Challenges facing information and communication technology implementation at the primary schools

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The importance of information and communication technology (ICT) in education in the 21st century cannot be overemphasized. A number of initiatives have been put in place in Ghana to ensure that information and communication technology is extensively used and taught at all levels of our education. The study utilized a descriptive survey design and employed cluster and simple random sampling technique to collect data from 525 pupils in 34 schools in the Cape Coast Metropolis, Ghana. The cluster was made up of six communities in the Metropolis, namely, Aboom, Bakaano, Cape Coast, Efutu, Ola, and Pedu/Abura. The sample was chosen on the basis of Cohen et al. recommendation for choosing representative samples. These two sampling techniques helped to arrive at a sample that was fairly representative of the population. The study addressed four research questions: (1) How available are the ICT facilities to pupils and teachers in Cape Coast Metropolis primary schools? (2) How does the use of ICT equipment affect the implementation of ICT programmes in primary schools in the Cape Coast Metropolis? (3) How does the attitude of primary school pupils affect the implementation of ICT in Cape Coast Metropolis? and (4) How does the attitude of teachers teaching ICT in the primary schools affect the implementation of ICT in the Cape Coast Metropolis? The analyses of responses from questionnaires revealed the unavailability of ICT equipment and pupils’ lack of access to ICT infrastructure. The study recommends that Ghana Education Service (GES) should institute technology and technical support units in the various schools to handle technology integration challenges.

Key words: Information and communication technology (ICT) challenges, access to ICT, implementation, primary school.

INTRODUCTION

In the last two decades information and communication technologies (ICT) has changed and transformed the way things are done. ICT has become one of the basic building blocks of the current information-driven society. Digital skills and computer literacy are now regarded basic requirements for employment and part of the core

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of education, alongside reading, writing and numeracy in many countries.

Understanding about the critical role ICTs play in our every life continues to increase and this is not only found in business, industries or economics but in teaching and learning (Barak and Rafaeli, 2004; Dori et al., 2003). Education as the bedrock for acquisition of knowledge have embraced emerging technologies in a bid to increase knowledge. Digital and advanced technologies are now part of the teaching and learning process in classrooms. These technologies, according to Barak et al. (2006) have the capability of becoming a significant component of today's education, as well as to change the manner class interactions and information flows.

In spite of the increasing advancement in ICT facilities in western and Asian countries, African countries remain stagnated in ICT implementation, and that continues to further widen the digital and knowledge divides. According to Kiptalam and Rodrigues (2010), the major challenge confronting most African countries has been the lack of access to ICT facilities, with a ratio of one computer to 150 pupils compared to the ratio of 1:15 pupils in the developed countries. The Ghanaian educational system appears to lag behind despite the positive results indicating that ICT has penetrated many sectors including banking, transportation, communications, and medical services. Additionally, the National Council for Science and Technology (2010) recently reported that computer use in Ghanaian classrooms is still in its infancy, and concluded that the perceptions and experiences of teachers and administrators do play a critical role in the use of computers in Ghanaian classrooms.

It is generally acknowledged that for Ghana to make any appreciable progress in its socio-economic development efforts, substantial resources will need to be directed at improving educational delivery. The key role that Information and Communication Technologies (ICTs) can play in widening access to education to a wider section of the population and literacy education for facilitating educational delivery and training at all levels has been recognized as a key priority area under the current Education Reforms of 2007.

In Ghana, various governments continue to place a strong emphasis on the role of ICT in transforming the country’s economy. These are captured in the country’s medium-term development plans including the Ghana Poverty Reduction Strategy Paper (GPRS I&II) and the Education Strategic Plan 2003-2015 that recognise the use of ICT as a vehicle for reaching out to the poor in Ghana (Government of Ghana, 2003). The Ghanaian Parliament, in 2004, legislated the Ghana’s ICT for Accelerated Development (ICT4AD) policy into law, and is now at various implementation stages. The Ministry of Education, in 2007, produced an ICT in education policy for Ghana to integrate ICTs in schools. An effort at developing a policy for the education sector precedes the national ICT policy. “The objectives of the policy were to:

1. Ensure that pupils have ICT literacy skills before coming out at each level of education
2. Provide guidelines for integrating ICT tools at all levels of education
3. Provide means of standardizing ICT resources for all schools
4. Facilitate training of teachers and pupils in ICT
5. Determine the type and level of ICT needed by schools for teaching and administrative purposes.
6. Promote ICT as a learning tool in the school curriculum at all levels” (Government of Ghana, 2005).

It not enough to ask whether technology can improve education because it is similar to asking whether experiments can improve science education. As Noss (2003) declares, it all hinges on what kind of technology is introduced, how it is used, its design and how teachers are supported to use it. For this reason, Ghana has put in place an ICT policy that aims to improve the livelihood of Ghanaian by ensuring the availability of accessible, efficient, reliable and affordable ICT services. The sections the national policy addresses include Broadcasting, Telecommunications and Postal Services and Information Technology. However, it is the section on information technology that spells out the aims and strategies regarding ICT and education.

In spite of the initiatives, it appears there are some challenges. This is supported by research findings on barriers to ICT application in other levels of education. Some of the findings of these studies are enumerated subsequently. For instance, lack of teacher’s confidence and teacher’s computer anxiety has been the foremost challenge (PECTA, 2004). This is followed by the lack of teacher’s competency as a result of lack of time for training, lack of pedagogical training, lack of skills training, and lack of ICTs focus in initial teacher training (PECTA, 2004; Yusuf, 2005). Lack of access to resources in terms of lack of hardware, poor organization of resources, poor quality hardware, inappropriate software, and lack of personal access for teachers are placed third. Fourth, is lack of time to use ICTs due to school time table (PECTA, 2004). The fifth relates to technical problems which comprise lack of technical support, lack of telecommunication, fear of things going wrong and other infrastructure, and erratic of electricity supply (PECTA, 2004). Others include lack of clear vision, lack of or ineffective technological leadership in schools, lack of incentives for teachers, lack of teachers’ involvement in planning for ICT integration (Spodark, 2003).

Purpose of the study

The purpose of the study was to investigate the
challenges facing ICT implementation, the primary schools in the Cape Coast Metropolis. In this regard, the study addressed the following research questions:

1. How available are the ICT facilities to pupils and teachers in Cape Coast Metropolis primary schools?
2. How does the use of ICT equipment affect the implementation of ICT programmes in primary schools in the Cape Coast Metropolis?
3. How does the attitude of primary school pupils affect the implementation of ICT in Cape Coast Metropolis?
4. How does the attitude of teachers teaching ICT in the primary schools affect the implementation of ICT in the Cape Coast Metropolis?

LITERATURE REVIEW

Importance of ICTs to everyday life

Literature reviewed show that information and communication technologies (ICT) have become indispensable tools in today’s information age, making a dramatic impact on the lives of people globally. This effect is most significant in education. Computer has become a motivating tool for teaching and learning in schools (Mossom, 1986; World Bank, 1999). Internet allows cost-effective information delivery services, collaborative and distance education, more than has ever been imagined (Clyde, 1995; Mbeki, 1996; Todd, 1997).

ICT can help provide equal opportunities for the neglected groups and communities. However, the irony of the matter is that for those marginalised groups that are behind the digital divide, ICT is yet another means to further widen the gap. Education is therefore expected to play a major role in solving this problem. Thus, unless ICT becomes part of both the delivery and content of education, the disadvantage will intensify and progress will suffer.

In today’s information age, ICTs and emerging technologies have become vital tools, having a significant impact on people’s lives globally. This effect is not only mostly felt in business, industry, and economics but also significantly impacting on education. The computer has become a motivating tool for teaching and learning in schools (Mossom, 1986; World Bank, 1999). For instance, the Internet permits cost-effective information delivery services, collaborative and distance education, individualized learning and more than has ever been imagined (Clyde, 1995; Mbeki, 1996; Todd, 1997).

Pupils' and teachers' access to ICT facilities

Availability of ICT infrastructure is another vital variable of ICT integration in schools. Ottesen (2006), in his doctoral dissertation revealed that lack of computer infrastructure is one major problem facing ICT integration in schools today. Relatedly, Norris et al. (2003) revealed that appropriate access to technology infrastructure is another key factor in the effective technology integration process. The study revealed substantive correlation between technology access and use. In another study, Yildirim (2007) revealed that teachers agreed that access to ICT infrastructure is one of the effective means to integrate ICT in classrooms.

Teachers’ pedagogical skills in teaching ICT in primary school

Most research on teachers’ use of information and communication technology (ICT) in their teaching describes low levels of usage and minimal pedagogical change and Mishra and Koehler (2006) suggest that it is of a necessity that teachers develop all-encompassing knowledge of teaching, content, and technology, called Technology Pedagogy and Content Knowledge (TPACK). In the 21st century, TPACK is becoming a required area of expertise for teachers in new technology-led learning environments. Schmidt et al. (2009) state that TPACK is a theoretical framework for describing the interaction and integration of technology, pedagogy, and content knowledge needed to successfully integrate technology use into teaching. As far back as, Shulman (1986), first asserted that teachers needed content knowledge (CK), pedagogy knowledge (PK), and pedagogical content knowledge (PCK). His work was extended by Mishra and Koehler’s (2006) work who added technological knowledge (TK) and came up with the term TPACK. In addition, Mishra and Koehler (2006) stated that the TPACK framework consists of seven domains: CK, PK, TK, PCK, technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPCK). Other researchers argue that TPACK emphasizes the dynamic interaction and integration of knowledge with the use of technology for teachers based on the three main knowledge categories (that is, content, pedagogy, and technology) (Schmidt et al., 2009; Thompson and Mishra, 2007). TPACK, therefore, describes the use of technology as an instructional technique and the use of technology to support particular pedagogies within a specific content coverage. In a nutshell, TPACK describes how technology is used to help teachers improve student learning (Schmidt et al., 2009; Thompson and Mishra, 2007).

As an instructional technique, it is also critical to know teachers’ specific ICT skills and how these skills translate to classroom teaching and learning. ICT skills are the core skills needed to use generic ICT tools (e.g. Word, Excel, Outlook, PowerPoint) to function in the information society and in working life. According to Owston (2006), in the past 15 years, research work has indicated the
significant influence of teacher competence and ICT skills on student achievement. Teachers are therefore required to have the necessary knowledge and competence to incorporate ICT in their everyday teaching and learning. This will maximize their ability to help improve student's digital competence. The relationship between teacher's digital competence and their utilisation of ICT in the classroom is well established in literature. In as much as training teachers how to use specific ICT equipment, the internet and general utilisation are important, it is also worth knowing that without feeling competent in how to integrate ICT into teaching appropriately, both from the pedagogical perspective as well as the specific viewpoint of the subject being taught, teachers are less likely to use ICT in the classroom for teaching and learning. There is therefore the need for more professional development opportunities on the pedagogical use of ICT and particularly subject-specific training on learning applications, by fewer teachers. Consequently, participation in professional development activities can significantly influence teachers' ICT use (Fredriksson et al., 2008; Valiente, 2010).

In the light of the aforementioned issues, it is worth knowing that teachers do not merely use technology for its use sake but their acceptance of technology in teaching is based on a critical analysis of the benefits technology allure to teaching and learning. In order to encourage teachers to use new technology in practice, it is necessary to provide them a suitable infrastructure/system, to enable them to use technology easily without any problem. This can be done by providing technology that meets subjects' content and learners' characteristics.

**Pupils' readiness to learn ICT**

Pupils in our schools today are all excited about using technology and ICT tools in learning and exploring their world. This excitement and other behaviour change exhibited by pupils in technology enabled lessons in classroom go a long way to influence their readiness to integrated ICT in their learning process or otherwise. According to previous studies (Dabholkar, 1994; Mick and Fournier, 1998; Parasuraman, 2000; Parasuraman and Colby, 2001), a mixture of positive and negative beliefs about technology is responsible for the domain of technology readiness. For instance, both Dabholkar (1994) and Mick and Fournier (1998) asserted that information technology/information system (IT/IS)' consumers with more positive beliefs are more receptive and ready to use the various new technologies. In addition, Dabholkar (1994) found that individuals simultaneously harbour positive (favorable) and negative (unfavorable) beliefs about technology. The positive beliefs propel individuals towards new technologies, while negative beliefs may hold them back. Parasuraman and Colby (2001) defined technology readiness as people's predisposition to accept and use new technologies at home and at the workplace. This suggests that pupils should develop more positive ICT integration to indicate their readiness to use and explore the benefits technology stands to provide their learning process in classroom. Hence, curriculum developers, designers and institutional providers must carefully consider the needs and value of learners, and to ensure that ICT and emerging technologies effectively fit the needs and demands of today's learners in classroom. In this regard, to encourage pupils to continue with ICT lessons, the teachers of subject matter need to ensure that ICT lessons are very flexible, easy to use and useful to improve students' academic performance. Specifically, the 'skeptics' and 'paranoids' must be convinced of the importance of using technology-driven classroom environment.

In classroom learning environment, implementation of ICT in schools cannot be successful without active involvement of the students. Technology acceptance greatly depends on personal attitude of students, as personal attitudes are major factors that affect individual ICT usage. Hence, to develop an appropriate technology-enabled environment, it is necessary to understand students' attitude towards ICT usage (Sánchez-Franco et al., 2009). In that regard, the technology acceptance model (TAM) is used as based model to explore the students' readiness towards learning of ICT. In the Information Systems Research, Technology Acceptance Model (TAM) has been extensively used to collect user reactions to information systems. The TAM model basically examines users' views of Usage, Usefulness, and Ease of Use. As some researchers opine, TAM is one of the most extensively used models to investigate adoption of a new technology or the intentions to adopt a new technology as it is seen as a powerful theory by the IS community (Lucas and Spitler, 1999; Venkatesh and Davis, 2000). However, the main weakness of TAM pointed out by researchers is its inability to explain the external variables affecting users' perceived usefulness and perceived ease of use (Legris et al., 2003). Although different researchers have studied student readiness with respect to learning ICT (Cheon et al., 2012; Hussin et al., 2012; Mahat et al., 2012), but the concept of student readiness towards technology is still evolving. Review of literature on ICT in education indicates an absence of a concise and well-established survey instruments to assess student readiness towards learning ICT (Khaddage and Knezek, 2013). Pupils' readiness to learn ICT in school has the power to power to reduce the digital gap. Learning ICT encourages independent and collaborative learning, improves self-confidence and self-respect of the learner, enhances numerical skills, "promotes education in informal settings, and engages learners for longer periods" (Attewell, 2005).
METHODOLOGY

Research design

The current study utilized the descriptive survey design. While a survey research is appropriate when a researcher attempts to study some aspect of a population by using unbiased sample of a population who are asked to complete a set of instruments to solicit for vital information to be used in the research work, descriptive study is primarily concerned with finding out “what is” and provide a clear picture of existing phenomena. This design allowed the research to collect large amount of data in a short time to address the research questions.

Participants

The current study was carried out in the Cape Coast Metropolis, of the Central Region of Ghana. The participants comprised 525 students selected from 34 schools, with a population of 15964. This was done through cluster and simple random sampling techniques. The cluster was made up of six communities in the Metropolis, namely, Aboom, Bakaano, Cape Coast, Efutu, Ola, and Pedu/Abura. The sample as chosen on the basis of Cohen et al. (2007)’s recommendation for choosing representative samples, these two sampling techniques helped to arrive at a sample that was fairly representative of the population. In addition, 34 teachers were also selected randomly from the six communities in the Metropolis.

Procedure

Two questionnaires were used for this study; one for pupils and the other questionnaire for teachers. These questionnaires were adapted from the work of Adebi-Caeser (2012). Each instrument had four main sections: A to D. While section A elicited data on respondents’ demographic information, sections B, C and D gathered data on availability of ICT facilities, pupils’ readiness to learn ICT, knowledge of competencies of ICT teachers, and the pedagogical skills of ICT teachers in the municipality, respectively. Most of the questions were five-point Likert scale items with responses ranging from strongly agree to strongly disagree.

The instruments were pilot-tested to determine their reliability vis-à-vis the suitability for this study. Using the internal consistency method, the instrument for teachers yielded a Cronbach alpha of 0.79 while the instrument for the pupils yielded 0.85 of Cronbach alpha which were considered satisfactory. The data collection process took place at one time.

RESULTS

The data collected through the questionnaires were analysed using descriptive statistics. The analysis was carried out in accordance with the research questions. The results were presented in the following.

Research Question 1: How available are the ICT facilities to pupils and teachers in Cape Coast Metropolis primary schools?

The data that addressed the research question 1 are shown in Table 1.

Data in Table 1 shows that out of the 525 respondents, majority disagreed (n=311, 59.2%) that each pupil has access to computers at school while a few (n=173, 33.0%) indicated that they had computers to practice with during ICT lessons. Again, a few agreed that they had computers laboratories for practical ICT lessons while majority disagreed they had computer laboratories. It also shows from the Table 1 that majority disagreed to the availability of ICT equipment such as scanners, digital cameras, microphones, etc. Equipment like printers and projectors were available in just a handful of schools.

Research Question 2: How does the use of ICT equipment affect the implementation of ICT programmes in primary schools in the Cape Coast Metropolis?

The second research question sought to find out the effect of the use of ICT equipment on the implementation of ICT programmes in primary schools in Cape Coast Metropolis. The data is shown in Table 2.

Results in Table 2 indicate that majority (n=273, 52.0%) of the respondents disagreed that they are given regular access to computers while the rest disagreed. Also, majority of the respondents disagreed that ICT equipment are used for only ICT lessons, pupils benefit from ICT training and the fact that pupils make use of email facility. However, majority (n=272, 52.0%) agreed that pupils are able to access information on the internet when they are given assignments, and that pupils use computers for other purposes (Games, Social Networks) other than ICT lessons. It can be concluded that although pupils benefit from ICT equipment, they are not used to support ICT lessons.

Research Question 3: How does the attitude of primary school pupils affect the implementation of ICT in Cape Coast Metropolis?

The third research question aimed to find out how the attitude of primary school pupils affects the implementation of ICT in Cape Coast Metropolis. The results are as shown in Table 3.

Results in Table 3 show that majority (n=410, 78.4%) agreed that they like ICT lesson and visit Internet Cafes to use their services after school hours (n=254, 48.5%). Also, a majority (n=331, 63.7%) indicated that additional time should be added to ICT period on the timetable and that they find ICT lessons interesting and insightful (n=405, 77.9%). However, more than half of the respondent (n=298, 57.2%) disagreed that they had personal computers at home. From this analysis, it can be concluded that primary school pupils in Cape Coast had...
positive attitude toward ICT and is affecting ICT implementation positively in Cape Coast Metropolis.

**Research Question 4: How does the attitude of teachers teaching ICT in the primary schools affect the implementation of ICT in the cape Coast Metropolis?**

The forth aim of the study was to investigate how the attitude of ICT teachers in the primary schools affects the implementation of ICT in the Cape Coast Metropolis. The data is shown in Table 4.

Results in Table 4 show that the teachers responded in affirmative to all the questions. For instance, all the 31 (91.2%) out of 34 teachers agreed to the statement that they like teaching ICT lessons and 29 (85.3%) out 34 also agreed that they will opt for advance training in ICT to improve subject competence. This suggests that the primary school ICT teachers in the Cape Coast Metropolis hold positive attitude that affect ICT implementation positively.

**DISCUSSION**

The importance of information and communication technology (ICT) in the 21st century cannot be
Table 3. Primary school pupils’ attitude that affect the implementation of ICT in Cape Coast Metropolis?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Students responses/frequency</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like ICT lessons</td>
<td>36</td>
<td>50</td>
</tr>
<tr>
<td>I visit Internet Café to use their service after school hours</td>
<td>144</td>
<td>86</td>
</tr>
<tr>
<td>Additional time should be added to ICT time table period</td>
<td>70</td>
<td>58</td>
</tr>
<tr>
<td>I would like other teachers to use computers to teach their subjects</td>
<td>137</td>
<td>82</td>
</tr>
<tr>
<td>I have a personal computer at home</td>
<td>208</td>
<td>89</td>
</tr>
<tr>
<td>I have my personal ICT textbook apart from school textbook</td>
<td>156</td>
<td>90</td>
</tr>
<tr>
<td>I find ICT lessons boring</td>
<td>185</td>
<td>88</td>
</tr>
<tr>
<td>I find ICT lessons interesting and insightful</td>
<td>47</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 4. Attitude of ICT teachers in the primary school that ICT implementation in the Cape Coast Metropolis.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Teachers responses/frequency</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like teaching ICT lessons</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>I use Applications such as Word Processing, Spreadsheet, etc., in teaching</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>I use Visual aids to reinforce pupils understanding of ICT lessons</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>I help other teachers to use computer in teaching their subject</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>I will opt for advance training in ICT to improve subject competence</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

overemphasized. The use of ICT in education continues to redefine teaching and learning processes. However, the implementation of these tools is faced with challenges that sometimes hinder their significance. The aim of this study was to assess the challenges facing the implementation of ICT programmes in the Cape Coast Metropolis. The results revealed that a majority of pupil had no access to computers individually at school while a few indicated that they had computers to practice with during ICT lessons. Again, it was found that basic schools in the Metropolis lack computer laboratories for practical ICT lessons. This suggests that ICT lessons have not been as effective as expected. These findings concur with Ottesen (2006) who revealed that one fundamental problem facing ICT integration in schools is the lack of computer infrastructure. In a related study, Norris et al. (2003) revealed that appropriate access to technology infrastructure is another key factor in the effective technology integration process.

The rippling effect of the unavailability of computers and other ICT resources in the Basic Schools in the Cape Coast Metropolis was evident in this study. The study revealed that pupils in the Metropolis lack regular access to ICT equipment which hinders effective use of computers. Pupils indicated that they do not have access to the internet when needed for assignments thereby having a negative effect on ICT programme implementation. Access to ICT is as critical as its availability; hence, there is the need to ensure it is available and accessible when needed. Soomro et al. (2018) state that not everyone has equal access to ICT. They intimated that the consequence of limited access to ICT is the lack of effective participation in society. Limited access has the tendency of denying students from taking control of their learning.

One key factor that militates the adoption of ICT in teaching and learning has been attitude towards technology. While positive attitude encourages the use of ICT, negative towards ICT impedes its adoption and usage. The results from the current study showed that pupils held positive attitude towards ICT in spite of unavailability and access to digital technologies. The results are consistent with Papaioannou and Charalambous (2011). Bertea (2009) declares that favourable attitude shows a greater possibility that learners will accept and use technology. This study also recorded positive attitude on the part of the ICT teachers in the Cape Coast Metropolis. This is also positive for ICT implementation in the metropolis.

CONCLUSION AND RECOMMENDATION

The purpose of this study was to investigate the challenges militating against the implementation ICT programmes in primary schools in the Cape Coast
Metropolis. On the basis of the findings, this study concludes that challenges of ICT programmes implementation in Cape Coast Metropolis emanate from lack of ICT equipment both at home and schools. ICT equipment such as computers, printers, scanners, projectors, digital cameras, and the internet are not available in most schools in the metropolis. This has also created limited access to these devices. Pupils do not have access to ICT laboratories where basic ICT skills could be practiced to enhance knowledge in ICT and improve the implementation of ICT programmes. In spite of these challenges, teachers and pupils hold positive attitude towards ICT programmes and lessons which are sometimes thought theoretically. On that score, the study recommends that the government, through the Ghana Education Service should institute technology and technical support unit in the various schools to handle technology integration challenges and provide rapid responses to teachers’ technological needs. The provision of this unit will go a long way to combat such challenges as accessibility to hardware, technical infrastructure, and software availability, adequate computer in laboratories and internet access and regularity.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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