GHANA REPORT

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The survey

The 'Pan-African Agenda on Pedagogical Integration of ICT' project, which was instituted by the University of Montreal, and funded by the International Development Research Centre (IDRC) in Canada, was to assist participating African countries to fully integrate ICT into teaching and learning through the frequent collection and analysis of data on ICT usage. The study was conducted by the Educational Research Network for West And Central Africa (ERNWACA), which is a regional network of highly trained African researchers and educational practitioners with a strong desire to close the gap between researchers, policy makers and implementers and make their expertise available for the development of national education systems. ERNWACA members include several hundred researchers in fourteen countries, ten francophone and four Anglophone: Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Gambia, Ghana, Guinea, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

Five institutions which were representative of the nation's pre-tertiary and tertiary educational system were purposively selected for the study; these are University of Education, Winneba, Obrachire Senior High Secondary-Technical, Asuasi Technical Institute, Ayirebi Junior High School and Tamale Senior High Secondary School. The choices of these research sites were based on the requirements of the project to get representative institutions across the educational system, and across geographic locations and consideration of proximity and access to the schools.

Qualitative and quantitative data were obtained from structured questionnaire and interview schedules for students, educators, and school administrators. The survey was carried out by ERNWACA members in the University of Education, Winneba between November and January 2009. The data collected, and reports generated from the data, were validated by a National Committee of educational experts, which was formed for this purpose.

Summary of Findings

Existence of National policy on ICT

- National policy on ICT was first developed in 2003;and

- The policy is under review since 2006 to outline strategies and implementation procedures and modules that would guide the development and deployment of ICT across the educational system

Resources for ICT integration in education

- Each institution has ICT instructor(s) who help in teaching the ICT course

- All the institutions have some computers and some forms of computer laboratories where teaching of ICT takes place

- At the pre-tertiary level, the few computers that the schools have easily break down because of lack of air-conditioners, unstable electrical power supply, and virus infections

- The ratio of students (and educators) to computers per institution was found to be very low. At the SHS level there is an average of about 30 students to a computer and 50 students to a computer at the tertiary level

- At the pre-tertiary level, none of the computer labs were networked and only four computers in one of the schools had internet connectivity

Types of ICT use by educators

- Only Core ICT teachers use ICT and employ the technology in their instructional activities; almost all teachers of other subjects do not use ICT in their instructional activities

- ICT is used in typing examination questions in all institutions and in some cases educators use ICT in processing students' examination results

- At the tertiary level, most ICT literate educators own their own computers and use the Internet for searching for teaching and learning materials which they use to enrich the contents of their lessons.

Types of ICT use by learners

- At the pre-tertiary level, the common types of ICT used by learners are computers, CDs and mobile phones.

- Learners use ICT largely for word processing.

- Learners have no opportunity to print out hard copies due to lack of printers

ICT training in pre-service teacher education programmes

- Educators at all levels are not trained to use ICT for teaching and learning

- The pre-service teacher training programmes of colleges of education and teaching universities provide little opportunity for trainees to learn skills necessary to integrate ICT into teaching

ICT training in in-service teacher education programmes

- At the pre-tertiary level, predominantly the Core ICT teachers reported to have participated in continuing professional development activities that did not exceed 50 hours and included ICT integration. None of the educators reported to have participated in continuing professional development activities that exceeded 50 hours and included ICT integration.

- At tertiary level, almost all educators reported to have participated in continuing professional development activities that did not exceed 50 hours and included ICT integration; but a few, predominantly the ICT teachers have exceed 50 hours.

- Educators require more continuing professional development activities to improve their competencies

Impact of ICT use on teaching and learning

- At the pre-tertiary level, the impact of ICT use on educators could not be established as very few teachers actually use ICT in their instructional activities

- At the pre-tertiary level no examples of ICT-based productions by learners were obtained since in many of the schools the assignments are marked on the computer and deleted to free space for other students to work

- At the tertiary level, some impact of ICT use was observed in educators and learners, particularly from those involved in department-based ICT courses.

ICT use for management and administration

- ICT use for management and administration purposes is largely for storage of students' and personnel records and preparation of documents

- None of the pre-tertiary institutions had a website or official e-mail account for communication and dissemination of information

Gender equity in ICT usage, access and training opportunities

- Though no differences were observed at the pre-tertiary level in the amount of time male and female learners use ICT for academic purposes,

- A wide proportional gap of 0.56 was observed for male and female learners use of ICT for academic purposes at the tertiary level

- For the educators, not much difference was observed in the amount of time male and female learners use ICT for academic purposes at the pre-tertiary level, since the technology is generally not being used across the curriculum

- At the tertiary level, male educators average ICT usage (hours per week) for academic purposes was three times that of the females educators

- At the pre-tertiary level, very few (i.e. under 5%) of the female educators had participated in continuing professional development activities that did not exceed 50 hours and included ICT integration. (Overall was 10%)

- At the tertiary level, almost all (100%) the female educators reported participating in continuing professional development activities that did not exceed 50 hours and included ICT integration.

The factors supporting the use of ICT by educators and learners

- Availability of ICT syllabuses/manuals

- ICT teachers who are willing to provide educators and learners with training

- Availability of computers and computer labs that can be accessed periodically

The challenges to the use of ICT by educators and learners

- Limited number of computers available in the schools and computer labs

- Limited access time, lab not opened at weekends and after classes

- Unreliable power supply, frequent breakdown of computers and poor maintenance of the existing machines

- Network related challenges – lack of connectivity, frequent internet breakdown/disruptions, high down-time of equipment

- Lack of resources like LCD projectors and specialized computer software for teaching the various subjects.

- Lack of interest of some of the heads of institutions and school management in ICT integration.

- The lack of administrative support and incentives for innovative faculty who integrate ICT into their instructional activities and for their students' learning.

In summary, though Ghana's national curricula for the various subjects contain policy statements about the use of ICT in teaching and learning, the limitations imposed by inadequate number of computers in institutions, poorly trained educators and lack of internet connectivity pose a major challenge to the implementation of the policy to integrate ICT into teaching and learning.

Recommendations

Ministry of Education (MOE)

- By requiring integration of ICT in teaching and learning, schools will need to acquire, maintain and sustain their ICT facilities and resources. The Ministry of Education should make budgetary allocations annually to maintain, replace, and expand ICT facilities and resources in the schools

- At the university level, students ICT user fees and GETFund should be maintained as the main source of funding for ICT projects. Besides, the university should source funding from donors to support its ICT initiative

- Software for processing students' examination results should be purchased for use at the various levels of pre-tertiary education

- A scheme should be put in place to encourage teachers to acquire their own computers

- Pre-tertiary institutions should be given adequate resources and encouraged to organize school-based in-service training in pedagogical integration of ICT.

Curriculum Research and Development Division (CRDD)

- There is a need to review the core ICT curriculum in pre tertiary education to make it more functional

- There is a need to review all pre tertiary education programmes in a manner that will enable teachers to integrate ICT in their instructional delivery

- There is a need to introduce into School-Based Assessment (SBA) the use of ICT, by asking learners to produce at least one assignment using computer application software. (This can begin at the SHS level)

Teacher Education Division (TED)

- Need to review ICT programmes of the teacher education institutions to enable prospective teachers to develop ICT integration skill.

- Pre-service programmes should include at least one course taken via the online mode to develop the trainees' capacity to use ICT tools

Schools

- Managers or heads of institutions should ensure they organize school-based in-service training in ICT usage for their staff.

- Past students associations, NGOs and PTAs should be encouraged to get more actively involved in supporting schools in setting up computer labs and increasing the number of computers and accessories

Introduction

The Pedagogical Integration of ICT project has come at an opportune time in Ghana to contribute to the ICT broadening process and to participate in the access, construction, and production of knowledge in the information era. The project is a great opportunity for the nation because the integration of ICT into her educational system was formally introduced as part of educational reforms which began in September 2007 as part of government's initiative to improve quality of teaching and learning in the nation's schools. One major requirement of the 2007 educational reform was to ensure that all students in pre-tertiary institutions in Ghana acquire basic ICT literacy skills (including internet use) and apply these not only in their studies but also in a variety of ways in their everyday life activities (CRDD, 2007a, b and c).

Computer technology use for teaching and learning is gaining acceptance in education globally but in Ghana efforts to use ICT in education began to receive governments' attention only recently. Ghana's recent participation in an international survey which was used to rate the ICT Development Indices (IDI) of the participating countries revealed that the country ranked between 100th and 140th position out of 154 countries surveyed (ITU, 2009). This indicates that Ghana, like many African countries, still lags behind in ICT development, use, and knowledge and skills as well as ICT basket values (see Table 4 in Appendix). For Ghana, and Africa as a whole, to be able to fully integrate ICT into teaching and learning there is the need for frequent collection and analysis of data on ICT usage. The 'Pan-African Agenda on Pedagogical Integration of ICT' project, which is being coordinated by the International Development Research Centre (IDRC) in Canada, was therefore instituted to address this very important need.

The main research goal of the project is to better understand how the pedagogical integration of ICT can improve the quality of teaching and learning in educational systems of participating African countries. To achieve this goal in all the participating

countries, and for that matter Ghana in particular, the following specific research objectives were addressed in the Phase 1 of the study:

- determine whether or not the nation has an ICT policy in place to guide its educational system;

- take inventory of different types of ICT usage and describe the state of ICT connectivity, and infrastructure in the nation's educational institutions;

- describe how teachers are given pre-service and in-service training in ICT usage for educational purposes;

- examine gender equity in ICT usage, access and training opportunities;

- identify teachers' professional development needs in ICT usage for educational purposes;

- document the role of principals, administrative personnel, educators, and the community in ICT integration;

- appraise how the use of ICT applications has influenced classroom practice and students' learning;

- identify successes and challenges of ICT usage in the nation's educational institutions.

Methodology

Five institutions (see Table 1), which were representative of the nation's pre-tertiary and tertiary educational institutions, were purposively selected for the study.

Table 1   Institutions selected for the study

Institution	Type	Town	Region	Location
University of Education, Winneba	Teacher Training (advanced)	Winneba	Central	Urban
Senior High Secondary-Technical	Secondary/Technical (upper)	Obrachire	Central	Non-urban
Asuasi Technical Institute	Secondary/Technical (upper)	Asuasi	Central	Non-urban
Ayirebi Junior High	Secondary (lower)	Akyem-Ayirebi	Eastern	Non-urban
Tamale Senior High Secondary School	Secondary (upper)	Tamale	Northern	Urban

The choices of these research sites were based on the requirements of the project to get representative institutions across the educational system, and across geographic locations. Interactions the research team had with members of the National **ICT** Policy and Plan Development **Committee** and officers of the National Science Resource Centre in Accra, informed the decision to select the institutions involved in the study. Furthermore, in view of time constraints on the team, consideration of proximity and access to the schools also influenced the selection of these sites.

At the teacher education level, it will be necessary to explain why the University of Education, Winneba (UEW) was selected out of the 40 institutions in the country. Pre-service teacher training in Ghana is offered at two levels. One is the teacher education university level and the other is the college of education (formerly referred to as teacher training college) level. The latter is wholly initial teacher training where secondary school graduates are trained to teach in primary and junior high schools; there are 38 of such institutions scattered all over the country. The former trains a few teachers for primary and

junior high schools but the majority for teaching in senior high schools and colleges of education.

There are only two teacher education universities in the country – the University of Cape Coast (UCC) and the UEW, which was used in the study. The selection of UEW for the study was based largely on the fact that it offers solely teacher education programmes but the UCC offers other programmes as well.

Data was collected from managers, educators and learners. The qualitative and quantitative data were obtained from structured questionnaire and interview schedules for students, educators, and school administrators. The team also interacted with teachers and ICT technical personnel of these schools and made observations that formed part of the data for the project.

The survey was carried out by researchers in the University of Education, Winneba between November and January 2009. The data collected, and reports generated from the data, were validated by a National Committee of educational experts, which was formed for this purpose.

Methodological Challenges

Challenges related to time constraints

The main challenge inherent in the research design was the volume of information required from participants within a constrained time period. The schedule for data collection, analysis and uploading was unrealistic, given the volume of work involved.

Challenges related to pre-designed instruments

The use of already prepared instrument where the local research team cannot make any modification was problematic because the situation in one country may not necessarily be the same in another country.

Size of information to upload onto the observatory

The size of information to upload onto the observatory, prescribed with respect to the word counts, could hardly be achieved for some items. This was a problem some institutions gave one word answers or indicated that whatever was being asked did not exist or was not applicable to them. Meanwhile, the research team was obliged to produce the expected number of words whether it was possible or not.

Organization of items in the questionnaire

Another challenge encountered was the way the items were mixed up in the questionnaire without following the sequence in which they were to be presented at the observatory. This delayed the imputing of the data because one needed to flip through all the questionnaires to locate the appropriate item to be imputed at the right position at the observatory.

Lack of logistics for data collection

Provision was not made for digital equipment to capture interview data and scenes at the research sites and also scan the completed questionnaires as demanded by the research process.
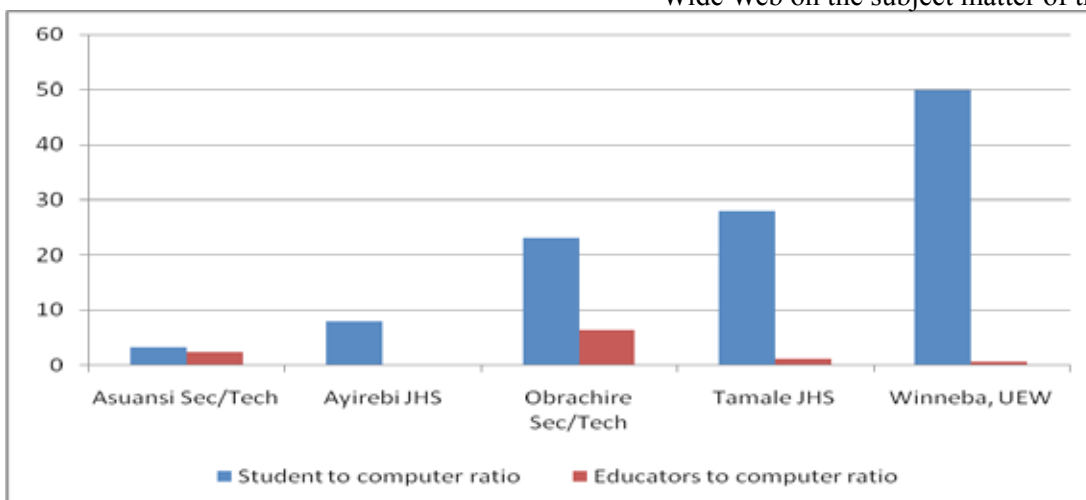
Lessons learnt

It is not easy combining work such as this with full time job unless one can effectively work under pressure. Despite the challenges, it has been very interesting working with different people from different countries with a common coordinator. Also, though some of the promptings from University of Montreal has been very tough, they served the purpose of putting the research team on its toes to deliver.

The project is useful in the sense that it has been able to gather enough data on ICT pedagogical integration in different institutions at different levels from several African countries including Ghana into the same domain for easy access and comparison. It also rekindles the spirit of further research on ICT amongst the team in Ghana and this can be harnessed for the second stage of the project. Also, the participating institutions have been very enthusiastic about the work because they believe it will put them at the centre stage of the world.

Brief summary of participating institutions

The institutions involved were a junior high school located in a non-urban area, one senior high school located in an urban centre, a secondary technical school in a non-urban area, a technical school in a non-urban area and a teacher training university located in an urban area. All the institutions were mixed in terms of gender.

The results show that all the schools have very limited ICT facilities (see Table 2 in the Appendix). At the pre-tertiary level, the few computers that the schools have easily break down because of lack of air-conditioners, unstable electrical power supply, and virus infections. The student per computer ratio is high. At the SHS level there is an average of about 30 students to a computer and 50 students to a computer at the tertiary level.

Challenges and successes

In Ghana the national curricula for the various subjects contain policy statements about the use of ICT in teaching and learning. But the limitations imposed by inadequate number of computers in institutions and lack of internet connectivity pose a major challenge to the implementation of the policy to integrate ICT into teaching and learning.

The major success is that despite the inadequacies, all the institutions have some computers and some forms of computer laboratories where teaching of ICT takes place. Also, each institution had ICT instructor(s) who help in teaching the ICT course. Generally, it is only the ICT course that is taught in the schools using ICT facilities. Despite the limited ICT resources, some students showed tremendous interest in using ICT in their schools. Where there is internet connectivity, both educators and learners were able to obtain information from the World Wide Web on the subject matter of their courses.

Student to computer ratio / Educators to computer ratio bar chart for Asuansi Sec/Tech, Ayirebi JHS, Obrachire Sec/Tech, Tamale JHS, Winneba, UEW

At the tertiary teacher-education institution (i.e. UEW), the educator per computer ratio is nearly one, as shown in the figure above. That is, almost all educators have access to a computer and many use their own in the office. Though most of the computers in the labs and offices in UEW had internet connectivity, only one of the SHS had it. The junior high school and the two non-urban SHS did not have it (see Table 3 in the Appendix).

Indications are also that ICT is used in typing examination questions and in some cases educators use ICT in processing students' examination results. Realizing the importance of ICT, some educators seek training or further training in the use of the computer. Furthermore, tutors who use ICT in teaching have realized that their ability to evaluate lessons has improved. Most lecturers who were enthusiastic about using ICT in teaching and learning have purchased their own laptops, which they use in their classrooms and seminar presentations.

Evidence based on analysis

Availability of national policy on ICT

Ghana has developed a national framework on which the deployment of ICTs in the education sector is to be based. This framework is contained in the Information Communications Technology for Accelerated Development (ICT4AD) document (Republic of Ghana, 2003). The ICT4AD policy seeks to provide a framework in which information and communication technologies will be used to transform the educational sector, allowing all Ghanaians to pursue quality life long learning opportunities regardless of their geographical location. The policy is an ambitious plan requiring technology expertise, infrastructure, and commitment on the part of politicians, educational administrators and educators to implement. The policy identified the Ministry of Education, Science and Sports, the universities, polytechnics, colleges of education, and research institutions, as well as local and foreign educational and training provision organizations (multilateral institutions and Non-Governmental Organization) as the key implementation agencies, players, and stakeholders. The Ministry of Education is in the process of developing a new 'ICT in Education Policy' (MOE, 2006) to replace the one developed in 2003 in order to outline strategies and implementation procedures and modules that would guide the development and deployment of ICT across the educational system.

Types of ICT use by educators and learners

At the pre-tertiary level, Core ICT instructors and, to a limited extent, Science teachers reported using ICT for teaching and learning purposes. The ICT instructors used the Microsoft Office suite, Encarta Encyclopedia, the Internet, and typing software in their instructional activities. In all the pre-tertiary institutions under the study, teachers who claimed they used ICT for teaching and learning did not use same for lesson delivery because the computer laboratories were not equipped with digital projectors and other presentation equipment. The few teachers who reported using ICT in instruction to a limited scale were mathematics graduates from UEW. These were mostly the Core ICT instructors. Almost all other teachers do not use ICT for teaching and learning at the pre-tertiary schools.

At the UEW, however, ICT literate educators use the Internet for searching for teaching and learning materials which they integrate in their lessons. They also use the Microsoft word processor for preparing lesson plans, typing examination papers, and lesson notes. Most ICT users use PowerPoint and digital projectors for lesson delivery in their classrooms. Some use Yahoo Messenger, and Skype to communicate with their learners on a regular basis, but cell phones remain the most common media for communication with students because most students do not have reliable access to the Internet. Educators (all faculty members) use online student information system to record students' grades.

In the pre-tertiary institutions, almost all the ICT teachers indicated that the Internet has been a main source of teaching and learning materials, which they used for their lesson planning. In the UEW, faculty stated that the use of ICT has enhanced the quality of lesson preparation, delivery and assessment. They claimed that the use of the Internet to get new ideas to incorporate in lessons has enriched the content of their instruction.

At the pre-tertiary level, the common types of ICT used by learners are computers, CDs and mobile phones. The major type of ICT use by the learners is for purposes of word processing. Students learn to type their pieces of work given as assignment in ICT lessons, but have no opportunity to print out hard copies due to lack of printers. In two of the pre-tertiary schools, students use Mavis Beacon typing software to practice their typing skills. They also use Microsoft Encarta encyclopedia for learning spelling and grammar, and search for information about their subject area content.

ICT training in pre-service teacher education programmes

The study showed that at the pre-tertiary levels, teachers are not trained to use ICT for teaching and learning, though the new curricula required that teachers integrate ICT into instruction across the curriculum. Visits to, and interviews with, teachers in some of the colleges of education revealed that the colleges of education were doing little to equip trainees with skills necessary to integrate ICT into teaching during their pre-service teacher training programmes. This study has also shown that the teaching universities are not doing much in this regard.

Only one department in the UEW is offering a programme which trains teachers to teach computer education in secondary schools - the Department of ICT Education at the Kumasi Campus. This department enrolls less than 5% of the university's students. The remaining 95% of the students enrolled by the university take only an introduction course in ICT in order to acquire basic computer literacy skills. This is a general course offered to all students at Level 100 to acquaint them with technology applications commonly found in educational settings. Students are taught basic skills in word processing, spreadsheets, PowerPoint, web quest and how to preview educational software. In addition, the course exposes students to ways of using the computer to enhance classroom instruction, communication and classroom management. This is done in computer laboratories across the universities campuses. Presently the Winneba campus has six labs with a total capacity of over 500 networked computers for students work.

In addition to the general course in ICT taken by all students at Level 100, certain departments offer additional course(s) that require the further use of the computer labs. The students in the Department of Mathematics Education take a 3-credit hour course in ICT each semester and therefore are adequately exposed to teach using ICT. Also students offering Art Education take an ICT course in Graphic Design and Technology and those in Music Education Department take ICT course in Music Technology, which is used for composition.

It can be concluded that over 95% the UEW students, like the trainees in the colleges of education, are not experiencing programmes that will offer them adequate opportunities to develop their pedagogical skills in integrating ICT. This observation had been confirmed by a recent study by the 'ICT in Education Programmes Unit' of the Ministry of Education (MOE) which recommended that the ICT teacher-training syllabi/courses of the colleges of education and the teacher training universities need to be reviewed to ensure that graduates possess the necessary skills needed to support ICT as a subject (core and elective) or use ICT as a means of integration (MOE, 2009).

ICT training in in-service teacher education programmes

The Ghana Education Service is expected to provide ICT in-service training that would empower teachers to effectively use ICT in teaching and learning, but as at the time of collecting the data no such training had taken place. However, at the pre-tertiary level, predominantly the Core ICT teachers reported to have participated in continuing professional development activities that did not exceed 50 hours and included ICT integration. These constitute about 10% of educators, meaning about 90% of pre-tertiary educators are yet to receive ICT related professional training. None of the educators reported to have participated in continuing professional development activities that exceeded 50 hours and included ICT integration.

At the teacher education universities, there were reports of planned school-based in-service training or professional development activities involving ICT. At the UEW most of the faculty had participated in ICT workshops organized by the university to equip staff with basic skills and knowledge in ICT literacy, information management, and to limited extent, to ICT integration across the university curriculum. About 90% of educators reported to have participated in continuing professional development activities that did not exceed 50 hours and included

ICT integration. For continuing professional development activities beyond 50 hours, only 3% reported to have participated in such activities. This means that even at the tertiary level, there is still a lot to be done to empower educators for effective ICT integration across the curriculum.

One thing that is being done to address the situation is the university's Center for Continuing Education programme that gives orientation to newly recruited university faculty. This programme envisages, among other things, to train new faculty to design, develop, and deliver online courses.

Competencies required for ICT use by educators

The results show that most of the educators have limited skills and knowledge in ICT integration for teaching and learning. The few who claim to use ICT integration techniques in instruction basically rely on PowerPoint presentations as if that was the only way to integrate ICT into instruction.

As the pre-service and in-service teacher education programmes failed to provide adequate ICT training that would empower teachers to effectively use ICT in teaching and learning, almost all the educators at the pre-tertiary and tertiary levels indicated that they required training in ICT competencies and skills including the following:

- typing and advanced word processing
- using spreadsheets (or excel)
- using AutoCAD
- using PowerPoint in creating presentations as well as how to present the slides when teaching;
- browsing the internet
- creating multimedia instructional materials using multimedia tools
- creating course websites to upload digital teaching and learning content
- using statistical data analysis packages such as SPSS
- how to use ICT integration techniques in instruction.

Impact of ICT use on teaching and learning

The responses from some of the educators and learners involved in the study point to a positive impact of ICT applications on students' access to knowledge. Some of the students interviewed stated that the use of ICT had equipped them with skills to search for information (from CD-ROMs or Internet) and this had helped them gain more knowledge of some of the things they study in many subjects, increasing their confidence in making contributions during class discussions. They also stated that the use of computer illustrations had helped them in understanding abstract ideas and concepts and the "Mavis Beacon Typing" software had made it easier, cheaper, and quicker for them to learn how to type.

The ICT instructors interviewed did not only confirm that ICT had been helpful in increasing the students' information search skills, but also added that the grammatical and typographical errors in their completed assignments had reduced because of the ability to use the spell and grammar check functions of the word processing program on the computer.

At the UEW, students used the Internet for searching for information, downloading driver software for repairs, and for communication with lecturers and friends. A few also used Microsoft Word for producing their assignments.

Examples of ICT-based productions by teachers and learners

Little documentation produced by learners using ICT is available in the pre-university institutions. None of the students indicated they had used the computer for assignments in subjects other than the Core ICT. Since in many of the schools the assignments are marked on the computer and deleted to free space for other students to work, nothing was available in students' documentation or ICT-based productions. But at the UEW, exhibits of students' computer course assignments were obtained; also samples of assignments in other subjects produced

with the computer were made available to the team. Some faculty observed that the use of ICT tools ease their lesson preparation and delivery, and expand their access to new information from the web. In general, the impact of ICT use on educators at UEW could not be established as very few teachers and faculty actually integrate ICT in their instructional activities.

The factors supporting the use of ICT by educators and learners

The learners and educators stated two factors that support their use of ICT in the institutions. One is the availability of ICT syllabuses/manuals and ICT teachers who are willing to provide them with training. The other is the availability of computers and computer labs which they can access periodically.

The challenges to the use of ICT by educators and learners

Teachers and faculty stated the following as challenges or barriers to ICT use by educators:

- Limited number of computers available in the schools and computer labs

- Unreliable power supply,

- Network related challenges - lack of connectivity, frequent internet breakdown/disruptions, high down-time of equipment,

- Frequent breakdown of computers

- Lack of interest from some of the students in the use of the computers in the teaching-learning process. This is due to the fact that two or more students have to share one computer during lessons.

- Poor knowledge in the use of ICT in the teaching-learning process

- Lack of Internet connectivity in most of the schools. This makes it impossible to access information on the web.

- Lack of resources like LCD projectors and specialized computer software for teaching the various subjects.

- Poor maintenance of the existing machines

- Lack of interest of some of the heads of institutions and school management in ICT integration.

- The lack of administrative support and incentives for innovative faculty who integrate ICT into their instructional activities and for their students' learning.

In addition to the above challenges, the students reported the following:

- poor maintenance of the existing machines;

- low speed of PCs and low storage capacity at the pre-tertiary levels,

- limited access time, lab not opened at weekends and after classes,

- limited technical support

- the inadequacy of the core ICT in meeting students' ICT literacy requirements.

ICT use for management and administration and its impact on education management practices

ICT use for management and administration purposes is largely for storage of students' and personnel records (student admission and academic records, and personnel records) and preparation of documents. The pre-tertiary institutions use the West African Examinations Council (WAEC) Examination Registration Software for registering candidates for the national and international examinations administered by WAEC. The finance offices at the pre-tertiary level used MS Excel or some other spreadsheets application for processing and keeping students' financial records. None of the pre-tertiary institutions had a website or official e-mail account for communication and dissemination of information. They still relied on letters and telephone for this purpose.

At the pre- tertiary level, the impact of ICT on administration was restricted in part by the limited ICT knowledge and skills of school administrators and managers. However, the responses from these administrators showed that schools are moving away from hardcopy file system to computer-based processing and storing of data and information, particularly with regards to students' admission, academic records, fees, and personnel records.

At the tertiary level, ICT is employed in carrying out most administrative tasks. But the biggest impact of ICT use for management has been on processing students' academic records. At the UEW, faculties enter examination scores online using the students' online information management system, which is used in processing the students' grades. This has tremendously reduced computational errors in students' results and grades.

Gender equity in access to ICT, ICT usage and access to ICT training opportunities

In Ghana, and many African countries, it appears ICT use is a male dominated job and some ICT relates jobs that were initially occupied by women have been taken over by men. Since women's limited access to ICT would certainly result in negative educational and economic outcomes, a major concern of this study is to examine ICT and gender related issues. This is because the little research that exists in sub-Saharan Africa focus on the barriers to women's access and use of ICT but does not explore the nature of the women's ICT expertise and usage (University of Montreal, 2006).

At both the tertiary and the pre-tertiary levels male educators and learners in each institution outnumber the females. Overall, about 25% or less of the educators in the institutions are females, while about 40% or less of the learners are females. Generally, it was observed that the people in charge of the computer labs and information processing rooms in the institutions' administration were all men. Women were rarely assigned ICT monitoring or teaching duties.

Though no differences were observed at the pre-tertiary level in the amount of time male and female learners use of ICT for academic purposes, a wide proportional gap of 0.56 was observed for learners at the tertiary level. That is, at the tertiary level (i.e. UEW), the average ICT usage (hours per week) for academic purposes among the males learners was about twice that of the females (average of 19 hours per week for female and 34 hours per week for male).

For the educators, not much difference was observed in the amount of time male and female learners use ICT for academic purposes at the pre-tertiary level, since the technology is generally not being used across the curriculum. However, at the tertiary level, male educators average ICT usage (hours per week) for academic purposes was three times that of the female educators (average of 8 hours per week for female and 24 hours per week for male). At the pre-tertiary level, very few (i.e. under 5%) of the female educators had participated in continuing professional development activities that did not exceed 50 hours and included ICT integration. None of the female educators reported to have participated in continuing professional development activities that exceeded 50 hours and included ICT integration. This means, that the GES has a lot to do at the pre-tertiary level to ensure gender equity in ICT usage and integration across the curriculum.

At the tertiary level, almost all the female educators reported to have participated in continuing professional development activities that did not exceed 50 hours and included ICT integration, but none for continuing professional development activities beyond 50 hours. This means that even at the tertiary level, there is still a lot to be done to empower educators for effective ICT integration across the curriculum.

Initial National Dialogue Workshop Held in the Ministry of Education Conference Room, Accra on April 15, 2009

Stakeholders in attendance

	Stakeholders	Number Present
1.	Active members of the PanAf Observatory national research team	3
2.	High level members of the team, such as the focal point or director of the partner institution	4
3.	Managers from the 5 schools participating in the study	4
4.	Education ministry representatives (involved in ICT integration in curriculum and pedagogy)	6
5.	ICT ministry (or Telecommunications / Industry) representatives	2
6.	Educators / their representatives engaged and invested in the pedagogical integration of ICTs	3
7.	Civil society representatives (local and international NGOs active in ICT4ED)	10
8.	Private sector representatives (local and international ICT companies and funders)	2
	Total	34

Objectives for Workshop

The workshop was aimed at affording stakeholders an opportunity to

- Share the National Report and communicate specific recommendation for changes to policy and practice identified by the research team through analysis of data collected on the PanAf Observatory during Phase 1 of the project

- Examine the specific recommendations raised in the research particularly relevant to the national context

- Identify challenges and successes in Phase 1

- Identify and discuss specific objectives for continued dialogue with decision-makers.

Recommendation from Various Stakeholders

The national workshop looked the research report in two panel groups and came out with the following recommendations and suggestions for phase 2 of the project:

Ministry of Education (MOE)

- By requiring integration of ICT in teaching and learning, schools and **Distance Education Centers** will need to acquire, maintain and sustain their ICT facilities and resources. The Ministry of Education should make budgetary allocations annually to maintain, replace, and expand ICT facilities and resources in the schools.

- At the university level, students ICT user fees and GET Fund should be maintained as the main source of funding for ICT projects. Besides, the university should source funding from donors to support its ICT initiative.

- Software for processing students' examination results, teaching, learning, assessment, and monitoring students' performance should be purchased for use at the various levels of pre-tertiary education. Interactive tutorials on Technology Professional Development (TPD) for teachers would help them to acquire the essential skills and knowledge for integrating ICT in their instructions.

- A scheme should be put in place to encourage teachers to acquire their own computers. There should be a collaboration between Ministry of Education and Ministry of Communication to assist teachers to acquire these computers and their accessories

- Pre-tertiary institutions should be given adequate resources and encouraged to organize school-based in-service training in ICT usage.

- Ghana Education Service (GES) should establish a reward system for rewarding innovative teachers who use ICT for teaching and learning.

Curriculum Research and Development Division (CRDD)

CRDD representative reported that the new does not only introduce ICT as core and elective courses, but has embedded ICT integration in all the other subject areas. The workshop agreed that the problem on the ground is that most of the ICT instructors are not trained teachers, and therefore lack the necessary pedagogical skills and knowledge. Such teachers teach basic computer skills and literacy with little applications. The issue is thus not a curricular one, but more of lack of appropriate ICT integration training and pedagogical alignments. Even though there is rhetoric about the integration of ICTs in the introductory part of the syllabuses, the ways that these tools could be integrated into teaching and learning were not stated in the content of the syllabuses.

Teacher Education Division (TED)

- Need to review ICT programmes of the teacher education institutions to enable prospective teachers to develop ICT integration skill.

- Tertiary Teacher Education (colleges of Education and UEW) programmes should include at least one course taken via the online mode to develop the teachers' capacity to use ICT tools

Discussion Group observed that teaching online is a long term dream, because as at now ICT infrastructure in Ghanaian schools is weak, particularly Internet connectivity is unreliable and expensive, educators' ICT skills and knowledge are low, and no Course Management Systems are available in almost all colleges and universities.

Schools

- Managers of institutions should endeavour to encourage their staff to attend in-service training in ICT integration.

- Past students associations, NGOs and PTAs should be encouraged to get more actively involved in supporting schools in setting up computer labs and increasing the number of computers and accessories

- Government/Ministry of Education/Ghana Education Service should be the main source of funding for institutional ICT infrastructure, facilities and resources

Group 2
Recommended Objectives for Phase 2 of the Project

The group made the following recommendations for consideration as objectives for the project phase 2, which were endorsed by participants:

- Find means and strategies of supporting heads of institution in addressing the identified challenges in phase 1

- Set the technology competence standards and benchmarks for teachers and learners

- Identify software packages that can be adopted for the teaching of the core subjects (Mathematics, Languages, Integrated Science, and Social Studies) at all levels

- Design and develop model lessons that use appropriate modern instructional strategies, which meet the diverse learning styles and needs of digital learners (Project-Based Learning or PBL, Inquiry-Based Learning or IBL, Connected Learning, and Authentic Assessment Models could be adopted in a student-centered learning environment)

Conclusion

The ratio of students (and educators) to computers per institution was found to be very high. At the SHS level there was an average of about 30 students to a computer and 50 students to a computer at the tertiary level. Similarly, at the SHS level there was an average of about 3 educators to a computer and 1 educator to a computer at the tertiary level. In view of the limited ICT facilities that were available in the institutions and the fact that in most subjects teachers do not use ICT in their instructional activities, the managers, educators and learners involved in the study could not say much about the impact of ICT applications on work in the various institutions**.** That is, very little evidence was available to conclude on improvements in administration, classroom practice and students' academic outcomes due to the use of ICT.

Recommendations

Ministry of Education (MOE)

- By requiring integration of ICT in teaching and learning, schools will need to acquire, maintain and sustain their ICT facilities and resources. The Ministry of Education should make budgetary allocations annually to maintain, replace, and expand ICT facilities and resources in the schools.

- At the university level, students ICT user fees and GETFund should be maintained as the main source of funding for ICT projects. Besides, the university should source funding from donors to support its ICT initiative.

- Software for processing students' examination results should be purchases for use at the various levels of pre-tertiary education

- A scheme should be put in place to encourage **teachers to acquire their own computers**

- Pre-tertiary institutions should be given adequate resources and encouraged to organize school-based in-service training in ICT usage.

Curriculum Research and Development Division (CRDD)

- There is a need to **review the core ICT curriculum** in pre tertiary education **to make it more functional**

- There is a need to **review all pre tertiary education programmes** in a **manner that will enable teachers to integrate ICT** in their instructional delivery

- There is a need to introduce into School-Based Assessment (SBA) the use of ICT to produce at least one assignment using computer application software.

Teacher Education Division (TED)

- Need to **review ICT programmes of the teacher education institutions** to enable prospective teachers to develop ICT integration skill.

- **Pre-service programmes should include at least one course taken via the online mode** to develop the teachers' capacity to use ICT tools

Schools

- Managers of institutions to should ensure they organize school-based in-service training in ICT usage for their staff.

- Past students associations, NGOs and PTAs should be encouraged to get more actively involved in supporting schools in setting up computer labs and increasing the number of computers and accessories

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Appendix

Existing ICT facilities and resources

Table 2 and 3 shows the results of the survey on existing ICT facilities and resources in the institutions involved in the study.

Table 2   Number and types of computers available and software installed

Institution	Number of Computer Labs	Number of Computers for learners	Type of Computers	Software Installed
Asuansi	1	23	P2 & P3 mixed refurbished	• Microsoft Office Suite (2003 and 2007) • AutoCad MS Encarta • CoralDraw Photoshop • Mavis Beacon Typing Software
Ayirebi	1	25	P2 & P3 refurbished	• Microsoft Office Suite and • Encarta
Obrahire	1	35	P2 refurbished	• Microsoft Office Suite (largely MS Word and little MS Excel), • Coral Draw, and AutoCAD
Tamale	2	64	P2 refurbished	• Microsoft Office Suite (Word processing: Word, Spreadsheet: Excel, database management system: Access, presentation: PowerPoint), • Mavis Beacon typing software, • Encarta encyclopedia,
UEW, Winneba	10 of which 6 are networked	500	P4 multimedia	• Microsoft office suite (Word, Excel, and PowerPoint), • AutoCAD, • Multimedia editing software, courseware and authorware, • Online student information system software, • Subject specific software for courses in some departments: e.g. Mathematics Department uses Maple, MatLab, Derive 6; Science Department uses. The COACH for physics, etc.; Music Department used

Table 3   Internet connectivity, students to computer ratio and educators to computer ratio

Institution	Internet connectivity	Other resources	Student to computer ratio	Educators to computer ratio
Asuansi	no	• nil	34:1 (64/19)	3:1 (60/23)
Ayirebi	no	• nil	8:1 (200/25)	1:1 (14/25)
Obrahire	no	• nil	23:1 (810/35)	6:1 ((32/5)
Tamale	Yes, only 4 computers	• nil	28:1 (1794/64)	1:1 (85/64)
UEW, Winneba	Yes, in most labs and offices	• Printers in offices, • digital projectors in labs and departments, • scanners and/or photocopiers.	46:1 (24982/500)	1:1 (322/400)

Table 3   Ghana-Country ICT Development Indices (IDI)

ICT Price Basket 2008					
Rank	ICT-Price Value (% GNI per Capita)	Fixed Value (% GNI per Capita)	Mobile Value (% GNI per Capita)	Broadband Value (% GNI per Capita)	GNI PER capita (USD)
125	40.5	9.5	12.0	131.0	590

ICT Development Index (IDI) 2007 (2002)	
Rank	Index
114 (122)	1.63 (1.10)
IDI Access Index 2007 (2002)	
123 (148)	1.72 (.82)
IDI Use Index 2007 (2002)	
124 (122)	.13 (.03)
IDI Skills Index 2007 (2002)	
117 (119)	4.48 (3.82)

Source: **ITU (2009). ICT Development Index: Measuring the Information Society**