Information And Communication Technology Usage By Junior High School Students In Ablekuma Central Sub-Metro District, Accra

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Abstract: Information and Communication Technology in the education policy of Ministry of Education made it mandatory for all students to be proficient in ICT literacy skills before coming out of each level of education in Ghana. In furtherance of this policy, ICT was made examinable at both the Basic Education Certificate Examination (BECE)and Senior School Certificate Examination (SSCE). The study examined the extent and character of Junior High School students' involvement and interaction with ICT outside the normal school settings in Ablekuma Central sub-metro district of Greater Accra. A researcher-designed questionnaire was used to collect data for the study. Reliability analysis and test-retest carried out on the questionnaire produced Cronbach's alpha value of 0.814 and 0.79 validity coefficient. Random Stratified Sampling was used to select 123 students from a group of 564 Junior High School students during the summer of 2014.The study found the public Internet café to be a central activity for Junior High School students in accessing and using ICT outside the traditional school settings. Results of the study also confirmed that ICT has some gender attributes that favoured boys in some way such that its access and usage tend to be biased toward the interest and fashions of boys in a manner that made them more confident and more likely to use ICT than girls.

Keywords: BECE, Cronbach alpha, ICT, Junior High School, public Internet Cafes,reliability, SSCE, validity coefficient

1 INTRODUCTION

Acommittee set up by the Ministry of Education, Youth and Sports outlined an ICT in education policy framework which made it mandatory for students to acquire ICT literacy skills before coming out of each level of education in Ghana (Mangesi, 2007). In furtherance of this policy, ICT was introduced at the Basic Education Certificate Examination (BECE) and Senior High School Certificate Examination (SSCE). Students learned specific skills related to using the computer, such as keyboarding skills, ethical uses of computers, or application packages, but these skills are tied to their involvement and interactions with ICT. Previous studies (Chen, Boase&Wellman, 2002; Lima, 2006; Tapscott, 1998) established that few researches had been done about how the Internet was being used in developing countries by students under 18. Available research on students' use of ICT primarily described and examined the potential of the Internet within the traditional educational system (Bernfeld, 1998; Mioduser, Nachmias, Lahav& Oren, 1998). It is widely accepted today that much of students' learning takes place in other settings than school such as the home, community centres, special interest groups, diverse cultural experiences, and public Internet cafes (Turkle, 1995). Nevertheless, most research efforts seldom took into account the fact that the real impact of ICT and the Internet on youngsters might come from outside the traditional school settings (Shashaani, 1997). The trend in differentiation in access and use of ICT between boys and girls started early (Collis, Kass&Kieren, 1989; Fetler, 1985). Studies by World Links (2001) confirmed the persistence of gender inequality in access to ICTspecifically in Ghana, Mauritania, Senegal and Uganda. Traditionally, in these areas, girls had less access to school because, as often argued, they will go into marriage anyway and simply stay at home.

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One deterrent noted repeatedly was the traditional role of girls at homes with responsibilities that limited their access time to ICT. The additional relevant questions being raised by the impact of ICT on youngsters' learning and social life relates to equity issues ingeneral and those involving gender in particular. A necessary conclusion therefore is that new research channels should be unlocked to study students' learning processes particularly outside school, and to assess the extent to which ICT use is connected with school-based activities and demands.

1.1 Research Questions

The following research questions were formulated for the study:

(a) Is there any gender difference in the extent of ICT usage outside school by JHS students
(b) Is the location where JHS students use Internet the most based on gender?
(c) To what extent will accessibility of ICT and perceived competence in ICT combine together to influence the skills in mastery of the Internet by JHS boys and girls?
(d) What are the perceived barriers in learning ICT by JHS students?

1.2 Significance of the Study

It is expected that the findings, suggestions and recommendations of this study would be useful to policy makers, educational planners and administrators, organisations such as Ghana Education Service, Ministry of Education, the West African Examinations Council and other Information and Communication Technology related institutions in the teaching and learning of ICT at basic school level. By understanding the needs of students and benefits of ICT studies, teachers and parents would gain more information on the role they should play in supporting JHS youngsters in ICT. The study could therefore be a significant endeavour in investigating challenges and providing recommendations useful in planning the study of ICT for JHS boys and girls. It could serve as a resource material for similar studies in future in view of the sparse nature of studies of this kind in the country.

1.3 Limitations of the Study

Participation in The Call Consult (TCC) ICT facility where the study was conducted was purely voluntary and therefore happenings at the centre might not be binding on all JHS students in the sub-metro, and may also not necessarily represent the situation in both public and private JHSs in the sub-metro. The study focused on characteristics of JHS youngsters' involvement and interaction with ICToutside the normal school settings such as home, community facilities, and Internet cafes, and in all these instances the focus was on the use of Internet and personal computers only and did not cover other aspects of ICT. The study sample (123 JHS students) was obtained from a non-traditional school setting and was devoid of the characteristics of a normal structured school environment. Chi-square test was used in determining whether there was relationship of some sort between variables without giving some sense of the strength of this relationship. Further analysis might be necessary to determine if some other factors accounted for the relationship. It is therefore safe to state that the results of the study cannot be conclusive.

2 REVIEW OF RELATED LITERATURE

2.1 ICT and Gender Equity

Analysis of student participation at all levels of education revealed that women were significantly underrepresented in the area of Information and Communication Technology. According to DiDio (1996), recent studies in Australia showed that girls were more inclined than boys to see IT as boring. These factors resulted in more boys than girls studying technology related subjects. Traditionally, girls have less access to school because, as often argued, they will go into marriage anyway and simply stay at home. Consequently, it is no surprise that in many developing countries men have attained a higher level of education than women. At the same time, even as more girls gain access to schools, greater stereotypes are reproduced as part of a 'hidden curriculum' and in the distinct career paths followed by boys and girls (Nartey, 2000). Brunner (1997) in another study found that whilst young women were not participating in ICT subjects at school to the same extent as their male counterparts, this did not meanthat they were not interested in computer technology. And that girls and women used computer technology widely but in different ways to boys and men. Girls would use ICT for social reasons such as chatting and meeting people whereas boys were inclined to be more interested in playing games, hacking and learning about technology. In terms of educational interest, Brunner suggested that computer technology needed to be introduced to girls as doing something specific rather than as an end in itself. A study by The Commonwealth Department of Education, Training and Youth Affairs (1999) found that girls were falling behind boys in attainment of advanced ICT skills, despite showing considerable interest in computer technology. Girls and boys were equally competent in basic computing skills, which they tend to develop at school. The study also found that where girls did not learn advanced computer skills at home, they tend not to acquire them at all and that girls relied heavily upon school to learn advanced computer skills, which boys tend to learn outside school. Where such skills were not taught at school, girls were the disadvantaged. How ICT subjects are taught in schools has a major impact on girls' attitudes towards these subjects, according to Newmarch, Taylor-Steele and Cumpston, (2000) who found that girls considered ICT subjects to be too theoretical, rigidly structured and boring. Girls, in the study commented that they found working on individual projects to be less rewarding and satisfying than working on group projects. A focus on software packages that girls associated with secretarial work was also a disincentive for interest in ICT subjects. Computers do not intimidate girls, however, venturing into male dominated areas such as computer programming, computer science or computer engineering may be intimidating. Girls needed to know that their approach to, and use of ICT is valid and valuable to the society. Research has shown that peer group, family, education, industry and media all affect girls' self-perceptions. This perspective is reflected to some extent in the ICT environment in Africa. It has been argued that the digital divide in Africa is also a gender divide, as evidenced through extensive differential access, use, and production of digital technologies between girls and women in comparison with boys and men. A study commissioned by World Links (2010) found that, in reality, it is harder for girls to access computer laboratories, particularly in Uganda, Mauritania, Senegal and Ghana, especially after school hours. Curfews coupled with traditional domestic responsibilities were enough challenges to limit their access time. Most of the literature reviewed spanned the period 1996 to 2010. A significant body of these works demonstrates that ICT is not gender neutral. Few girls as compared to boys access and use ICT. Girls continue to be underrepresented in ICT courses, computer clubs and ICT-based careers. Challenges that constrain girls' access to ICT include high illiteracy rates, low educational levels among girls, and lack of skills training. Girls' access to ICT may also be limited by the location and logistics of public ICT facilities, such as information centres and cybercafés. Despite many successful initiatives and literature, gaps remain with regard to studies on girls' access and use of ICT particularly outside the school settings. Situating these facilities is often decided without considering the constraints for women and girls, such as inappropriate opening times (including evenings), security issues and lack of transport. As a result, public ICT facilities have a tendency to become men-only spaces; effectively inhibiting women's and girls' access.

2.2 Role models

Studies have cited the lack of positive IT role models for young women, both real and within fictional popular culture, as problematic. Those that are available tend to reinforce negative stereotypes of IT workers. Popular culture tends to portray workers in the computer technology sector as socially inept, isolated, working in sterile environments or as obsessive and sometimes sinister personalities. The few popular culture movies that showed women actively engaged with computer technology depicted them as encountering danger or harassment as a result of their technology use (Rowan, Knobel, Bigum&Lankshear, 2002). The absence of female role models has been identified as an important deterrent for women considering a role in sectors not traditionally viewed as 'female friendly.' According to Organisation for Economic Co-operation and Development [OECD] (2006), studies have shown that female teachers have more negative attitudes towards computers and greater anxiety about them which may affect girls' perspectives. And that young people typically make critical career decisions between the ages of 13 years and 17 years. At this point in their education they orientate towards or

away from science and technology studies. An analysis of education data shows that at the age of 15 years, both girls and boys have roughly the same preferences and ability in science and technology. But as they progress towards adulthood, girls generally drop out of science, engineering and technology to pursue other subjects. According Gannon (2008), girls and boys show differences in how they perceive computer science studies and careers. Girls more often associate the concept of ICT with hardware, algorithms and programming; whereas boys are more likely than girls to see ICT as socially-oriented. Despite having equally good – or better – grades as male counterparts in mathematics, science and technology subjects, girls are often actively discouraged by families, teachers and career advisors from pursuing further studies or careers in the field. Similarly, while girls enjoy their chosen uses of computers, there is some evidence that they contrast these practices with stereotyped images of male computer users, IT companies and IT professionals: the connectedness and digital mobility that girls take up for pleasure in their everyday lives do not carry into perceptions of IT workplaces as potentially enabling of cool and connected working lives (Gannon, 2008). Available evidence according to Lipman-Blueman (1975) on the actual career patterns of young women have been attributed to (a) girls' perception of mathematics related careers example, engineering and technology as incompatible with family responsibilities, and (b) the absence of female role models in the scientific profession that require a lot of mathematics. According to Fox (1976), stereotyping career requiring a lot of mathematics as male domain, might not be attractive to females especially to adolescent girls whose socialization has effectively emphasized the importance of marriage and family priorities for them. The study also showed that in the Soviet Union about 40% of all scientific workers were women. Barauch (1974) again found mother's employment to be an important variable in a girl's career choice. They act as role models. According to Byrne (1991) there is no empirical evidence to support the theory that if women role models are available, there would be more female participation in scientific and technical training. She asserted that the critical 'positive' influence of several successful females had been those of male mentors. She therefore claimed that if there is equal mentorship for both males and females, women would be equally influenced. The traditional gender-linked behaviour learnt at home is also reinforced in the classroom, at workplace and on the playground (Goodale, 1989). The study on socio-cultural factors and similar ones on gender equity by Grandfield (1996), and Goodale (1989) all go to buttress the fact that it is difficult to put female and male differences on nature exclusively. Both work to influence behaviour and choice. It can therefore be stated without any fear of contradiction that with the right attitudes to science and mathematics more females might be made to take courses that lead to Information and Communication Technology.

3METHODOLOGY

The study employed descriptive survey method. The subjects of the accessible population for the study were 564 JHS students admitted to do long vacation ICT training at The Call Consult between June and September, 2014. It comprised 334 boys and 230 girls. The basis for selecting The Call Consult (TCC) was due to its proximity and convenience and also, being the only ICT resource facility that mounts free ICT training for JHS students in the Ablekuma Central sub-metropolitan district in the Greater Accra region. According to Amedahe (2002), for most quantitative studies, a sample size of 5% to 20% of the population size was sufficient for generalisation purposes. Stratified sampling technique was therefore used to select 123 students (51 girls and 72 boys) to form the sample size for the study. A researcher-designed questionnaire was used as the main instrument for the study. The questionnaire design was developed in three phases. The first phase consisted of 12 JHS students who were selected for an open-ended interview in order to obtain detailed description of students' attitude, motivation and patterns of ICT use. Information from the interviews was used to construct 56 questionnaire items which were mostly scored on a 5-point Likert type scale. A few items in open-ended format were included in the questionnaire. The use of different response formats was to guard against a stereotyped response set (Bowling, 2002). The second phase of the design of the questionnaire involved pilot testing of the questionnaire in order to test its reliability and validity. It was conducted at Agricultural and Rural Development (ARD) IT Centre in the Ayawaso Central sub-metro district in Accra in May, 2014 where 33 JHS students (17 boys and 16 girls) were selected for the pilot test. Both ARD and TCC collaborate to run free ICT training for JHS students using West African Examinations Council (WAEC) ICT syllabus. Reliability analysis on 56 items of the questionnaire was carried out using IBM SPSS Statistics 20. According to Churchill (1999), an item was considered for elimination during reliability analysis, if (a) it had a low or negative "corrected item total correlation coefficient," or (b) the deletion of an item improved the reliability coefficient. At the end of reduction of the fifth pool of items, alpha coefficient improved from 0.775 with 56 items to 0.814 with 51 items. The estimated Cronbach's alpha suggest how perfectly reliable most items are and that the questionnaire would measure the same way (true score) each time it was used under the same condition with the same subjects (Field, 2005). The high reliability coefficient for the instrument indicates that the items on it are very similar to each other in content (homogeneous). It also indicates how highly dependable and consistent items on the questionnaire will measure a characteristic. The third phase of the questionnaire design involved test-retesting. It was done to indicate the repeatability of response scores with the passage of time and how the estimate would reflect the stability of the characteristic or construct being measured by the test. Two weeks after the pilot test the questionnaire was again administered on the sample of 33 JHS students. The two measurements were labelled test X and text Y. The correlations between the two separate measurements test X and test Y produced values (a) 0.815 (at interval of 0.713 to 0.893 with 95% confidence) (Appendix B) and (b) 0.775 (at interval of 0.650 to 0.872 with 95% confidence) respectively (Appendix C). The validity of the two tests was assessed using intra-class correlation coefficients. In the mixed model for the Average Measure Intra-class Correlation, the non-existence of rater-performance interaction is assumed (Guttman, 1945). A questionnaire is 'valid' if it examines the full scope of a research question in a balanced way. In this case, a valid questionnaire measures what it aims to measure (Black, Brazier, Fitzpatrick & Reeves, 1993). The validity coefficient relates directly to the reliability of both the tests scores and corresponding criterion scores. The following formula shows

how the reliability of scores on a test influences the maximum possible validity coefficient:

$$r_{x,y} = \sqrt{(r_{x,x})(r_{y,y})} \quad (1)$$

In the given formula, r_{xy} refers to the theoretical maximum validity correlation between scores on tests X and Y, r_{xx} refers to the reliability correlation between test-retest scores for test X, and r_{yy} refers to the correlation between test-retest scores for test Y. The maximum value for the validity coefficient becomes important when the reliability of either the test or criterion scores remains unknown (Guttman, 1945).

Thus,

$$r_{x,y} = \sqrt{(0.815)(0.775)} \quad (2)$$

$$= 0.794261$$

The high estimated validity coefficient of 0.79 indicates how beneficial and confident one could have in using the questionnaire to make specific conclusions or predictions about respondents (U.S. Department of Labour Employment and Training Administration, 1999). Descriptive and inferential statistics were used for analysing the survey data. Gender difference was analysed using the chi-square test, t-test, F-test of independence, and ANOVA. In addition, a stepwise linear regression was conducted on proficiency in Internet usage as the dependent variable, with ICT access, and varied ICT usage characteristics as independent variables.

4 RESULTS AND DISCUSSIONS

A total of 123 Junior High School students completed the questionnaire. Table 1 shows the gender distribution of participants.

TABLE 1
DEMOGRAPHICS OF RESPONDENTS (N=123)

Gender	Frequency	Percent (%)
Male	72	58.5
Female	51	41.5
Total	123	100.0

Source: *Survey Data, 2014*

4.1 Research Question 1

The formulated research question is stated as following: Is there any gender difference in the extent of Internet usage outside school by JHS students? Table 2 shows results of SPSS procedure of chi-square test conducted on Internet use by JHS students based on gender. The test produced chi-square test value $\chi^2(3, N=123)=17.486$, $p<0.05$ with likelihood value of 0.001 at 5% level of significance.

TABLE 2
CHI-SQUARE TESTS OF INTERNET USE AND GENDER

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	**17.486[a]**	**3**	**.001**
Likelihood Ratio	18.079	3	.000
Linear-by-Linear Association	12.528	1	.000
No. of Valid Cases	123		

The proposition tested is expressed as:

H_o: there is no significant difference in the extent of Internet use outside school between genders in the population of JHS students

H_1: there is significant difference in the extent of Internet use outside school between genders in the population of JHS students

From Table 2 the likelihood for the chi-square test value of 17.486 is 0.001. Since the likelihood value 0.001 is far less than 5% (0.05) level of significance, the null hypothesis (H_o) is rejected. The conclusion is that there is a significant difference in the extent of Internet use outside school between genders in the population of JHS students. This result, therefore, suggest that JHS boys tend to spent more time using the Internet outside school than JHS girls.

4.2 Research Question 2

Research Question 2 is stated as: Is the location where JHS students use Internet the most based on gender? The output in Table 3 indicates that majority of the respondents (62.6%) reported they use public Internet Café outside school and were mostly JHS boys.

TABLE 3
LOCATIONS FOR INTERNET USE OUTSIDE SCHOOL (n=123)

Location	Male (%)	Female (%)	Total (%)
Home	19.4	49.0	31.7
Internet café	72.2	49.0	62.6
friend's house	8.3	2.0	5.7
Total	100	100	100

Source: *Survey Data, 2014*

The chi-square analysis conducted on location where JHS students use Internet the most produced chi-square value($\chi^2(3, N=123)=12.933$, $p<0.05$) with likelihood value 0.002 (2%) at 5% level of significance (Table 4).

TABLE 4
CHI-SQUARE TESTS OF LOCATION FOR INTERNET USAGE

	Value	Df	Asymp.Sig. (2-sided)
Pearson Chi-Square	**12.933**[a]	**2**	**.002**
Likelihood Ratio	13.176	2	.001
Linear-by-Linear Association	12.492	1	.000
N of Valid Cases	123		

The proposition tested is expressed as:
H_o: there is no significant difference in the location where Internet is used the most between JHS boys and girls
H_1: there is significant difference in the location where Internet is used the most between JHS boys and girls

Since the likelihood value 0.002 is less than 5% level of significance, the null hypothesis (H_o) is rejected. It can therefore be inferred that there is relationship between location where Internet is used the most and gender in the population of JHS students. The results also demonstrate that JHS boys use Internet more than girls at locations outside the school.

4.3 Research Question 3

The Research Question is expressed as: To what extent will accessibility of ICT and perceived competence in ICT combine together to influence the skills in mastery of the Internet by JHS boys and girls? Table 5 shows SPSS summary output of regression conducted on factors that influence Internet usage by JHS boys and girls outside school. A Stepwise Linear Regression was conducted on *netskills* (proficiency in Internet use) entered as the dependent variable. Only three factors *netfreq*, *pcusefreq*, and *ICTcompetence*entered and influenced the dependent variable *netskills*.

TABLE 5
REGRESSION OF FACTORS THAT AFFECT INTERNET USAGE OUTSIDE SCHOOL BY JHS STUDENTS

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.665[a]	.443	.438	.932
2	.701[b]	.491	.482	.895
3	**.714**[c]	**.510**	.498	.881

a. Predictors: (Constant), *netfreq*

b. Predictors: (Constant), *netfreq*, *pcusefreq*

c. Predictors:(Constant),*netfreq*,*pcusefreq*, *CTcompetence*

d. Dependent Variable: *netskills*

This suggests that regression is an involved process, and therefore, only output in bold are discussed.The strength of the relation between the dependent variable and the three predictors is explained by the regression coefficient of 0.714. It suggests a strong positive relationship between expertise in Internet use; and ICT accessibility (frequency of PC use, frequency of Internet use), and ICT competence. The result confirms that the three predictors strongly influence the skills in Internet use by JHS students outside their schools. The coefficient of determination (R^2=0.51) indicates that the three predictors together explain about 51.0% of the variance of the dependent variable and that other factors account for about 49.0% of the variation. Interpretation of SPSS output for research question 3 is further discussed by analysis of variance (Table 6). The proposition for the research question is stated as:

H_o: the regression coefficient is zero
H_1: the regression coefficient is not zero (the regression coefficient is significantly different from zero)

Table 6.
ANALYSIS OF VARIANCE

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	99.577	4	24.894	**32.979**	**.000**[a]
Residual	89.073	118	.755		
Total	188.650	122			

a. Predictors:(Constant), *netfreq*, *ICTcompetence*, *pcusefreq*

b. Dependent Variable: *netskills*

Table 6 shows the analysis of variance of the dependent variable (*netskills*) and the three predictors (*netfreq*, *ICTcompetence*, *pcusefreq*). It also shows the probability (0.000) as measured by F-test which confirms a significant relation between the dependent variable and the independent variables since it is far lesser than the 5% level of significance. This further confirms that ICTcompetence, frequency of PC use, and frequency of Internet usage together determine how proficient the JHS student uses the Internet outside school.

4.4 Research Question 4

The research question is stated as: What are the perceived barriers in learning ICT by JHS students?

TABLE 7
PERCEIVED BARRIERS IN LEARNING ICT BY JHS STUDENTS (n=123)

Item	Gender	Strongly agree (%)	agree (%)	Un decide (%)	disagree (%)	strongly disagree (%)
PCqty	M	52.8	4.9	0	0	0.8
	F	36.6	4.9	0	0	0
Software	M	25.2	8.1	0	22.0	3.3
	F	16.3	2.4	0	21.1	1.6
Netaccess	M	52.8	4.9	0	0	0.8
	F	36.6	4.9	0	0	0
Power	M	30.1	10.6	0	8.9	8.9
	F	15.4	12.2	0	11.4	2.4
Fewtuition	M	14.6	4.1	14.6	0	25.2
	F	16.3	1.6	5.7	4.1	13.8
Maint.	M	24.4	16.3	8.1	0	9.8
	F	6.3	18.7	2.4	0	13.8
TutorQ	M	11.4	20.3	8.9	0	17.9
	F	9.8	14.6	2.4	0	14.6

Source: *Survey Data, 2014*

The results in Table 7 indicates most JHS students perceive lack of Internet access (about 99.2%) and inadequate PCs (about 99.2%) as obstacles to teaching and learning ICT at school. On the other hand, about 50% to 60% of the students are of the view that inadequate software, and unreliable power supply, and irregular ICT maintenance are barriers to learning ICT by JHS students at school. Significantly, no student disagreed with the perception that inadequate PCs, lack of Internet access, insufficient ICT teaching and learning periods, coupled with irregular maintenance of ICT equipment are obstacles in learning ICT at school by JHS students.

5 Conclusions

Gender difference was evident regarding most aspects of the results of the study. Data analysed on gender equity in ICT usage showed that ICT usage was not gender neutral in most aspects. In general, more boys used ICT more extensively than girls did and also boys perceived themselves more competent in ICT skills than girls. The gender difference in the results of the study was found to be consistent with previous studies. Bimber(as cited in Isman&Celiklin, 2009) showed that computers had some gender attributes that favoured boys in some way and that its usage had been known as biased toward the interests and fashions of men so that boys were more confident and likely to use computers than girls. The general feeling on the focus of integration of ICT into Junior High School education is more in the formal school arrangement. According to Nachmias, Mioduser, and Shemla (2001) the school by its organisational set up can be characterised as highly structured that operated on strictly well-defined set of objectives in order to foster social equity. This arrangement might be defined as non-democratic. In contrast to this is the cyber world with a culture that could be perceived as excessively democratic, non-structured and highly individualistic. The conclusion that was drawn from this scenario was the fact that the public Internet cafes, widespread in most communities, prevailed during the study as a central activity for JHS youngsters in “outside” school settings for the involvement and interactions in ICT activities. This study identified the Internet cafés as the most significant location that influenced usage of the internet among JHS students. This affirms the fact that the role of public Internet cafes could no longer be overlooked in the teaching and learning of ICT among JHS students. From the study, all respondents agreed that there were inherent impediments in the teaching and learning of ICT at JHS at school. By these indications, it was safe to say that JHS students were not comfortable with the kind of ICT teaching and learning environment at school, and also the kind of ICT tuition they received from teachers. Another constraint was that girls by their traditional role in developing world, had responsibilities that limited their access time to ICT use. Girls’ access to ICT could also be limited by the fact that the location and logistics of public ICT facilities, such as cybercafés, were often decided without considering the constraints for girls, such as inappropriate opening times (including evenings) and security issues. As a result, public ICT facilities had the tendency to become men-only spaces; effectively inhibiting women’s and girls’ access according to Katz (1997) and Lima (2006).

6 Recommendations

1. Stakeholders in education need to reconsider the school as the society’s only foremost ICT teaching and learning nerve centre and communication facilitator. The Ghana Education Service (GES), Parent Teachers Associations (PTAs) and other stakeholders in ICT education must build on the JHS students’ prevalent interest in ICT by increasing investments in access of ICTs outside school through empowerment of existing well-structured private Internet cafes and other ICT-enabled facilities such as community communication centres.
2. For many reasons, science and ICT are perceived as masculine domain. Indeed, findings of this study corroborates with suggestions that computers have some gender attributes that tend to favour boys in some way so that boys are more likely to access and use ICT more than girls. It is clear that the potential of ICT to empower girls and foster equality between boys and girls has not been entirely harnessed. There is the need for policy makers and other stakeholders in JHS education to promote greater understanding of the gender dimensions of access to and use of ICT, and the importance of using ICT as a tool for the promotion of equality between boys and girls. The Ministry of Education and GES should create more spaces through Science, Technology and Mathematics Education (STME) clinics where girls and young women are able to speak for themselves, especially to break the culture of silence around their situations. Projects should be initiated on the ground that will facilitate the creation of content by girls, increase their ownership and control over ICT, and bring about greater benefits for them.
3. Girls, compared to boys, are more influenced by role models in their environment – whether ‘close’ role models such as parents, teachers and family or ‘distant’ role models such as famous actresses and musicians. The lack of ICT-oriented role models can be a dissuading factor for girls: their role models might not see ICT studies or ICT careers as female-friendly. Exposing girls more to ICT-oriented role models by school authorities and PTAs can be one of the numerous areas where improvements could be made to encourage JHS girls to participate more actively in ICT.

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9 APPENDICES

9.1 APPENDIX A: STUDENT QUESTIONNAIRE

Demographic Data

1. What type of school do you attend?
   - ○1 public
   - ○2 private
2. In which form are you?
   - ○1 JHS1
   - ○2 JHS2
   - ○3 JHS3
3. What is your gender?
   - ○1 male
   - ○2 female
4. Do you intend to take a career in ICT in future?
   - ○1 yes
   - ○2 no
5. Do you intend to write ICT at BECE?
   - ○1 yes
   - ○2 no

Items on Access to ICT

6. Do you use a PC "out of school"? If no, go to item no. 10.
   - ○1 yes
   - ○2 no
7. How often do you use a PC "out of school" per week?
   - ○1 Everyday
   - ○2 At least 5 days
   - ○3 At least 3 day
   - ○4 At least 1 day
   - ○5 Never
8. Where do you use the PC the most?
   - ○1 home
   - ○2 Internet cafe
   - ○3 a friend's house
   - ○4 resource centre
9. Who helps you most when using the PC "out of school"?
   - ○1 class mate
   - ○2 family member (parent / brother / sister)
   - ○3 Internet personnel
   - ○4 friend
   - ○5 no one
10. Do you use the Internet?
    - ○1 yes
    - ○2 no
11. Do you have access to Internet "out of school"? If no go to item no. 15.
    - ○1 yes
    - ○2 no
12. How often do you use the Internet "out of school" per week?
    - ○1 Everyday
    - ○2 At least 5 days
    - ○3 At least 3 day
    - ○4 At least 1 day
    - ○5 Never
13. Where do you use Internet the most "out of school"?
    - ○1 Home
    - ○2 Internet cafe
    - ○3 a friend's house
    - ○4 resource centre
14. Who helps you the most when using Internet "out of school"?
    - ○1 class mate
    - ○2 family member (parent / brother / sister)
    - ○3 Internet personnel
    - ○4 friends
    - ○5 no one

Perceived Inadequacies in ICT Use at School

15. Do you perceive any inadequacies in ICT use in your school? If no, go to item no. 17.
    - ○1 yes
    - ○2 no
16. What is your opinion on perceived barriers in learning of ICT by JHS boys and girls at school? Please, place the mark (√) in the circle of the given scale to indicate your opinion.

Perceived inadequacies in	Strongly Agree	Agree	Disagree	Strongly disagree	Undecided
a. Computers	○1	○2	○3	○4	○5
b. Software	○1	○2	○3	○4	○5
c. Internet access	○1	○2	○3	○4	○5
d. power supply	○1	○2	○3	○4	○5
e. ICT period	○1	○2	○3	○4	○5
f. Maintenance	○1	○2	○3	○4	○5
g. ICT tutors	○1	○2	○3	○4	○5

Extent and Character of ICT Usage

17. How often do you use the PC for the following aims: Please, place the mark (√) in the circle of the given scale to indicate your opinion.

Aim for PC Use	Every day	At least 5 days	At least 3 days	At least 1 day	Never
a. Games	○1	○2	○3	○4	○5
b. Word processing	○1	○2	○3	○4	○5
c. Spreadsheet	○1	○2	○3	○4	○5
d. Database	○1	○2	○3	○4	○5
e. School works	○1	○2	○3	○4	○5
f. Graphic design	○1	○2	○3	○4	○5
g. Presentation	○1	○2	○3	○4	○5
h. Internet	○1	○2	○3	○4	○5

18. How often do you use the Internet for the following purposes? Please, place the mark (√) in the circle of the given scale to indicate your opinion.

Aim for Internet Use	Everyday	At least 5 days	At least 3 days	At least 1 day	Never
a. to gather information	○1	○2	○3	○4	○5
b. to do homework	○1	○2	○3	○4	○5
c. to play games	○1	○2	○3	○4	○5
d. to send and receive email	○1	○2	○3	○4	○5
e. to listen to music	○1	○2	○3	○4	○5
f. to chat	○1	○2	○3	○4	○5
g. to browse entertainment sites	○1	○2	○3	○4	○5
h. to access social network	○1	○2	○3	○4	○5

19. How often do you use the Internet at the following locations? Please, place the mark (√) in the circle of the given scale to indicate your opinion.

Locations for using Internet	Always	At least 5 days	At least 3 days	At least 1 day	Never
a. Home	○1	○2	○3	○4	○5
b. resource centres	○1	○2	○3	○4	○5
c. Internet café	○1	○2	○3	○4	○5
d. friend's home	○1	○2	○3	○4	○5
e. other places	○1	○2	○3	○4	○5

Student's Perception of ICT Knowledge

20. How would you rate your level of knowledge in ICT?
    - ○1 Very competent
    - ○2 Competent
    - ○3 Little knowledge
    - ○4 Very little knowledge
    - ○5 No knowledge at all

21. How would you rate your skills in the use of ICT for the following purposes? Please, place the mark (√) in the circle of the given scale to indicate your response.

ICT skills	Very C'petent	C'petent	Little	Very little	Not at All
a. use Internet to do assignment	○1	○2	○3	○4	○5
b. access news on Internet	○1	○2	○3	○4	○5
c. communicate with Internet	○1	○2	○3	○4	○5
d. analyze information on Internet	○1	○2	○3	○4	○5
e. use word processor	○1	○2	○3	○4	○5
f. use spreadsheet	○1	○2	○3	○4	○5
g. use database	○1	○2	○3	○4	○5

9.2 APPENDIX B: Intraclass Correlation Coefficient for Test X

	IntraclassCorrelation[a]	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.080[b]	.046	.143	5.416	32	1600	.000
Average Measures	.815[c]	.713	.895	5.416	32	1600	.000

9.3 APPENDIX C: Intraclass Correlation Coefficient for Test Y

	IntraclassCorrelation[a]	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.063[b]	.035	.118	4.442	32	1600	.000
Average Measures	.775[c]	.650	.872	4.442	32	1600	.000