matches with the study done by Newhouse (2002), which reveals that many teachers lack the knowledge and skills to use computers and are not enthusiastic about the changes and integration of supplementary learning associated with bringing computers into their teaching practices. Another study by Pelgrum (2001), found that teachers' lack of technological competence is a main barrier to their acceptance and adoption of ICT. Mukama and Anderson (2008) in their study reports that, using ICT to train teachers is most necessary as it leads teachers to change attitudes, be more technologically skilled, motivated to use the same technologies after training and enhance collaboration. The study concludes little or lack of professional training on how to use ICT in teaching is a major barrier, for successful integration of ICT in teaching an emphasis should be put in providing pedagogical training on using ICT as across the curriculum is important. Therefore, teachers need knowledge of appropriate ICT integration approaches and ICT skills to successfully incorporate the ICT tools into their lessons. Training teachers on ICT related skills within the context of classroom objectives and activities ensures development of skills in integrated use of ICT in teaching.

4.1 Teachers Attitude towards the Use of ICT to Facilitate Teaching.

A lot of research on the attitude of both students and teachers towards the use of ICT in teaching and learning had been done with outcome being either positive or negative. For instance, BECTA (2004) reported that negative attitude was a barrier towards integration of ICT in teaching and learning while, Rhoda and Gerald (2000) found that positive attitudes towards ICT use are widely recognized as a necessary condition for effective ICT use in teaching and learning. Similarly, Kubiatko et al., (2009) in their study identified that attitude towards ICT determines its adoption in teaching. According to Jones (2001), the attitudes of teachers towards technology greatly influence their adoption and integration of computers into their teaching. The study shows that teachers prefer to use the traditional method for teaching in their classroom because of their lack of motivation, acceptance and readiness towards the ICT integration and adoption in teaching. From the results, this study found that 88% of the respondents agreed that their negative attitude towards the use of ICT to facilitate teaching hinders them to use ICT in classroom teaching. According to Gomes (2005), much research into the barriers to the integration of ICTs into education found that teacher attitudes and an inherent resistance to change was a significant barrier. To successfully initiate and implement educational technology in schools depends strongly on the teachers' support and attitudes. It is believed that if teachers perceived technology programs as neither fulfilling their needs nor their students' needs, it is likely that they will not integrate the technology into their teaching. In the study by Selewyn (1999), integration of ICT in education environment depends, to a great extent, on teachers and student attitude towards their use. If teachers' attitudes are positive toward

the use of educational technology, then they can easily provide useful insight about the adoption and integration of ICTs into teaching processes.

From interviews some teachers who resist to use ICT in teaching believe that ICT have no benefits for themselves and their learners they give excuses such as they feel shy to learn use ICT, they are too old to learn how to use ICT and some don't see the logic of learning while they know they won't use because facilities are not available. An interview results with teachers both who are computer literate and other with limited computer skills revealed that teachers are more sensitive about their ability to use computer and intention to use computer than their perceptions of the usefulness of computer. It therefore appears that teachers' attitude may influence adoption of ICT in teaching process. The study reveals that positive attitude towards computers, computer experience, and personal entrepreneurship of the teacher educator have a direct positive influence on the innovative use of ICT by the teacher. The study is in line with another study by Schiller (2003) which reveals that personal characteristics such as educational level, age, gender, educational experience, and experience with the computer for educational purpose and attitude towards computers can influence the adoption of a technology in teaching. It is undeniable that teacher attitude is one of the most critical factors that enhance or inhibit the integration of ICT into classroom instruction. Teacher attitude and competence ensure ICT implementation and guarantee further ICT innovation. The attitudes of teachers towards technology greatly influence their adoption and integration ICT into their teaching process, therefore an understanding of personal characteristics that influence teachers' adoption and integration of ICT into teaching is relevant. To successfully integrate ICT in teaching processes teachers are argued to change their attitude towards ICT specially to develop a positive attitude. It is advisable to adopt more appropriate measures to help both teachers and students further improve on their attitude towards ICT use in teaching and learning.

4.2 Limited Access to ICT Facilities.

The study results show that 100% of the respondents agreed that unavailability and inaccessibility of ICT facilities and resources hinders the use of ICT to facilitate teaching. The study results indicate that accessibility and availability of ICT resources plays a huge role in determining the use ICT to facilitate teaching. To supplement these results an interview was conducted to the selected sample and the respondents gave their views regarding the barriers that hinders the use of ICT to facilitate teaching and learning most respondents argued that they do not use ICT because they do not have access to ICT resources and some schools don't have facilities such as power, computer laboratory, internet access, and electronic projectors. The study by Eze and Olusola (2013) revealed that in Botswana, lack of electricity in rural schools and high cost of computers is a stumbling block to the integration of ICT in teaching, internet is impossible where there are no telephones and electricity. Effective application of ICT into classroom heavily relies on the availability of technological resources, qualified and confident teacher and other internal and external factors that directly or indirectly affect teachers' welfare and morale. The study further show that teachers have a positive perception on the use of ICT, but the availability and accessibility of ICT resources such as hardware, software and communication infrastructure are limited. If there are some ICT resources in a school, they are only limited to office use. Integrating ICT to teaching learning is not an option to the government and school owners, efforts should be made to ensure ICT infrastructures are available in all schools and are used as we a preparing child to live in a 21st century.

4.3 Lack of Technical Support

The study shows that 80% of the respondents indicated that they lack technical support on ICT issues hence they are intimidated to use ICT in teaching. The study by Pelgrum (2001) found that in the view of

primary and, secondary teachers, one of the top barriers to ICT use in education was lack of technical assistance. Lewis (2003) asserted that without both good technical support in the classroom and whole school resources, teachers cannot be expected to overcome the barriers preventing them from using ICT. The findings show that one of the challenges facing the use of ICT in teaching and learning is the availability of support staff. The interview conducted revealed that breakdown of a computer causes interruptions and if there is lack of technical assistance, then it is likely that the regular repairs of the computer will not be carried out resulting in teachers not using computers in teaching. The effect is that teachers will be discouraged from using computers because of fear of equipment failure since no one would give them technical support in case there is technical problem. BECTA (2004) agrees that if there is a lack of technical support available in a school, then it is likely that technical maintenance will not be carried out regularly, resulting in a higher risk of technical breakdowns. Therefore, if there is no technical support for teachers, they become frustrated resulting in their unwillingness to use ICT, ICT support in schools influence teachers to apply ICTs in classrooms without wasting time troubleshooting hardware and software problems?

4.4 Teaching Experience

The study result shows that there is a digital divide (generation gap) between the teachers. Youngers teachers have emerged to be positive about using ICT to facilitate teaching than older teachers, the study indicate that for most of younger teacher apart from owning computers and tablets or smartphones they occasionally engage in using software and mobile application and educational website in teaching as compared to senior teachers. The study reveals that senior teachers indicated that their age and teaching experiences were the barriers to adapt to the ICT integration into their lessons. The older teachers with more experience in teaching did not prefer to use ICT tools in their classes.

4.5 Professional Development

Insufficient amount of in-service training programs for teachers is another barrier that hinders the use of ICT in teaching, during the interview session respondents reported that there were no enough in-service training opportunities for teachers in the use of ICTs in teaching. A study by Newhouse (2002) states that "teachers need to not only be ICT literate; but they also need to develop skills in integrating ICT use into their teaching". According to Newhouse (2002), teachers need training in technology education (focusing on the study of technologies themselves) and educational technology (support for teaching in the classroom). It can be concluded that there are barriers which hinders the use of ICT to facilitate teaching and learning which are teacher's attitudes toward use of ICT, lack of teacher training on the use of ICT to facilitate teaching and learning, unavailability of technical support staff, availability and accessibility of ICTs resources and facilities. These factors have been mentioned repeatedly as the barriers to the use of ICT to facilitate teaching process.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Implication of the Study

1. The findings of the study established that Junior High school teachers teaching integrated science in the Wa municipality are qualified to teach in the Junior schools. The results show that there is a positive perception of science teachers in integrating ICT in teaching.
2. Majority of teachers integrate ICT in their instructional practice with varied challenges.
3. The study reveals there is a digital divide- the gap between schools who have access to ICT facilities and those who do not, which makes a huge difference in the use of ICT in teaching among schools.

4. In objective two of the study, the following were identified as barriers of the using ICT in teaching; - negative attitude, teacher competence and confidence, teaching experience, inadequate infrastructure, lack of training and lack of technical support.

RECOMMENDATIONS

1. The study recommends that teachers should develop positive attitude towards ICT, teachers should be trained on how to use ICT in teaching and not only on the general use of ICT tools.
2. The study also recommends that schools authorities should empower teachers by facilitating in-service training, provide enough ICT facilities.
3. The Ministry of education needs to give more funds to establish at least minimum ICT facilities to enable the school to have these infrastructures for teaching.
4. The study further recommends that the government through the Ministry of Education should make ICT training mandatory in Teacher's education, introduce in-service ICT training programs for teachers in public schools, fund public schools to purchase ICT infrastructures, employ ICT technical staff in public schools as there are IT technicians in churned out by the Technical Universities, teachers resource centers should be equipped with ICT facilities for immediate access.

CONCLUSIONS

1. There was a positive attitude teacher developed towards ICT, teachers should be trained on how to use ICT in teaching and not only on the general use of ICT tools.
2. The barriers that hinder using of ICT in teaching and learning can be eliminated.
3. For successful integration of ICT in teaching, the determining factors must be given consideration.

Suggestions for Further Research

This study was only carried out in selected Junior High schools in the Wa municipality.

1. The researcher therefore suggests that a similar study can be done in other Metropolitan areas, municipalities and Districts (MMD) in Ghana.
2. It is also suggested that this study be replicated using a case study design to provide in-depth information on the underlying causes of the challenges science teachers face in integrating technology into their instructional activities.

REFERENCES

1. Agyedu, G. O., Donkor, F. & Obeng, S. (2007). *Teach yourself research methods*. Kumasi campus: University of education, Winneba.
2. Balanskat, A., Blamire, R. & Kafela, S. (2006). *A reviewe of studies of ICT impact on schools in Europe*. European Schoolnet.
3. Becker, H., Ravitz, J. & Wong, Y. (1999). *Teacher and teacher-directed student use of computers and software. Teaching, Learning, and Computing: 1998 National Survey. Report.*
4. Bryman, A. (2008). *Social research methods*. Oxford University Press: Oxford
5. Crawley and Koballa (1994)
6. Eze, R. I., & Olusola E. (2013). *The teachers and the use of ICT for professional development*. International Conference on ICT for Africa: 2013.
7. Gomes, C. (2005). *Integration of ICT in science teaching: A study performed in Azores, Portugal*. Recent Research Developments in Learning Technologies

8. Jones, C. A. (2001). Teach support: Preparing teachers to use technology. *Principal Leadership, 1(9)*, 35-39.

9. Kim, C., Kim, M., Lee, C., Spector, J. & DeMeester, K. (2013). Teacher beliefs and technology integration: *Teaching and Teacher Education, 29 (3),* 76 – 85

10. Loveless, A. (2003). *The role of ICT*. Continuum Ltd: London.

11. Loveless, A. (2011). Making a difference? An evaluation of professional knowledge and pedagogy in art and ICT. *Journal of Art and Design Education, 22* (2), 145154.

12. Mishra, P. & Koehler, M. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record, 108*(6), 1017-1054

13. Myer, J. M., & Halpin, R. (2002). Teacher's attitude and use of multimedia technology in the classroom: Constructivist based professional development training for school districts. *Journal of Computing in Teacher Education, 18*(4), 133-140.

14. Newhouse, P. (2002). *Literature review: The impact of ICT on learning and teaching*. Perth, Western Australia: Department of Education.

15. Oliver, M. (2006). New pedagogies for e-learning? *ALT-J, 14*(2), 133 — 134

16. Prestridge, S. (2012). The beliefs behind the teacher that influences their ICT practices. *Computers & Education, 58 (75),* 449 – 458

17. Pelgrum, W. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers & Education, 37*(4), 163-178

18. Schiler, J. (2003). Working with ICT: Perceptions of Australian principals. *Journal of Educational Administration, 41 (*3), 171-185.

19. Schoepp, Y. (2005). Barriers to technology integration in a technology-rich environment: Learning and teaching in higher education. *Gulf Perspectives, 2* (1), 81-122.

20. Selwyn, N. (2010). Looking beyond learning: Notes towards the critical study of educational technology. *Journal of Computer Assisted Learning, 26* (2), 65–73

21. Talabi, J.K. (2015). *Educational Technology*. The institute of educational Development and Extension.University of Education,Winniba.

22. Tomei, L. A. (2005). *Taxonomy for the technology domain*. Information Science Publishing: USA. http://doi: 10.4018/978-1-59140-524-5.ch005