

Assessing Information and Communication Technology (ICT) Integration into the Curriculum of Ghanaian Pre-Tertiary Schools: A Case Study of Sagnerigu Municipality

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ABSTRACT

Drawing on the COVID-19 pandemic lockdown experience, higher education institutions in Ghana invested in and are deriving strategies to fully utilise the Online Teaching and Learning platform. However, these strategies will not be successful if ICT is not fully integrated into the school curriculum. In Ghana, efforts have been made by different governments through policies and other initiatives to ensure the full integration of Information and Communication Technology (ICT) into the school curriculum. This research focuses on the integration in pre-tertiary institutions within the Sagnerigu Municipality. Questionnaires administered via an online survey were used to collect data from randomly selected respondents who were students and teachers in pre-tertiary schools in Sagnerigu Municipality, Northern Region, Ghana. The research findings revealed that there are some barriers to effective ICT integration, including inadequate computers, inadequate network connectivity and lack of school level ICT policies. It was also revealed that apart from ICT being taught as a subject in the schools, not much is done to ensure the use of ICT in teaching other subjects. Massive infrastructural development and technical and professional training of teachers are recommended to improve the situation at the pre-tertiary schools in Ghana.

Keywords: *Information and Communication Technology (ICT); Integration; Curriculum; Pre-Tertiary Schools*

INTRODUCTION

Modern Technology such as ICT has influenced every aspect of our society (Hammond, 2014; Wang, Chen and Liang, 2011) but very little of the technology is used in teaching and learning at the pre-tertiary schools in Ghana (Buabeng-Andoh, 2015; Natia and Al-hassan, 2015; Quaicoe and Pata, 2018). The use of ICT has been identified as a fundamental strategy in the delivery of education in the 21st Century, most especially grounded in the experience of the COVID-19 pandemic, where higher education institutions and some selected pre-tertiary institutions in Ghana had to move to online teaching and learning as a way of maintaining normalcy in the academic calendar.

Ghana stands to benefit when teachers shift their pedagogical approach towards ICT-rich instructional models. This will better prepare students and make them highly proficient in the use of technology. It will also prepare teachers to use technology, most especially to gain experience from working with equipment and software, as well as use technology to organise and communicate knowledge.

In addition, the enormous benefits of ICT in education include improved provision of immediate feedback, reflection and rewards (Kozma and Anderson, 2002; Wishart and Blease, 1999), improved lesson delivery (Kozma, 2005; Kozma and Anderson, 2002), enhanced quality of student learning (Livingstone, 2012; Nicol and Coen, 2003), student motivation (Li, Yamaguchi and Takada, 2018; Nicol and Coen, 2003), improved access to learning resources and online expert tutorial support (Nicol & Coen, 2003), production of active and creative learners (Wang, 2009), increased staff satisfaction (Nicol & Coen, 2003), development of staff professional skills (Nicol & Coen, 2003;

Wang, 2009), improvements in organisational efficiency and innovation (Nicol & Coen, 2003; Wang, 2009), and enhanced public profile of the institution and its attendant wealth creation benefits (Nicol & Coen, 2003).

To achieve these benefits as outlined above, many countries have considered the integration of ICT into teaching and learning as a key driving factor. ICT can revolutionise education delivery (Gyamfi, 2017) in Ghana by transforming the teaching and learning methods which have the potential to improve the quality of education (Reynolds, Treharne, and Tripp, 2003) as enshrined in SDGs 4.

This research focuses on integration of ICT into the Ghanaian pre-tertiary schools' curriculum to transform the delivery of education. The integration of ICT into the school curriculum requires a paradigm shift from the use of equipment as an ICT based approach, to incorporation of an instructional approach that requires the use of ICT in the planning, implementation, and evaluation of instruction (Wang, 2009). Technology integrated into the curriculum will result in boosting the efficiency of student achievement and better learning outcomes.

The rapid shift of higher education institutions in Ghana during the COVID-19 lockdown to online teaching and learning excluded some of the students from the online teaching and learning experience as they were ill prepared for the shift. The integration of ICT into the curriculum will end these exclusionary issues as both teachers and students will be well prepared at the pre-tertiary level to cope with the ICT-rich school learning environment in the higher educational institutions. Full integration of ICT techniques into regular classroom practices will provide an opportunity for interactive learning among students and make learning interesting (Alkahtani, 2017). ICT has come to stay therefore an incorporation of ICT into pedagogical practices will help transform the educational system in Ghana. This research seeks to provide an impetus to support Ghana to fully embark on this progressive journey to the future.

For students in Ghana to be able to compete with their colleagues in other parts of the world, they must be prepared to use technology. The need for technology skills is an important factor in almost all workplaces. Technologically endowed students have better chances of securing jobs and attaining outstanding levels of performance in their workplaces (Savage and Brown, 2014). However, the daunting task of ensuring the full integration of ICT into classroom instruction remains the critical issue which requires high level governmental intervention (Pittman and Gaines, 2015). The current commitment and the steps taken by the Ghanaian government to integrate ICT into the curriculum in pre-tertiary schools require improvement, as there are some bottlenecks impeding the complete integration, including inadequate infrastructure, insufficient technological tools and technical know-how of teachers, inadequate teacher motivation to use ICT tools, perceptions of teachers on the use of ICT in the delivery of education, among others. For the pre-tertiary student to be well prepared for tertiary education, technology integration and usage is non-negotiable.

The main aim of this research is to assess the level of integration of ICT into the pre-tertiary curriculum in Ghana using Sagnerigu Municipality in Tamale as a case study. This Municipality has been selected because of its socio-economic characteristics. It has both rural and well-endowed urban schools in the Northern Region of Ghana with higher enrolments in schools. This therefore represents the Ghanaian typical school system. The study is also aimed at assessing the ICT infrastructure in schools in the study area, professional development of teachers for school-wide ICT usage, school-based policy strategies for the usage of ICT in teaching and learning and the barriers to the use of ICT in education delivery in Ghana. The research question that guided the study is thus presented.

RESEARCH QUESTION

What are the intricacies of ICT integration into Ghanaian Pre-tertiary schools' curriculum?

REVIEW OF RELEVANT LITERATURE

The Impact of ICT in Teaching and Learning

The utilisation of ICT in the school environment has become the new norm especially since the outbreak of COVID-19. ICT has made a great impact in education especially in the areas of record keeping, creation of online modules for teaching and learning, and the use of ICT tools to facilitate the teaching and learning of other subjects. Currently, some educational institutions do not require students to be physically present in the classroom. Remote learning is preferred, and the learning resources are available online for students. ICT is now an integral part of teaching and learning as it affords both students and teachers an opportunity to learn new things and to develop new ways of teaching and learning (Dei, 2018; Qaddumi, Bartram and Qashmar, 2021).

A study conducted in basic schools by Wikan and Molster, (2011) revealed that few teachers integrate ICT techniques into their classroom teaching and learning while most of the teachers utilise ICT lesson preparation and information searching. They concluded that ICT integration is infrequently utilised in the delivery of education.

The use of technology or computers have become essential tools that enable teachers to perform their professional assignments. Teachers use computers to prepare their lessons for teaching, to write lesson notes, analyse their students' grades and marks, and communicate with students and colleague teachers. This notwithstanding, many teachers do not use computers and do not encourage their students to use them in the teaching and learning activities. Among the early researchers, Dellit, (2002) is of the view that the use of ICT does not inevitably guarantee quality teaching and learning as it can also be used to promote immoral activities or inconsequential activities.

Effective utilisation of technology in education delivery was found to support the preparation of students to be active and effective citizens in increasingly democratic societies (John and Sutherland, 2004). This made ICT a powerful tool in teaching and learning in the schools. In this new era of ICT where its integration is encouraged, teachers with the pedagogical expertise who are willing and ready to guide their students to construct meaningful knowledge, will make an impact in the teaching and learning process if they effectively integrate technology. The possession of ICT knowledge and skills will support school management and influence the use of ICT in the classroom (Mirzajani *et al.*, 2016; Li *et al.*, 2019; Nath, 2019).

According to Condie and Munro, (2007) the effective integration of ICT skills into teaching and learning positively impacted the learning process. Students were found to benefit from the use of ICT in many ways. Wishart and Blease (1999) indicated that the use of ICT enabled students to get immediate feedback and rewards, while Kozma (2005) stated that ICT usage could improve access to education as well as improve lesson delivery, and Kozma and Anderson (2002) concluded that education was being transformed by ICT through the introduction of new curricular based on real-life problems, providing opportunities for feedback and reflection and providing diverse tools to improve learning.

Trajectories of ICT policy and Education in Ghana

The integration of ICT techniques into the Ghanaian pre-tertiary schools' curriculum is a requirement driven by policies such as the Ghana ICT for Accelerated Development Policy (ICT4AD) among others. ICT has what it takes to influence every facet of the school activities. Therefore, to promote creativity, professional development, information management and better methods of teaching and learning, schools must promote the effective usage of ICT.

The usage of ICT for teaching and learning is gaining global acceptance but in Ghana, the efforts made to promote the usage of ICT in education began to receive government attention only

recently. The Ghanaian government, in an effort to integrate ICT in teaching and learning and other sectors of the economy, developed several ICT policies to guide the process.

The first national policy on ICT in Ghana is the Ghana ICT for Accelerated Development Policy (ICT4AD) which was developed in June 2003. The 14 pillars of the ICT4AD include the promotion of ICT in Education National Pre-tertiary Education Curriculum Framework (n.d.). The main objective of this policy is the promotion of an improved educational system driven by the deployment and utilisation of ICT, to ensure the delivery of educational services at pre-tertiary and tertiary institutions to enhance access (National Pre-Tertiary Education Curriculum Framework, 2018). The strategies to be implemented to achieve the objectives include the introduction of computers into all the pre-tertiary institutions and promoting Internet access to all educational institutions in Ghana (schools, colleges, and universities).

The second national policy on ICT was the ICT in Education Policy developed in November 2008. The overall goal of this policy is to provide a platform for graduates from Ghanaian institutions to self-confidently utilise ICT skills to construct meaning, knowledge, and initiate innovative technological inventions (Ministry of Education ICT in Education Policy, 2008). The strategies employed to achieve this included equipping and re-tooling teacher training colleges to train creative and innovative teachers, ensuring basic training in ICT skills for Ghanaian teachers, providing a platform for ICT integration into the teaching and learning process at all levels of the educational system, and the introduction of ICT as a teaching subject (Ministry of Education ICT in Education Policy, 2008).

The ICT in Education Policy (2015) was the next to be developed by the government. This policy is hinged on three pillars, namely ICT as a learning and operating tool, integration of ICT into teaching and learning, as well as ICT as a career opportunity for students. The introduction of ICT at all levels of the Ghanaian education curriculum is seen as an important means of sustaining the integration of ICT and stimulating the interest of students (Ghana ICT in Education Policy, August 2015)

As a way of implementing these policies, government has made several efforts, including making the study of ICT compulsory at all levels of education, distribution of laptops to teachers, distribution of computers and Uninterruptible Power Supplies to 926 basic, Senior High and a few tertiary institutions as well as the training of basic school teachers on the use of technology. There has also been an installation of wireless Internet facilities in about 700 Senior High Schools and selected Colleges of Education and Nursing Training Colleges across the country. This notwithstanding, there are challenges hindering the effective integration of ICT.

Challenges to Effective ICT Integration

ICT integration into teaching and learning is the use of technology to guide students to construct their own knowledge. The use of ICT in education goes beyond teaching learners how to use computers. In this direction, ICT usage in most Ghanaian pre-tertiary schools is still limited to computer literacy. There are several challenges that work against the effective integration of ICT into education in Ghana. Some of them include inadequate computer skills among teachers, inadequate number of available computers, and lack of maintenance and technical assistance (Gasior, 2013). Other barriers to ICT integration include fear of change, inadequate time, lack of accessibility, lack of confidence on the part of some teachers, lack of appreciation of the benefits of ICT, and inadequate resources (Alkahtani, 2017; Mafuraga and Moremi, 2017).

In addition, Balanskat, Blamire and Kefala (2006) categorised the barriers to ICT integration into three main types: system, school, and teacher level barriers. System level challenges are those that are related to the wider educational framework, the school level barriers are closely connected to the institution such as poor infrastructure and limited access to ICT tools. Teacher level barriers

are related to teachers' attitude such as lack of motivation, inadequate skills, and unwillingness to adapt to change.

METHODOLOGY

The study was limited to pre-tertiary schools within the Sagnerigu Municipality. The Sagnerigu Municipality has a total of 5 Senior High Schools (SHS) and 82 Junior High Schools (JHS) which constitute the pre-tertiary institutions within the context of the study area. The SHS operates the double track system, Gold, and Green - students are allocated to either a green or gold track for each form and alternate the attendance at classes by track. Out of the 82 Junior High Schools in the municipality, 47 were randomly selected while one out of the two tracks in Senior High Schools was also selected for the study. The number of students in the 5 Senior High schools at the time of this research stood at 12,585 (with 6,290 students constituting the track under study) while the 47 selected Junior High Schools had 9,590 students. The total number of teachers at the Senior High Schools was 535 (with 272 constituting the number of teachers in the track under study) while that of the selected Junior High Schools was 664.

The population for the study was 15,880 students and 936 teachers. Given that the Senior High Schools run a double-track system, the track that was in school at the time of this research was the group considered. Data were collected using hard copy questionnaires and an online survey. The online survey was designed for the teachers since they had devices that they could use to access the Internet, while the hardcopy questionnaire was administered to the students. In all, 478 respondents were randomly selected for the study, comprising 114 teachers and 364 students. The 114 teachers represented 82 JHS teachers and 32 SHS teachers, while the 364 student-respondents were made up of 214 JHS students and 150 SHS students. The data collected which was purely quantitative were analysed using Statistical Package for Social Sciences (SPSS). The results were presented in tables, frequencies, percentages, and charts for ease of understanding.

RESULTS

Background/Characteristics of Respondents

The findings in Table 1 below shows that there are more male teachers (82.5%) than female teachers (17.5%) in Junior and Senior High schools in the selected study area. The results in Table 2 also show a higher percentage of male students (60.2%) to female students (39.8%). These findings suggest that there is gender disparity among both students and teachers in the pre-tertiary institutions in the study area. The gender disparity in teachers may be because of the tendency for more males to enrol in teacher training institutions as compared to their female counterparts. The gender disparity in students may be because of factors such as poverty, child labour and teenage pregnancy that compel females to drop out of school.

Table 1: Gender -Teachers

Gender	Frequency	Percentage (%)
Female	20	17.5
Male	94	82.5
Total	114	100

Table 2: Gender-Students

Gender	Frequency	Percentage (%)
Female	145	39.8
Male	219	60.2
Total	364	100

ICT Tools Available to Students Outside of the School

Figure 1 shows the ICT tools that are available to students outside school. Apart from digital readers (19.5%) and digital cameras (23.9%), most of the students have access to mobile phones (83.4%), video players (42.4%), desktop and laptop computers at home. This shows that there is more access to ICT tools by students at home as compared to when they are in school. It should be noted that the use of most of these devices, especially mobile phones is not allowed in Ghanaian pre-tertiary schools.

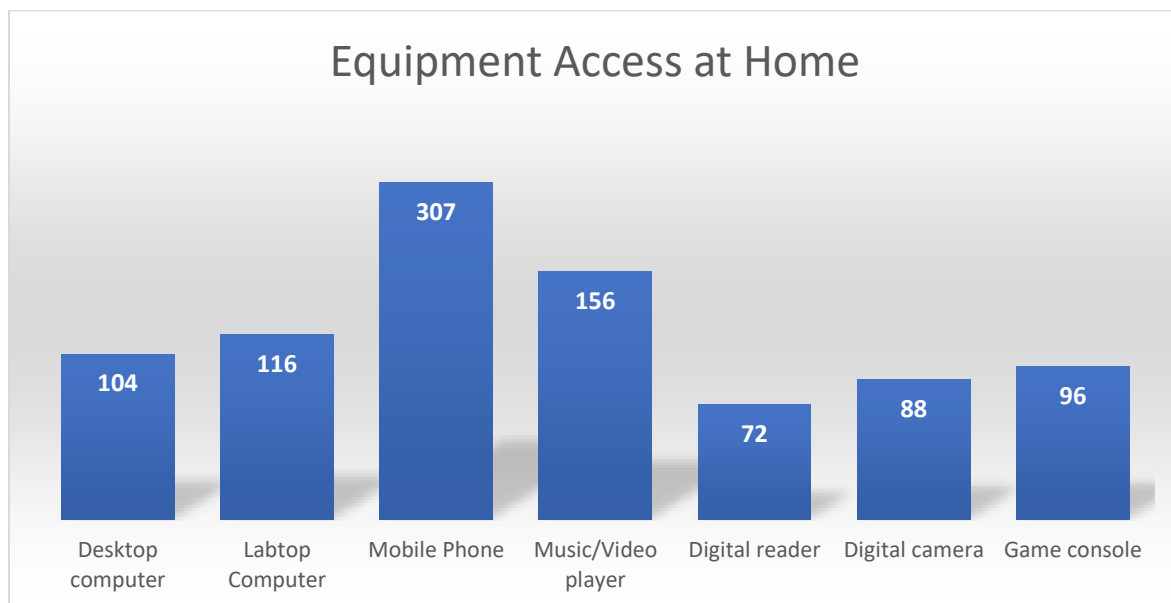


Figure 1: ICT tools available to students at home

ICT Infrastructure in Schools

The data in Table 3 indicate that there is an improvement in the provision of ICT infrastructure in Ghanaian schools except in the provision of mobile phones by schools. Predominant among the infrastructure are desktop and laptop computers. Even though very few of the Junior High Schools have computer laboratories, all five Senior High Schools have computer laboratories equipped with desktop and laptop computers and projectors. There is also an improved access to Internet connectivity in the Senior High Schools because of the government's initiative to provide about 700 Senior High Schools and Colleges of Education with Wireless Internet connectivity. The results also show that the few printers (5.3%) found in some of the schools are only used for administrative purposes, except during examination periods. Usage at 18.4% for smart TVs are mostly coming from the Junior High Schools and the study revealed that those schools have partnership agreements with Discovery Learning Alliance, an NGO that provides the TVs for the purposes of distance learning.

Table 3: ICT infrastructure

Digital device	Frequency	Percentage (%)
Desktop computer	72	63.2
Laptop computer	47	41.3
Mobile phone provided by school	0	0
Projector	36	31.6
Smart TV	21	18.4
Printer	6	5.3
Interactive whiteboard	18	15.8
Internet connectivity	58	50.9

Professional Development for Teachers Using ICT

The data in Table 4 clearly shows that serious efforts are needed to improve the provision of professional development of pre-tertiary teachers regarding ICT. Most of the teachers (82.5%) have never had any ICT professional development training whatsoever. This will defeat the government's efforts of trying to make ICT an integral part of the newly developed curriculum for the basic schools.

Table 4: Professional development for teachers using ICT

Digital device	Frequency	Percentage (%)
Introductory courses in ICT	12	10.5
Advanced courses in ICT	5	4.4
Equipment-specific training	7	6.1
Pedagogical ICT Courses	20	17.5
Subject specific training on learning applications	16	14.0
Course on multimedia	14	12.3
None	94	82.5

School Policy on the Usage of ICT in Education delivery

The data in Figure 2 illustrates the need for school level ICT policies in Ghanaian pre-tertiary schools. In the area of ICT policy, 86.0% of the institutions do not have any ICT policies in their schools while just 7.9% have written statements about the use of ICT in their schools. Even though there are several national policies on ICT, pre-tertiary schools are not making the effort to develop their own policies, unlike the universities and colleges. In this direction, the full integration of ICT into the curriculum requires frantic efforts to develop policies that will guide the use of ICT tools and ensure its proper integration.

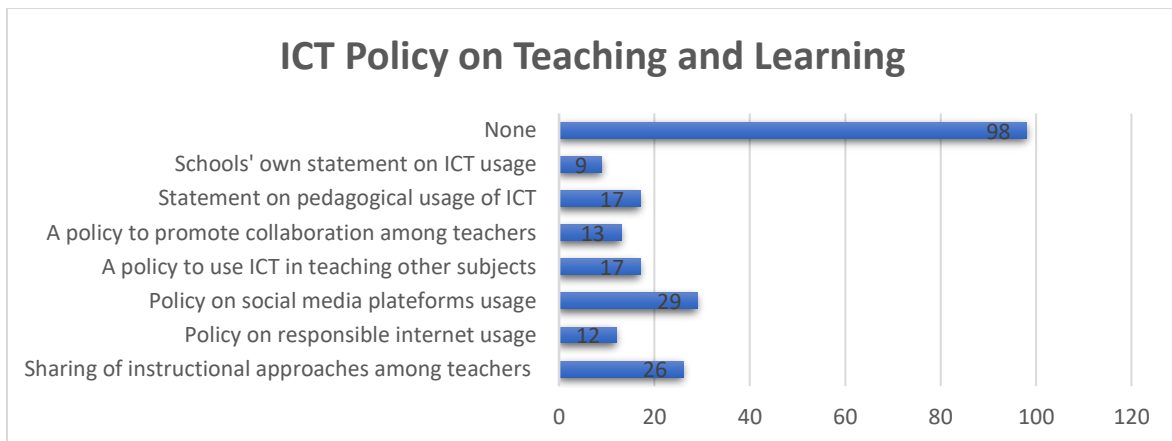


Figure 2: ICT policy of teaching and learning

ICT Integration into the Curriculum

The data in Figure 3 illustrates the level of integration of ICT into the Ghanaian school curriculum. ICT is a teaching subject in Junior and Senior High Schools. This is the reason why all respondents (114) indicated that ICT is taught as a separate subject in their schools. However, apart from teaching ICT as a separate subject, not much is done in trying to integrate it in the teaching of other subjects such as Mathematics or Social Studies. The new curriculum for Colleges of Education and schools places more emphasis on the use of ICT in the teaching and learning of other subjects and much needs to be done for this objective to be achieved. Only 39.5% of the respondents were aware that it is a curriculum requirement to ensure the integration of ICT in Ghanaian Schools.

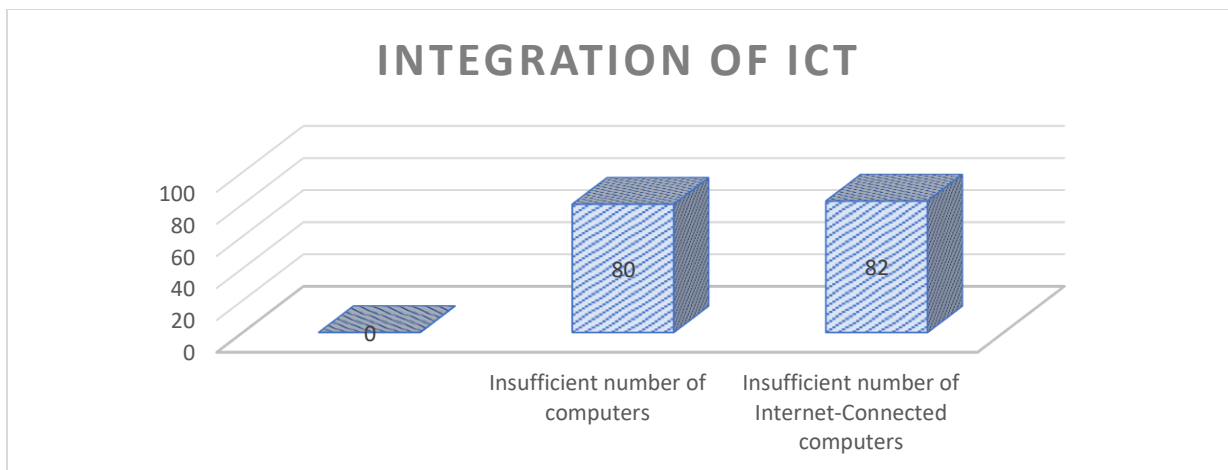


Figure 3: Integrating ICT into the curriculum

Barriers to Effective ICT Integration

The research revealed inadequate numbers of computers, Internet-enabled computers, Internet bandwidth and laptops as the major barriers to effective ICT integration into the curriculum.

Between 2017 and 2020, the government of Ghana supplied computers and Uninterrupted Power Supplies (UPS) to 926 schools across the country. This includes basic schools, Senior High Schools, and a few tertiary institutions. Several schools within the Sagnerigu municipality where this study was undertaken, benefited from the initiative. The results as illustrated in Figure 4 shows that much needs to be done.

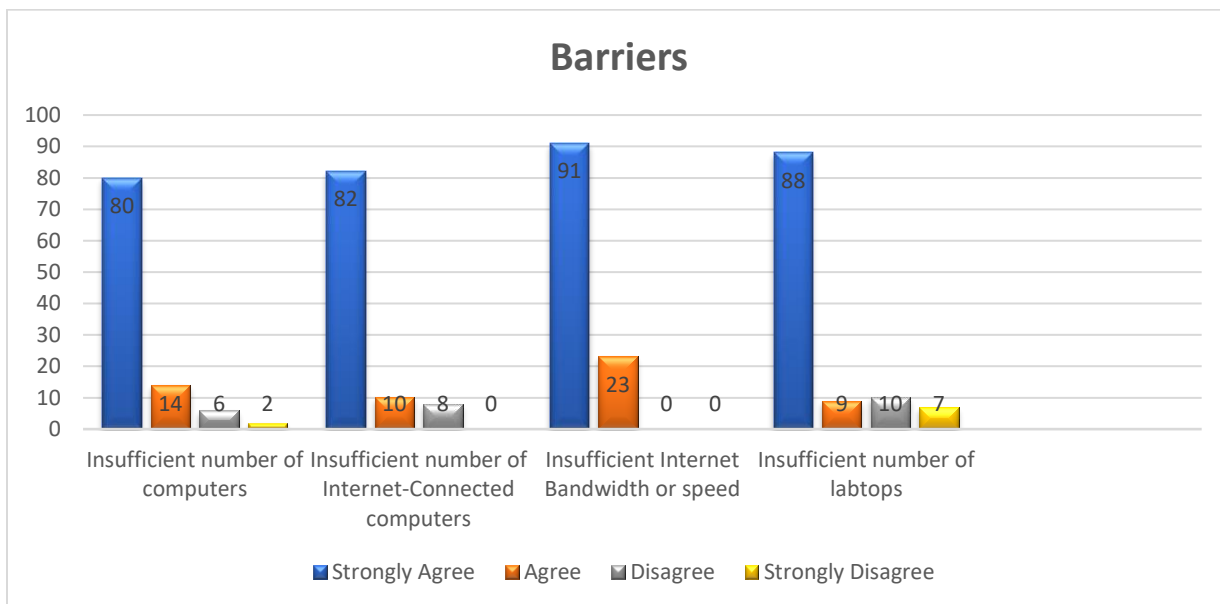


Figure 4: Barriers to effective ICT integration

CONCLUSION

Government should embark on aggressive infrastructure development, designing of relevant programmes to improve teacher use of ICT tools and digital content. This should include frantic efforts to ensure that teachers receive an appreciable amount of ICT professional training. Even though there are several national level policies on the integration of ICT into teaching and learning in Ghanaian basic and senior high school institutions, the study revealed that nothing is being done at the school level to implement those policies.

Efforts must therefore be made to ensure that ICT policies are developed and implemented so that the objective of universal integration of ICT into the curriculum in Ghanaian pre-tertiary schools can be achieved. Government through the Ghana Education Service may also have to consider allowing and regulating the use of digital devices such as smartphones in the classroom.

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