

THE PERCEPTIONS OF STUDENTS, TEACHERS, AND EDUCATIONAL OFFICERS IN GHANA ON THE ROLE OF COMPUTER AND THE TEACHER IN PROMOTING THE FIRST FIVE PRINCIPLES OF INSTRUCTION

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ABSTRACT

This study explored the perceptions of 395 participants (students, teachers, and education officers) in Ghana on the role of the computer and the teacher in promoting the first five principles of instruction for quality teaching and learning. To achieve the intention of the study, five point Likert-type scales based on the first five principles of instruction, with Cronbach alpha of .87, were used for the data collection. Frequency distributions and chi-square tests were employed to analyse the data. The results of the study indicate that there is perception dissimilarities among the participants on the role of a computer and a teacher in implementing the first five principles of instruction. In addition, according to the findings, there is a mismatch of participants' recommendations on training students to acquire computer skills, and training teachers to acquire skills in designing their teaching. The theoretical and practical implications of the results are discussed.

Keywords: first five principles of instruction, perception, students, teachers, computer

INTRODUCTION

During the last few years, information and communication technology (ICT - in the context of this study is computer specific) has been adopted in many areas such as business, entertainment, government and education. The global adoption of computers has been the landmark on the educational scene for the last few years (Albirini, 2006). Harvey (1983) envisages that the effectiveness of the use of computers in education may be an important factor in determining which countries will succeed in the future.

Computers are used in education for varied reasons (Leshin, Pollock, & Reigeluth, 1992; Heinich, Molenda, Russell, & Smaldino, 1996). In most of the schools, computers are used to aid management and administrative activities - activities that directly relate to management and administrative support, and activities that steer the management of the whole organisation as one entity. In addition, computers are used in schools as an object of instruction - learning to acquire computer knowledge and skills to meet the challenges of the information age. Moreover, in most schools, specifically in higher institutions, the curricula have been upgraded to include computer components (e.g., computer application in accounting, computer application in design and technology, computer application in medicine, computer application in curriculum development). Furthermore, and more importantly, computers are used for learning and instructional purposes. In this article, the interest in computers concentrates on their use in schools for learning and instructional purposes.

In developing countries, particularly in Ghana, the metaphor of the information age has generated a whole set of speculations about the need for educational reforms that will accommodate the new tool, "computer", as indicated by Pelgrim (2001). Government and educational planners in Ghana have responded to the challenge by creating national programmes to integrate new technologies (e.g., computers, internet, and intranet) at all educational levels. Computer technology is attracting a large proportion of the country's limited budget for education. However, with regard to the use of computers in teaching/instruction to increase learning gains, as noted by Earl (2002), Sarfo & Elen (2007) and many other instructional technology researchers, the costs are huge, but the impact may not be realised as expected. Solomon (2002) indicates that the revolutionary change in education - learning in particular - expected with the computer has not been realised. One of the reasons assigned to this, according to Solomon (2002), is that computer users in educational settings, thinking that computer alone will bring a revolutionary change in learning, mostly focus on access to computer rather than on effective instructional principles designed by teachers. This study sets out to investigate the perceptions of students, teachers, and education officers on the role of computer and effective instructional principles designed

by the teacher for successful learning. The intention is to make academic contribution to the integration of computer into teaching and learning to promote the achievement of quality education.

RELATED LITERATURE

Since the 1980s, the proliferation of micro-computers with their ever-increasing power, processing capacity and lower prices, has generated a renewed interest in integrating computers in education. And there has also been a significant increase in the number of computers in schools (Reiser, 2001). Educational policy makers and educational practitioners believe that integrating computers in instruction is an excellent means of achieving the modern aims of education. In that regard there is a widespread conception that computer technology can play a key role in enhancing teaching and learning (Kozma & Macghee, 2003).

Kozma (1994), who is recognised as one of the best known prolific debaters for media (computer) effectiveness in instruction and learning reviewed two studies/projects: 1) thinker tools (White, 1984, 1993) and 2) Jasper Woodbury series (Cognitive and Technology Group at Vanderbilt, 1992). He concluded that processing capacity rather than symbol systems or attributes of media (computer) facilitate learning. According to Kozma (1994), the capacity of a medium determines its strengths and functions in cognitive processes. The capacity of computers is the underlying structure that explains and contributes to understanding how computers influence learning (Seel & Winn, 1997). A review conducted by Schater (1999) shows that on the average, students who used computer instruction scored in the 64th percentile on tests on achievement, compared to students in the controlled conditions without computers who scored in the 50th percentile. Moreover, research results of ImpaCT2 (a project commissioned by the U.K Department for Education and Skills and managed by BECTOR (2002) indicates that computer use has a positive impact on test results. In Michigan's Freedom to Learn (FTL) program, laptops are provided to a number of state's middle schools along with extensive teacher professional development around technology integration. Evaluations on the program by Lowther, Strahl, Inan, & Bates (2007) show that students participating in the FTL had significantly higher levels of engagement in their work and in using computer as a learning tool when compared with the national average.

In addition, the results of randomised control trials conducted by Murphy (2007) to test for the effect of the use of computer to learn foreign language comprehension found significant positive effects. In line with these findings and many others, many computer determinists entertain the expectation that the introduction of computers itself will bring about quality teaching and learning (Elen, Lowyck & Van den Berg, 1999). According to them, all one needs to do is to equip schools with computers and access to the internet and a positive change will follow. The conception that computer can play a key role in enhancing teaching and learning has also been expressed in Ghana (President's Committee on Review of Education in Ghana, 2002). In Africa, and specifically, in Ghana, the sentiment for the introduction of computer technology in all schools and other governmental and non-governmental organisations has been best summarised by Professor F. H. Allotey of the Kwame Nkrumah University of Science and Technology when speaking in Tanzania to top decision-makers in Africa:

"We paid the price for not taking part in the industrial revolution of the late eighteenth century because we didn't have the opportunity to see what was taking place in Europe. Now we see that information technology has become an indispensable tool. We can no longer sit down and watch passively" (Sagahyroom., 1995, p 164).

Following this idea, many educationalists, students, teachers, policy-makers (including the government), and other agencies are optimistic that computer technology is the bedrock of quality socio-economic activities and quality education, particularly quality teaching and learning in Ghana (President's Committee on Review of Education in Ghana, 2002; ICT for Accelerated Development [ICT4AD], 2003; World Bank, 2007). Over the past years, government, Microsoft Corporation, and other agencies (e.g., Voltacom) have made attempt to develop ICT (computer) in Ghana. One of the moves is the Kofi Annan ICT Centre of excellence. This centre is a joint Ghana India project established with the main responsibility to produce the human capacity needed for the various educational institutions and the emerging ICT industry in Ghana. In 2004, Parliament passed into law Ghana's ICT4AD policy. The policy indicates the vision of Ghana in relation to ICT in the knowledge and technological age. It addresses fourteen priority stages. One of the stages is promoting ICT in education – the deployment and exploitation of ICTs in education. This policy is at various stages of implementation. In addition, through the help of various agencies, including Global e-School and Communities Initiative (GeSCI), an ICT in Education policy document was prepared and released in 2007 (Mangesi, 2007). Some of the objectives of the policy:

- ensuring that students have ICT literacy skills before coming out of each level of education;
- providing guidelines for integrating ICT tools at all levels of education;
- facilitating training of teachers and students;
- promoting ICT as a learning tool in the school curriculum;

In line with these developments, many of the universities and polytechnics in Ghana have developed their own ICT policies. For instance, learning management system has been developed to support teaching and learning activities in the University of Ghana (Mohammedhai, 2009). Internet facilities are available in almost all the public universities (e.g., University of Ghana, Kwame Nkrumah University of Science and Technology, University of Education, Winneba) and private universities (e.g., Ashesi University, Valley View University) to facilitate research/development, teaching, and learning activities. These developments are not without problems relating to poor maintenance system; woefully inadequate resources (computer – hardware and software); very slow internet connectivity; high cost of internet usage; power interruption; and many others.

Attempts have been made to provide computer laboratories in most of the Senior High Schools (SHS). However most of the basic schools have no laboratories (President's Committee on Review of Education, 2002). Even the computer laboratories in most of the Senior High Schools are virtually empty. Those which have been equipped, have computers that are very old and cannot function properly or are completely dysfunctional. Some schools have managed, on their own, to acquire computers through their Parents Teachers Associations (PTA) and Old Boys and Old Girls Associations. In most of the schools (tertiary, SHS, and basic), both the students and the parents agree to pay certain amounts as part of their school fees towards the purchase of computers to facilitate teaching and learning.

Apart from a few experimental Senior High Schools and very few SHSs in the urban areas, there are no internet facilities in Senior High Schools in Ghana. Lack of funding is the most common reason for the inability to acquire adequate computer facilities in Basic and Senior High Schools. It can be concluded that in Ghana there is a remarkable attempt at the government level, ministerial level, school level, parent level, and student level to provide ICT (computer) resources to facilitate teaching and learning towards the achievement of quality education.

However, it is quite clear that the use of computer or any medium at all to improve learning is subject to considerable debate (Clark, 1994, 2001; Kozma, 1994, Sarfo & Elen, 2007). From the literature, the issue of pedagogical effectiveness of computer technology in teaching and learning has not been convincing.

Clark (1994, 2001), who is one of the best-known prolific debaters against media (computer) gains in learning, indicates that the achievement gains resulting from computer based instruction studies are overestimated and that they are actually due to the uncontrolled, but robust instructional method in computer based instruction. In other words, findings in the studies that support computer gains in learning confound medium (computer) with content or method. The learning gains achieved were due to the method, the content, or novelty, and not to the computer used. It is not the processing capabilities of media (computer) that facilitate learning. Instead, it is the creative development of instructional strategies or methods that actively engage learners (Sarfo & Elen, 2007).

To support this assertion, Smaldino, Lowther, & Russell (2008) emphasise that the 'magic' in computer technology, if it existed, all lies in the instructional design of the software, and not in the hardware. Moreover, after having thoroughly and comprehensively reviewed 375 empirical studies conducted in the past 70 years, Russell (1999) provides abundant evidence that technology (e.g., computer) does not directly improve learning.

In addition, Salomon (2002) indicates that despite the infusion of information technologies with the internet and multimedia, e-mail and simulations, and endless other possibilities and affordances, classrooms today with the exception of few daring pioneering cases, are not very different from those of yester-years in terms of learning impact. Earle (2002) claims that despite the general sense that the computer revolution of the last decade has had a major impact in schools, the nature of this impact seems to be limited to access and information retrieval rather than improved teaching method to yield learning gains. The results of the study conducted by Sarfo & Elen (2007) to test the effects of powerful learning environments with and without computer indicated no significant difference in terms of learning gain. In a study of the effectiveness of reading and mathematics with and without computer on standardised test scores, Dynaski et al. (2007) found no significant improvement in scores between treatment and control classrooms in either subject.

In summary, the above research results and reports suggest that the use of the computer will not itself result in better learning. More importantly, there is established evidence based on what has been discussed that effective design of support (good design of learning tasks and interventions), rather than the computer is the fundamental building block and therefore the most effective means of achieving quality education.

In regard to the design of effective support for learning, Merrill (2002, 2006) has identified the first five principles of instruction: 1) task centeredness, 2) demonstration, 3) activation, 4) application, and 5) integration. Merrill argues that any quality instruction should meet all the five principles. Task centeredness is based on the proposition that development of competencies is promoted if learners are engaged in solving real life problems. This has been the main focus of contemporary learning theories. Task-based instruction provides specific demonstration of a particular whole task (e.g., van Merriënboer, 1997; van Merriënboer & Kirschner, 2007) similar to those things the learners will confront in real life settings. The demonstration principle indicates that learners remember and can apply information better when the information includes specific examples. van Merriënboer & Kirschner (2007) indicate that showing a learner what to do through worked-out examples, and modeling example, in addition to practice, are important dimensions for successful learning. The activation principle emphasizes that learning is promoted when relevant prior knowledge is activated. Stimulating prior knowledge of the learners and making it active for use in working memory, as a foundation for new information, is the key to productive and successful learning. The application principle asserts that learning is promoted when learners are required to use their new knowledge to solve problems. Finally, the integration principle indicates that learning is facilitated when learners are encouraged to integrate new knowledge or skills into their everyday life. Merrill (2002, 2006) indicates that the real intrinsic motivation for learners is learning. Learners have integrated instruction into their life when they are able to demonstrate improvement in skills and modify their new knowledge for use in their everyday lives. These five principles are recognized in the literature of instructional design and technology as the fundamental requirements for quality teaching/instruction and learning. Computer is not the basic requirement for productive learning and the computer alone or itself does not lead to pedagogical innovation, but the use of the computer is part of a more extensive pedagogical innovation based on the principles of effective instruction. Therefore to achieve the modern aims of education it is very important to also focus more attention on the training of teachers to acquire quality knowledge and skills in instructional design related to the principles of effective instruction. In addition, it is also important to expose learners to the effective principles of instruction.

Research Questions

It is evidenced in the literature review that both effective use of a computer and the design of effective learning support by the teacher are equally important for effective learning. Merely purchasing computers and practice softwares is not enough (ISTE, 2008). Nonetheless, it seems in developing countries, specifically Ghana as described in the literature, the need to provide computers in the classrooms has taken precedence over training teachers to acquire adequate knowledge in effective instructional principles for quality learning. In the context of education, more particularly in teaching and learning, as discussed in the literature, focusing most or all attention on the expansion of computers in the classrooms perceiving that it is the computer alone that can promote quality learning is not the optimal means of achieving quality education. This is especially so in Ghana as a developing country where there are limited resources. More importantly, from both theoretical and empirical perspectives, teachers and students perceptions on the elements of the learning environments seem to have a significant impact on students learning. For instance, according to Konings, Brand-Gruwel, & van Merriënboer (2005) students' and teachers' perceptions and conceptions of a learning environment do influence student learning and the quality of learning. Teo (2009) provides an empirical evidence to support the proposition that teachers' beliefs and perceptions about the use of technology (computer) affect the way they use technology in teaching. Therefore, the perceptions of educational practitioners in Ghana (especially students, teachers, and education officers) on the role of computer and effective principles of instruction by the teacher should be empirically investigated and properly addressed. If not it could affect the planning, designing, and implementation of effective learning environments (with computer) towards the achievement of modern aims of education in Ghana. In addition, according to ISTE (2008), to implement technology for learning successfully, among other things, the professional development of teachers is equally important. Teachers, as well as students, not only need training in computer literacy but also in application of various kinds of educational software in teaching and learning (Castillo, 2007). Teachers should be motivated to learn how to integrate computer into their classroom activities and school structure.

This study is intended to explore the perceptions of educational practitioners (teachers, students, and education officers) in Ghana on the role of computer and the teacher in the implementation of the first five principles of instruction for promoting quality education. Also the study explores the participants' recommendations for the training of the students and teachers on the use of computer on one hand, and effective instructional design

principles by teachers on the other hand for the achievement of quality teaching and learning. The goal is to achieve a better means of integrating computer in teaching and learning to promote quality education in Ghana as a developing country.

METHODOLOGY

Participants

The participants of this study were:

- a) three hundred 3rd Year students selected from six SHS with 80 from each school and comprising 190 males and 110 females; their ages ranged from 18-22 with average age of 19.
- b) seventy one teachers made up of 50 males and 21 females selected from six SHS with ages ranging from 29-59 and averaging 37.
- c) twenty four education officers or policy makers – 13 males and 11 females selected from Regional Education offices in Ghana with age range 33-58 and the average of 41.

Research materials

The basic instrument for the study was a questionnaire: 5 point Likert-type scale from strongly agree to strongly disagree comprising 15 items; and three additional questions to identify the participants’ recommendations. The scale was constructed based on the first five principles of instruction (Merrill 2002).

The questionnaire consisted of the introduction, Part I, and Part II. The introduction briefly contained the importance of the study, and the fact that participants’ responses would be treated as confidential. Part I included participants’ profile: age, sex, and name of school or place of work. Part II consisted of the instructions for the participants; the 15 items of 5 point Likert-type scale; and the questions to explore students’ recommendations.

The introduction of Part II read “Each of the statements in the scale expresses an idea or a perception about strategies for effective instruction/teaching. Please rate this statement to the extent to which you agree. For each statement choose ‘A’ if you strongly agree; ‘B’ if you agree; ‘C’ if you are undecided – which means both computer and the teacher can do it equally well; ‘D’ if you disagree; and ‘E’ if you strongly disagree”. The statements in the scale were developed based on the first five principles of effective instruction (Merrill 2002): task centeredness; application; activation; demonstration, and integration. Three effective instructional strategies, based on each of the First Five Principles of instruction (Merrill, 2002) were used to construct three statements for each principle (See table 1 for the details), but the statements were reshuffled in the scale. In total the scale consisted of 15 statements with Cronbach alpha of .87. As regards the participants’ recommendations, they were asked to choose any one of the following recommendations which in their view was the priority and reflected their perceptions:

- teachers should be trained to use computer to support their teaching;
- students should be trained to be able to use computer to learn in the classroom without the teacher; and
- teachers should be trained to know better how to design their instruction and teaching for effective learning

Table 1: The 15 statements on the first 5 principles of instruction

First five principles of instruction by Merrill	
1.Task centeredness	<ul style="list-style-type: none"> • Using a computer as a technological tool can help learners to solve challenging real life problems better than a teacher • Using a computer as a technological tool can support learners to gradually acquire knowledge and skills needed to work in real life situations better than a computer • A teacher can support learners to gradually work on activities similar to real life activities better than a computer
2.Application	<ul style="list-style-type: none"> • A teacher can help learners apply what they learn in the classroom better than a computer • Using a computer as a technological tool can help learners use the new knowledge to solve problems better than a teacher can help them • A teacher can help learners to transfer the acquired knowledge to various situations better than a computer
3.Activation	<ul style="list-style-type: none"> • Using a computer as a technological tool can help learners to remember previous knowledge better than a teacher

- A teacher can help learners recall the previous knowledge better than a computer
- A teacher can stimulate the recall of previous knowledge in learners better than a computer

4. Demonstration

- A teacher can present specific examples better than a computer
- Using a computer as a technological tool can present good examples better than a teacher
- Using a computer as a technological tool can present lifelike skills or procedures better than a teacher

5. Integration

- A teacher can help learners to defend the acquired knowledge outside the classroom better than a computer
- Using a computer as a technological tool can help learners use the new knowledge in their everyday life better than a teacher
- A teacher can help learners reflect on what they learn better than a computer

Procedure

The questionnaire was pilot tested and reviewed by the researcher and one instructional design professor. The researcher administered the final questionnaire to the participants in their classrooms and offices. The administration took about 25 minutes for the students and 20 minutes for the teachers and the education officers (policy makers). The students were instructed to work independently, and they were supervised by the researcher. Data gathering took approximately 1 month.

RESULTS

The data were collated, frequency distributions and chi-square tests were carried out to analyse the data in order to answer the research questions.

Participants' Perceptions

Table 2 shows the overview of the frequency scores on participants' degree of responses to the statement that computer can facilitate the implementation of the first five principles of instruction better than the teacher

Table 2: Overview of frequency scores: perceptions about computer can facilitate the implementation of the "first five principles of instruction" better than a teacher

Responses	Students		Teachers		Education officers	
	Frequency	%	Frequency	%	Frequency	%
Strongly agree	110	36.67	16	22.54	6	23.33
Agree	46	15.33	12	17.18	4	17.50
Undecided	45	15	12	17.18	3	13.33
Disagree	53	17.73	19	27.32	8	32.50
Strongly disagree	48	15.27	11	15.77	3	13.33
Total	300	100	71	100	24	100

The results of the analysis showed that 37% of the students strongly agreed that the computer can facilitate the implementation of the first five principles of instruction better than the teacher, 15% agreed, 15% undecided, 18% disagreed, and 15% strongly disagreed (figure 1 shows the overview of the students' responses). A chi-square analysis conducted on the students degree of responses revealed significant statistical difference $\chi^2(4, N = 300) = 56.3, p = 0.05$ indicating that students generally strongly agreed with the sentiment that the computer can facilitate the implementation of the first five principles of instruction better than the teacher.

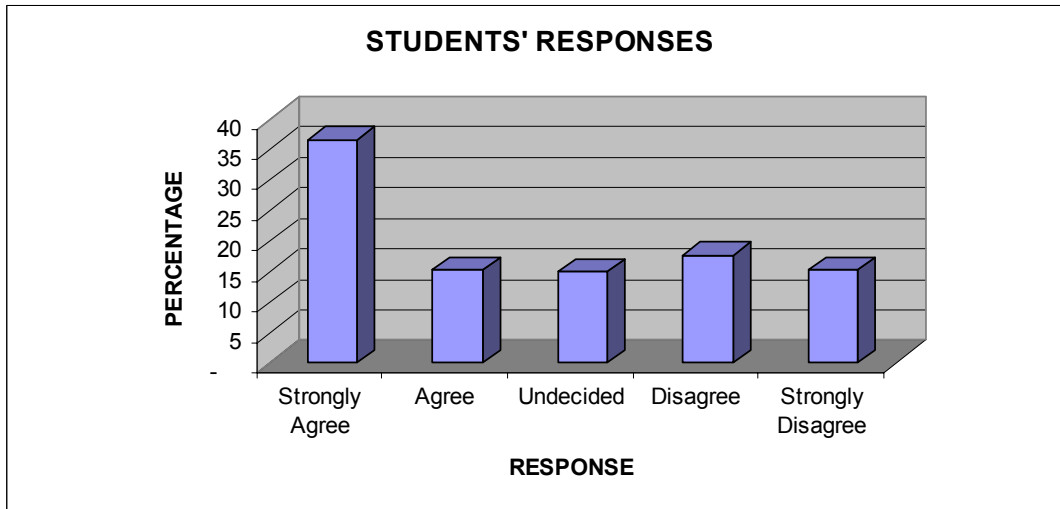


Figure 1. Overview of students' responses

For the teachers, 23% strongly agreed that the computer can facilitate the implementation of the first five principles better than the teacher, 17% agreed, 17% undecided, 27% disagreed, and 16% strongly disagreed (Figure 2 depicts the overview of the teachers' responses). A chi-square analysis conducted indicated no significant statistical difference in teachers' degree of responses to the statement “: computer can facilitate the implementation of the first five principles of instruction better than the teacher”. This indicates that teachers are not generally agreed or disagreed with the sentiment that the computer can facilitate the implementation of the first five principles of instruction better than the teacher.

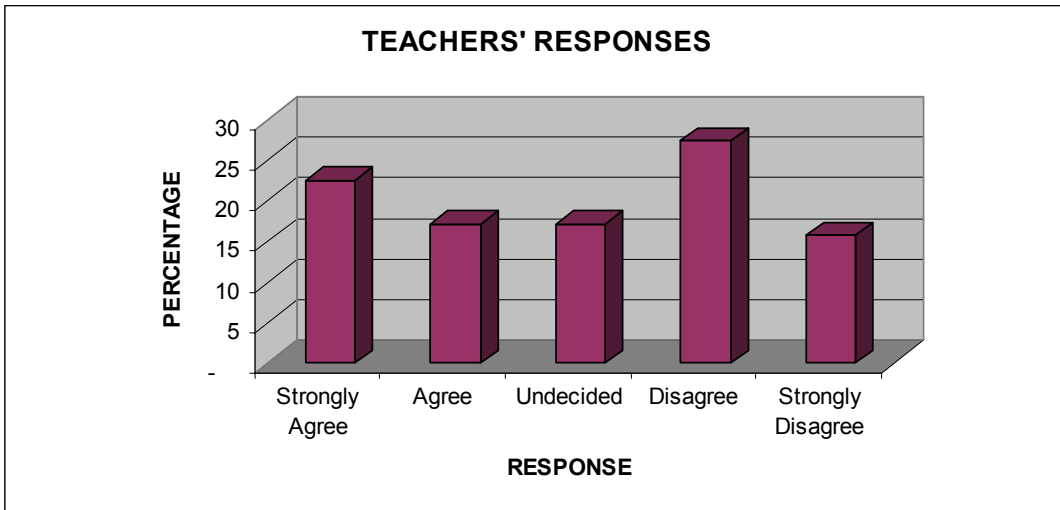


Figure 2. Overview of teachers' responses

For the education officers or policy makers, 23% strongly agreed that the computer can implement the first five principles better than the teacher, 18% agreed, 13% undecided, 33% disagreed, and 13% strongly disagreed (figure 3 highlights the overview of educational officers' responses). A chi-square analysis indicated no statistical significant differences in the degree of responses of policy makers

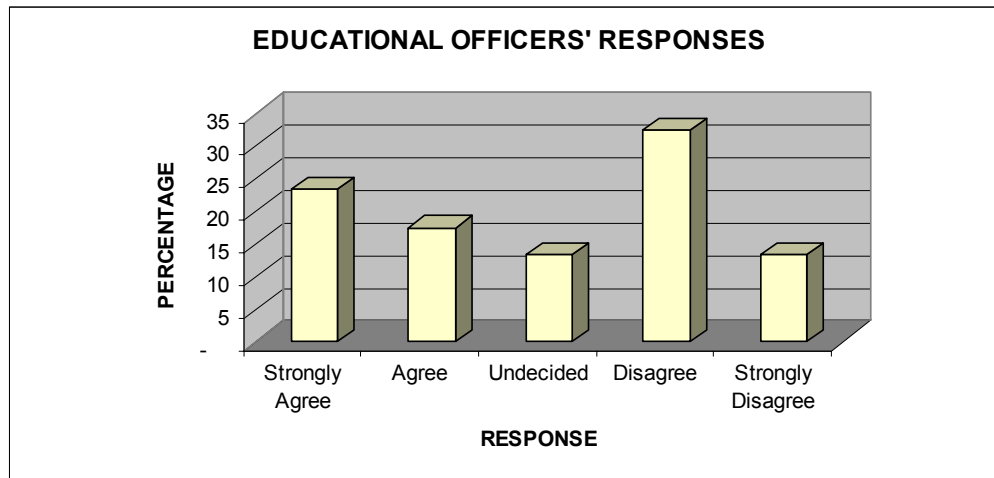


Figure 3. Overview of educational officers' responses

Participants' Recommendations

Thirty five percent of the participants (students = 39%, teachers = 36%, and education officers = 31%) selected the recommendation that “teachers should be trained to use computer to support their teaching” (see table 3). A chi-square analysis revealed no significant statistical difference in their recommendation indicating that 35% of the participants generally accepted this recommendation. Approximately 38% of the participants (students = 43%, teachers = 19%, and education officers = 30%) selected the recommendation that “students should be trained to be able to use computer to learn without the teacher”. A chi-square analysis yielded significant statistical difference $\chi^2(4, N = 92) = 10.97, p = 0.05$ indicating more students than teachers and education officers accepted the recommendation that students should be trained to be able to use the computer without the teacher. Twenty three percent of the participants (students = 18%, teachers = 45%, and education officers = 39%) selected the recommendation that “teachers should be trained to know better how to design their instruction for effective teaching”. A chi-square test revealed a significant statistical difference in their recommendation $\chi^2(4, N = 102) = 12.27, p < 0.05$ indicating that teachers, rather than students, want teachers to be trained to design their instruction for effective teaching.

Table 3: Overview of the participants' recommendations

Participants' Recommendations	Students		Teachers		Education Officers		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
1. Teachers should be trained to use computer to support their teaching	117	39	26	36	9	31	152	38.5
2. Students should be trained to be able to use the computer to learn without the teacher	129	43	13	19	7	30	149	37.7
3. Teacher should be trained to know better how to design their teaching/teaching for effective learning	54	18	31	45	9	39	94	23.8
Total	300	100	71	100	24	100	395	100

DISCUSSION OF RESULTS

This study aimed at discovering the perceptions of students, teachers, and education officers in Ghana on the role of the computer and the teacher in the implementation of the first five principles of instruction for promoting quality education. In addition, the study was designed to explore the participants' recommendations for the training of the students and teachers on the use of computer on one hand, and effective instructional design principles by teachers on the other hand for the achievement of quality teaching and learning. The goal is to achieve a better means of designing and implementing effective learning environments (integrated with computer) to achieve the modern aims of education in Ghana as a developing country.

The result of the study indicates that in Ghana, students have strong perceptions that the computer can promote the first five principles of instruction for successful learning better than the teacher. In this regard, from the perspective of Ghanaian students, it is necessary to pay more attention to the expansion of computers in the

classrooms in order to enhance quality teaching and learning. Their perceptions in this sense are in line with Kozma (1994), Schater (1999), BECTOR (2002), Sahhin & Toy (2009) and to some great extent the Government and other individuals of Ghana. Students' perceptions in this comportment indicate that students might think the computer is the absolute solution to their learning problems or the computer might be an essential precondition to their learning problems. Ghanaian students' perceptions in this way are similar to the characteristics of "Digital Natives" or "Net Generations" (Prensky, 2001; Kenedy, Judd, Churchward, & Gray, 2008). Prensky (2001) explained that Digital Natives have spent their entire lives surrounded by and using computers, digital music, cell phones and all the other toys and tools of digital age. He maintained that the Digital culture and environment in which the natives had grown up had changed the way they think and therefore the way they perceive teaching and learning. Digital natives rely heavily on communication technologies to access information and they have a low tolerance to teaching/instruction by the teachers. However, their perceptions are in dissonance with the propositions (Clark 1999; Sarfo & Elen 2007) that effective instructional design by the teacher rather than media (computer) is the better means of achieving quality learning. One possible reason for the students' perceptions not in line with the assertion of Clark (1999) and Sarfo & Elen (2007) is that students might not have adequate knowledge about the strengths and weaknesses of various instructional techniques and media; they might also not have sufficient exposure to the first five principles of instruction and therefore cannot make any concrete decision on effective means of promoting good instructional/teaching principles.

Moreover, the result of the study indicates that not all the teachers have the perceptions that computer can facilitate the implementation of the first five principles of instruction better than the teacher. This particular finding is interesting because whilst some teachers' perceptions in this way are in line with Clark (1999), Sarfo & Elen (2007), and Taiwo (2009); other teachers' perceptions according to the result are in line with the students' perceptions which conform to the contention of Kozma (1994) and others. On one hand the teachers whose perceptions are in line with the use of computer might think that there is the need to cope with the technological changes in teaching and learning. On the other hand, the teachers whose perceptions are in dissonance with the use of computer can be attributed to the fact that, as pointed out by Means (1994), teachers feared that they would be replaced by computers. In other words, the perceptions of teachers in this way are in line with the characteristics of "Digital Immigrants" (Prensky, 2001). Digital Immigrants lack technological literacy and they are foreigners in Digital lands of the net generation. The results suggest that in Ghana, to some degree, students and teachers have different perceptions with respect to the role of the computer and the teacher in promoting the implementation of the first five principles for productive learning to augment quality education

In addition, the result indicates that some education officers (education policy makers) have the perceptions that the teacher can implement the effective principles of instruction for quality learning better than the computer. However, other education officers according to the result have the perceptions that the computer can facilitate the implementation of the effective principles of instruction better than the teacher. It is not surprising that the perceptions of the education officers on the role of a computer, and a teacher in the promotion of good instructional practice for quality learning are similar. This is because the education officers are (experienced) teachers.

Furthermore, the result of the study shows that students, teachers, and education officers recommend that teachers should be trained to acquire computer skills. Teachers' recommendation that they need training is in line with research findings of Koc & Bakir (2010). In addition, according to the result, most of the students suggest that students should be trained to use the computer to learn without the teacher, but this is not the recommendation of most of the teachers. Teachers' position in this regard is to avoid being redundant in the classroom in the future, and also could support the fact that they are Digital Immigrants. Moreover, the result indicates that most of the teachers and the education officers recommend that teachers should be trained to acquire instructional design skills but this is not the recommendation of majority of the students. Majority of the students not recommending this could be interpreted to mean that students think only good computer skills of the students and the teachers could promote quality learning but not good skills in effective instructional principles of the teacher.

CONCLUSION

The representativeness of the sample for the present study is debatable and therefore the results should be generalized with careful consideration. However, the results are worthwhile to be reported. Generally, in the present study, students' perceptions about the role of the computer in the implementation of the first five principles expose students' conceptions (or thinking) about the pedagogical role and relevance of the computer as instructional media in this information revolution age. Thus students have the conception that the computer can help them to learn better than a teacher. This indicates how students (or Digital Natives) are determined to

use the computer as a technological tool or as an instructional medium to acquire knowledge in this era of information age. But the important question is “Is determination to use the computer as a technological tool to learn the same as the determination to learn”? On the other hand “Is students’ pedagogical belief in computer as a technological tool actually translates into their pedagogical practice to facilitate learning? Further research study should be conducted to answer these research questions. Furthermore, based on the results of the study it can be concluded that (in Ghana) students’ perceptions on the role of a computer and a teacher in the implementation of effective instructional principles for effective learning are different from the perceptions of teachers and education officers. This mismatch of perceptions of students and teachers is a very significant finding, and it must be properly addressed by educational (technology) researchers/practitioners and instructional system developers (in Ghana) otherwise any attempt to design teaching and instruction (integrated with computer) by teachers based on the first five principles to facilitate productive learning might result in learning ineffectiveness. Moreover, the findings of the study suggest that students, education officers and the teachers recommend that teachers should be trained to acquire computer skills. However, teachers and students, based on their recommendations, have different expectations for training teachers to acquire skills in principles of effective instruction and training students to acquire computer skills that would enable them to use the computer to facilitate learning without teachers’ support. These recommendations of dissimilarities among the teachers and the students are significant finding and calls for attention. Thus, students need efficient exposure in teachers’ role in implementing effective instructional principles, and the teachers too need efficient exposure in effective instructional principles as well as integration of computer into teaching and learning.

The results of the study advises computer determinists, educational (technology) researchers/practitioners, educational planners, and the government (of Ghana) on how to make a better decision (for future planning and implementation) for effective principles of instructional design and computer for quality education.

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