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Assessing Computer Knowledge in Senior High School: A Case Study of the Upper East Region in Ghana

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Abstract: Problem statement: This study contracted with assessing the knowledge of computer in Senior High Schools of the Upper East Region in Ghana. **Approach:** Data collected by means of administration of questionnaire brings out the level of computer knowledge expected from a student completing a Senior High School in the Upper East Region in Ghana. 140 sample students from 8 districts were selected for the study. **Results:** Hypotheses were tested at $\alpha = 0.05$ while the analyses of data were presented through SAS and SPSS. General Linear Model (GLM), post ANOVA and Least Significant Difference (LSD) were also used. **Conclusion:** The study revealed that an average student in Senior High School of the Upper East Region can not pass in computer subject. The research further revealed that gender has no influence on the level of computer knowledge of a student. This indicates that the level of computer knowledge of males and females is not significantly different.

Key words: Computer knowledge, senior high school, variance, ANOVA, grade, hypothesis, percentage, gender

INTRODUCTION

Computers are powerful educational tools that when properly employed will undoubtedly transform Ghana educational system by changing the contents of education and the nature of learning processes in Senior Secondary Schools in Ghana. Computers have the potential to help students to solve problems, think for themselves and collaborate with others. Some critics of educational technology have drawn conclusions for current educational technology based upon previous technologies. Others have argued that technology will never influence learning Oppenheimer, Postman, Tyack and Cuban, Clark[1,3-5]. These criticisms have been the catalyst for research into instructional methods and educational technology, as they must be linked by the very nature of education Kozma[2]. Computer science is a sub set of integrated science which is made up of introductory biology, physics, agriculture, chemistry and computer in senior high schools in Ghana.

Students completing senior high schools are therefore not fully assessed on basic computer knowledge as it forms a very small integral part of their external assessment in integrated science. A student with no computer knowledge can still make a very good grade in integrated science.

Looking at the importance of computers in this modern World has necessitated the need to assess the level of computer knowledge a student completing senior high school acquires before completion.

This study then wish to determine the level of computer knowledge a senior high school student acquires before completion, establish the differences in computer knowledge of senior high schools students across districts, establish if any of the differences in computer knowledge between males and females of senior high schools, establish if the presence of a computer laboratory has got an influence on level of computer knowledge in senior high schools and lastly generate data for future research.

Research hypothesis: Attempts were made to test the following hypotheses:

Hypothesis one: Districts versus Districts

H_{o1}: There is no significant difference in the level of computer knowledge across districts of the Upper East Region.

Hypothesis Two: Males versus Females

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H_{o2}: There is no significant difference in the level of computer knowledge between Males and Females.

Hypothesis three: Schools with computer laboratory versus Schools without computer laboratory

H_{o3}: Students from schools with computer laboratory and student from schools without computer laboratory have the same level of computer knowledge.

Historical background on introduction of computers and ICT into senior secondary schools (senior high schools) in Ghana: The application of Information and Communication Technology (ICT) in schools is perceived as a means for transforming teaching and learning processes and has thus been met with significant enthusiasm. The developing world also perceives ICT as a tool that will promote socioeconomic, political and sustainable development. This perception underpins the introduction of computers and the internet in some secondary schools in Ghana.

Computer literacy is not an optional luxury but a fundamental part of the development needs of the school and of the country as a whole. It is a key to the goal of improving performance on the West African Examination Council (WAEC) exams, notably in Math, Integrated science and English. It can be a useful educational tool for all areas of the syllabus.

Computer literacy advances best not by copying what others have done elsewhere but in finding solutions appropriate to local circumstances. So for example, instead of training students on one particular word processor such as Microsoft Word, the goal is to give students a broad based understanding of word processors and the Graphical User Interfaces (GUIs) behind them. Computer literacy should be a hands-on activity. The students' primary focus of attention should be on the computers, not on the instructor.

Education policymakers in Ghana have hailed the introduction of Information and Communication Technology (ICT) in Ghanaian secondary schools as a remarkable step that will contribute to knowledge production, communication and information sharing among students and teachers in the school system. This perception stems from assertions in the literature about the benefits that come with ICT literacy in schools[13,14] points out that ICT is a transformative tool and its full integration into the school systems is necessary to prepare students for the information society they will inherit. Contrary to the promising notion of ICT as a means of knowledge production, numerous scholars have highlighted the need to address the numerous problems that the introduction of ICT will bring.

These issues include: lack of adequate planning for implementation of ICT[7]; inadequate teacher training, inequalities in ICT distribution[9,10]; lack of information regarding the distribution of ICT; low levels of literacy in general and lack of relevant content and technology applications to meet the needs of diverse societies[12,14].

Educational policy makers, Non-Governmental Organizations (NGO), bilateral and multilateral donor organizations and school administrators are making the collective efforts to promote ICT in Ghanaian secondary schools. Because of the efforts of NGOs and donor organizations in particular, ICT facilities have extended to some schools.

The National ICT Policy and Plan Development Committee met with the President and members of the National House of Chiefs on Thursday, the 28th of November 2002 as part of the National Consultative exercise aimed at developing an ICT-driven socio-economic development policy and plan. During the meeting some of the key comments and observations made by chiefs are the following:

There is no doubt that ICT could play a major role in facilitating Ghana's development. There is a need for the country to embrace ICT if it is to achieve its developmental goals in the new information age.

The Ghana ICT for accelerated development process is extremely important and this could lead to the reconstruction of the economy.

The nation's successes in pursuing an ICT-led development agenda will to a large extend depend on the youths. The youths should therefore be equipped with the necessary skills to help them develop and move the nation forward. Basic literacy of the population will be playing a key role in the ICT for development process. There is therefore the need to address issues relating to the illiteracy rate of the country. The countries that have developed made it partly through high literacy rates of their populations. The Malaysian and Singaporean success story can to some extent be attributed to those nation's high literacy rates and skilled manpower.

Population of the study: The research covered seven districts in the Upper East Region. Name of selected school, district and location in each region are shown in Table 2, in which the total population is 140 students.

Sampling techniques: Two sampling techniques (stratified sampling and multistage sampling) were used in the sampling process. The whole sampling process was randomly done. No particular school was chosen for a particular purpose. All schools were considered equal in terms of infrastructures and teachers.

Instrumentation: Only primary data was collected as there was no past record on the performance of students in computer in schools. This was due to the fact that computer was not an independent subject in Senior High Schools. The primary data was collected using an appropriate designed questionnaire.

Validation of the instrument: The selection of the schools and the students was purely random. All schools had equal opportunity of being selected. All form three students irrespective of their course and class had equal chances of selection. The sampling unit was obtained by just randomly calling any form three students.

Data analysis procedure: Data collected was coded and entered into SAS and SPSS where all the analyses were done. All hypothesis were tested at the 95% confident interval (Significant level of $\alpha = 0.05$). If the calculated significance is less than the $\alpha = 0.05$, then we fail to accept the null hypothesis (H_o), otherwise the alternative hypothesis (H_1) is rejected in favor of the null hypothesis.

The tools that will be used during the analysis will include Analysis of Variance (ANOVA), Student T-Test and Post ANOVA.

General description of variables: The data collected were coded and entered into excel. It was then transported into SPSS and SAS where appropriate analyses were made. The data collected was coded under 13 variables. The variables and their respective number of levels and meaning are displayed in the Table 12 data below.

Description of variables: The marks obtained by individual students in the test conducted during the data collection process were marked out of 100. The new West African Senior School Certificate Examination (WASSCE) grading system is displayed in Table 9 and 10 below. Most analysis will be in reference to this grading system. (Source: http://www.ghanawaec.org)

Preliminary analysis:

General performance: The research conducted revealed that the average Senior High School student in the Upper East Region will score about 31% which by the new West African Senior School Certificate Examination (WASSCE) grading system is equivalent to F_9 (Failure). This is an indication that the general performance was very poor and all stakeholders who mater in terms of computer teaching in Senior High Schools, especially in the Upper East Region should sit-up.

The general performance of the 140 students sampled in term of the new West African Senior School Certificate Examination (WASSCE) grading system, is displayed in Table 9.

From Table 9 below, as much as 107 students representing 76.4% of the total sample size failed, by the new West African Senior School Certificate Examination (WASSE) grading system. This leaves only 33 students representing 23.6% to be distributed among the other grades. The distribution of the grades across the districts is shown on the Table 9.

From the Table 10 below indicates that the best performance came from the Talensi-Nabdam District with the worse performance coming from the Builsa district as all students sampled from this district failed. The detailed performances with regard to the various variables are discussed below.

Performance across districts: A total of seven districts were considered in the research process. The mean marks scored by student in the various districts are displayed in Table 2.

From the Table 2 it can be seen that Talensi-Nabdam District recorded the highest mean score followed by Kasena-Nankana District with Builsa District scoring the least.

By the new West African Senior School Certificate Examination (WASSCE) grading system, in exception of Talensi-Nabdam district where an average SHS student can score grade C_6 (Credit), an average SHS student from the other six districts will score grade F_9 (Failure).

Performance based on gender: The mean mark score of males and females are displayed in Table 1 below.

Table 1: Marks of students * sex of student

Sex of student	Mean mark	Number
Male	32.77	70
Female	28.57	70
Total	30.67	140

Table 2: Marks of students * district

District	Mean mark	Number
Talensi-Nabdam District	55.40	20
Bolgatanga Municipal	26.10	20
Bongo District	27.75	20
Bawku West District	25.45	20
Bawku Municipal	22.65	20
Kasena-Nankana District	39.90	20
Builsa District	17.45	20
Total	30.67	140

Table 3: Marks of students * computer usage

Computer usage	Mean mark	Number
Yes	35.87	94
No	20.04	46
Total	30.67	140

Table 4: Marks of students * computer lab

Computer lab	Mean mark	Number
Yes	34.36	100
No	21.45	40
Total	30.67	140

Table 1 reveals that the mean mark scored by males is slightly higher than that of females even though their respective mean scores will both yield a grade of F_9 (Failure). This is an indication that the general performance of both males and females in Senior High School in computer is very poor.

Frequency distribution of students based on whether they have ever used a computer before: Students were asked whether they have ever used a computer before. Their frequency distribution based on the responses they gave is displayed in Table 3.

In the Table 3, it is clear that about 67% of the students sampled out for this research have ever used a computer as against 33% who had never used the computer.

Performance based on accessibility to computer laboratory: Students were asked whether they had a computer laboratory or not. Table 4 display their frequency distributions and their respective mean mark scores.

Table 4 indicates that out of the 140 students sampled, 100 of them representing about 72% had access to a computer laboratory while the remaining 40 students representing about 28% did not have a computer lab in their respective schools. Their mean marks in term of accessibility are displayed in Table 4.

Table 4 shows that students who have access to computer laboratory perform slightly better than students with no access to a computer laboratory. Even though the mean mark scored by either category of students is nothing to write home about, there is still a possible indication that availability of computer laboratory to students may be a contributive factor to their knowledge in computer. This will be tested in the further analysis to verify if the availability of computer laboratories in schools is a real factor of computer knowledge.

Table 5: Marks of students * practical work

Practical work	Mean mark	Number
Yes	37.29	80
No	21.85	60
Total	30.67	140

Table 6: Marks of students * no. of computer teachers

No. of computer teachers	Mean mark	Number
0	17.45	20
1	27.75	20
2	24.05	40
4	47.65	40
5	26.10	20
Total	30.67	140

Performance based on practical lessons: During the research it came out that even though some schools had a computer laboratory, they did not give their student the opportunity to visit the laboratory for practical lessons. Table 5 below gives a frequency distribution and their respective categorical mean mark scores.

There is an indication that 57% of the 140 students sampled have practical lessons as against 43% who did not have practical lessons. Comparing the percentage number of students, who had practical lessons to the percentage number of students that had access to a computer laboratory, shows that it had reduced from 72 to 57%. This is a clear indication that some students are been denied their right to practical lessons even though they paid to use the facility. The performance of the students in each category is displayed as shown in Table 5.

Performance of both categories of students was poor as can be seen from Table 5. An average student who attends practical computer lesson will score about 37% which will yield grade F_9 (Failure). The least said about the students who did not practical lessons the better. Table 5 and 9 give reasons to believe that having practical lessons will improve a student's knowledge in computer. This may be due to the assertion by many people that 'practice makes man perfect'.

Performance based on the number of computer teachers: Students were asked to indicate the number of computer teachers they had in their respective schools. Their responses are displayed in Table 6 below. Their frequencies and average mark score of each category are put together on the same chart.

From Table 6, it can be seen that 40 students had 2 teachers in their school and another 40 had 4 teachers in their schools. 20 students did not have a computer teacher in their school. The highest mean mark score came from the category of students who had 4 computer teachers, with the lowest mean mark score recorded by the category of students with no computer teacher. It

might be expected that the more the number of computer teachers in a school, the better the knowledge they impact as the teacher to student ratio will be low. But it must also be noted that individual differences among the teachers, in term of method, skill and knowledge are possible factors that may sway this pattern.

Performance based on time spent per practical lesson: Table 7 displays the performance of students based on the amount of time spent per practical lesson.

It is believed that the more time spent on practical lessons the better the performance of students in computer. It is therefore not surprising that this pattern has been displayed by the above chart with the category of students who spent one hour per practical lesson recording the highest mean mark while the category of students who do not have practical lessons scored the least mean mark. By the new West African Senior School Certificate Examination (WASSCE) grading system, an average student who spends one hour per practical lesson will score grade E_8 (pass). This could be an indication that the amount of time spent per practical lessons had an influence on the general performance in computer.

Performance based on number of students per a computer: Students were required to indicate the number of them that use one computer at a time during practical lessons. Their frequency distribution and mean mark score for each category is displayed on the Table 8.

The pattern indicated by Table 8 shows that the lower the ratio the better the performance as the mean mark score for the category of students who sit two to a computer is the highest. As usual the mean mark of students who do not have practical lessons is lowest. This could be due to the fact that as the ratio becomes smaller, it gives more opportunity to the students to have access to the computer thereby increasing their understanding.

Further analysis: During the preliminary analysis it was suspected that some factors were responsible for the poor performance. This section will seek to further analyze these factors to confirm or disprove the suspected claims such as males perform better than females, category of students who have access to a computer laboratory perform better than the category of students who do not have access to a computer laboratory and that the district in which a student attends school has an influence on his/her performance. There were numerous factors that were suspected to have an influence on performance of students in computer as discussed in the preliminary analysis. But for the purpose of this study, only the availability of a computer laboratory, gender of the student and the district to which a student belongs will be considered.

Table 7: Marks of students * hours per visit

Hours per visit	Mean mark	Number
30 min	33.83	40
1 h	40.75	40
Others	21.85	60
Total	30.67	140

Table 8: Marks of students * ratio of student to computer

Ratio of student to computer	Mean mark	Number
1-to-2	41.58	40
1-to-5	33.00	40
Others	21.85	60
Total	30.67	140

Table 9: Grade of students (remark)

Grade (remark)	Frequency	Percent	Valid (%)	Cumulative (%)
F_9 (fail)	107	76.4	76.4	76.4
E_8 (pass)	10	7.1	7.1	83.6
D_7 (pass)	4	2.9	2.9	86.4
C_6 (credit)	6	4.3	4.3	90.7
C_5 (credit)	3	2.1	2.1	92.9
C_4 (credit)	3	2.1	2.1	95.0
B_3 (good)	1	0.7	0.7	95.7
B_2 (very good)	2	1.4	1.4	97.1
A_1 (excellent)	4	2.9	2.9	100.0
Total	140	100.0	100.0	

Table 10: Grade of students (remark) * district cross tabulation

	Districts							
Grade of students (Remark)	Talensi-Nabdam District	Bolgatanga Municipal	Bongo District	Bawku District	Bawku West District	Kasena-nankana Municipal	Builsa District	Total
F9 (fail)	5	18	17	18	17	12	20	107
E8 (pass)	2	1	3		2	2		10
D7 (pass)	2	1				1		4
C6 (credit)	2			1		3		6
C5 (credit)	1				1	1		3
C4 (credit)	3							3
B3 (good)				1				1
B2 (very good)	2							2
A1 (excellent)	3					1		4
Total	20	20	20	20	20	20	20	140

Table 11: Grade of students (remark) * computer lab cross-tabulation

	Computer lab		
Grade of students (remark)	Yes	No	Total
F9 (fail)	69	38	107
E8 (pass)	10		10
D7 (pass)	4		4
C6 (credit)	5	1	6
C5 (credit)	3		3
C4 (credit)	3		3
B3 (good)		1	1
B2 (very good)	2		2
A1 (excellent)	4		4
Total	100	40	140

Table 12: Data

Id	Sex	Age	District	RG of RES	Use Comp	Comp Lab	Prt Wrks	Hours per vist	Ratio	No. Comp Tchs	Tchs Pfs	Mark
120	1	18	1	UER	1	1	1	2	2	4	2	76
110	2	18	1	UER	1	1	1	2	2	4	3	27
112	1	19	1	UER	1	1	1	2	2	4	3	58
111	1	18	1	UER	1	1	1	2	2	4	2	88
113	1	20	1	BAR	1	1	1	2	2	4	1	81
114	1	20	1	UER	1	1	1	2	2	4	2	80
115	1	19	1	NR	1	1	1	2	2	4	4	48
116	1	17	1	UER	1	1	1	2	2	4	1	24
117	1	18	1	UER	1	1	1	2	2	4	2	60
118	1	20	1	UER	1	1	1	2	2	4	4	78
109	2	18	1	UER	1	1	1	2	2	4	2	42
108	2	19	1	UER	1	1	1	2	2	4	2	57
107	2	18	1	UER	1	1	1	2	2	4	1	25
106	2	18	1	ASR	1	1	1	2	2	4	2	51
105	2	19	1	UER	1	1	1	2	2	4	1	51
104	2	18	1	UER	1	1	1	2	2	4	2	66
103	2	19	1	UER	1	1	1	2	2	4	4	31
102	2	18	1	UWR	1	1	1	2	2	4	4	67
101	2	19	1	NR	1	1	1	2	2	4	1	31
119	1	19	1	UER	1	1	1	2	2	4	3	67
100	1	25	2	UER	1	1	1	2	3	5	2	39
81	1	22	2	UER	1	1	1	2	3	5	4	28
82	1	20	2	UER	1	1	1	2	3	5	5	1
83	2	19	2	UER	1	1	1	2	3	5	4	9
84	1	19	2	UER	1	1	1	2	3	5	5	31
85	2	18	2	UER	1	1	1	2	3	5	1	34
86	2	22	2	UER	1	1	1	2	3	5	4	9
87	2	17	2	UER	1	1	1	2	3	5	1	40
88	2	19	2	UER	1	1	1	2	3	5	2	15
89	2	19	2	UER	1	1	1	2	3	5	4	26
90	2	20	2	UER	1	1	1	2	3	5	1	15
91	1	25	2	UER	1	1	1	2	3	5	5	35
92	2	19	2	ASR	1	1	1	2	3	5	1	34
93	2	18	2	ASR	1	1	1	2	3	5	2	33
94	1	19	2	ASR	1	1	1	2	3	5	2	33
96	1	29	2	UER	1	1	1	2	3	5	1	33
97	1	19	2	UWR	1	1	1	2	3	5	2	54
98	1	24	2	UER	1	1	1	2	3	5	5	20
99	2	20	2	UWR	1	1	1	2	3	5	3	16
95	1	20	2	UER	1	1	1	2	3	5	3	17
80	2	18	3	UER	1	1	1	1	2	1	5	25
61	1	20	3	UER	1	1	1	1	2	1	5	33
62	1	18	3	UER	1	1	1	1	2	1	1	37
63	2	20	3	UER	1	1	1	1	2	1	3	43
64	2	20	3	UER	1	1	1	1	2	1	1	34
65	2	18	3	UER	1	1	1	1	2	1	5	39
66	1	24	3	UER	1	1	1	1	2	1	2	47
67	2	19	3	UER	1	1	1	1	2	1	5	10

Table 12: Continued

68	1	20	3	UER	1	1	1	1	2	1	4	23
69	1	18	3	UER	1	1	1	1	2	1	3	12
70	1	18	3	UER	1	1	1	1	2	1	1	14
71	2	20	3	UER	1	1	1	1	2	1	5	27
72	2	21	3	UER	1	1	1	1	2	1	3	20
73	1	22	3	UER	1	1	1	1	2	1	5	47
74	1	17	3	UER	1	1	1	1	2	1	5	38
75	2	17	3	UER	1	1	1	1	2	1	3	34
76	2	23	3	UER	1	1	1	1	2	1	5	23
77	1	21	3	UER	1	1	1	1	2	1	5	17
78	1	20	3	UER	1	1	1	1	2	1	2	19
79	2	19	3	UER	1	1	1	1	2	1	5	13
41	2	18	4	UER	2	2	2	4	4	2	3	25
42	1	22	4	UER	2	2	2	4	4	2	1	59
43	1	18	4	UER	2	2	2	4	4	2	3	25
44	2	19	4	UER	2	2	2	4	4	2	3	20
45	1	23	4	UER	2	2	2	4	4	2	3	15
46	1	25	4	UER	2	2	2	4	4	2	1	10
47	1	24	4	UER	2	2	2	4	4	2	4	7
48	1	20	4	UER	1	2	2	4	4	2	2	71
49	2	18	4	UER	2	2	2	4	4	2	1	11
50	2	19	4	UER	2	2	2	4	4	2	2	24
51	1	19	4	UER	2	2	2	4	4	2	1	17
52	2	18	4	UER	2	2	2	4	4	2	2	30
53	2	19	4	ASR	1	2	2	4	4	2	1	12
54	1	22	4	UER	2	2	2	4	4	2	4	20
55	1	21	4	UER	2	2	2	4	4	2	3	31
56	2	19	4	UER	1	2	2	4	4	2	2	33
57	2	21	4	UER	1	2	2	4	4	2	3	21
58	2	18	4	UER	2	2	2	4	4	2	2	18
59	1	18	4	UER	1	2	2	4	4	2	5	36
60	2	17	4	UER	2	2	2	4	4	2	3	24
21	2	16	5	UER	1	1	2	4	4	2	2	31
22	1	20	5	UER	2	1	2	4	4	2	3	12
23	1	20	5	UER	2	1	2	4	4	2	4	7
24	2	16	5	UER	1	1	2	4	4	2	3	15
25	2	17	5	NR	1	1	2	4	4	2	5	9
26	2	17	5	UER	1	1	2	4	4	2	5	38
27	2	18	5	UER	2	1	2	4	4	2	4	9
28	1	18	5	UER	1	1	2	4	4	2	2	60
29	2	16	5	UER	1	1	2	4	4	2	2	32
30	1	21	5	UER	2	1	2	4	4	2	1	9
31	1	14	5	UER	2	1	2	4	4	2	5	26
32	2	16	5	UER	1	1	2	4	4	2	1	46
33	1	19	5	UER	2	1	2	4	4	2	1	8
34	1	19	5	UER	2	1	2	4	4	2	3	40
35	1	19	5	NR	2	1	2	4	4	2	5	7
36	1	19	5	UER	1	1	2	4	4	2	4	28
37	1	20	5	UER	2	1	2	4	4	2	3	16
38	2	17	5	UER	1	1	2	4	4	2	3	9
39	2	18	5	UER	2	1	2	4	4	2	4	17
40	2	16	5	UER	2	1	2	4	4	2	2	34
20	1	17	6	UER	1	1	1	1	3	5	3	58
19	1	15	6	UER	1	1	1	1	3	2	3	13
18	1	21	6	UER	1	1	1	1	3	4	4	33
17	1	19	6	NR	1	1	1	1	3	4	4	23
16	1	20	6	CR	1	1	1	1	3	4	4	81
15	1	19	6	UER	2	1	1	1	3	4	5	36
14	1	22	6	UER	1	1	1	1	3	4	3	34
13	1	18	6	UER	1	1	1	1	3	4	3	13
12	1	19	6	UER	1	1	1	1	3	4	5	51
11	2	16	6	UER	2	1	1	1	3	4	4	36
10	2	20	6	GR	2	1	1	1	3	4	5	33
9	2	18	6	UER	1	1	1	1	3	4	4	41
8	2	18	6	UER	1	1	1	1	3	4	1	587
	2	17	6	UER	1	1	1	1	3	4	2	55
6	2	21	6	UER	1	1	1	1	3	4	4	44
5	2	17	6	UER	1	1	1	1	3	4	5	63
4	2	18	6	UER	1	1	1	1	3	4	1	34

Table 12: Continued

3	2	17	6	UER	2	1	1	1	3	4	4	34
2	1	23	6	UER	1	1	1	1	3	4	1	33
1	2	19	6	UER	1	1	1	1	3	4	2	25
140	1	19	7	UER	2	2	2	4	4	0	0	13
139	2	20	7	UER	1	2	2	4	4	0	0	28
138	2	19	7	UER	2	2	2	4	4	0	0	15
137	1	18	7	UER	1	2	2	4	4	0	0	20
136	1	19	7	UER	1	2	2	4	4	0	0	14
135	2	17	7	UER	2	2	2	4	4	0	0	12
134	2	19	7	UER	2	2	2	4	4	0	0	12
133	2	18	7	UER	2	2	2	4	4	0	0	25
132	2	17	7	UER	2	2	2	4	4	0	0	20
131	2	21	7	UER	2	2	2	4	4	0	0	13
130	1	21	7	UER	2	2	2	4	4	0	0	22
129	1	22	7	UER	2	2	2	4	4	0	0	30
128	2	18	7	UER	2	2	2	4	4	0	0	12
127	1	18	7	UER	2	2	2	4	4	0	0	17
126	1	20	7	UER	2	2	2	4	4	0	0	6
125	1	19	7	UER	2	2	2	4	4	0	0	14
124	2	19	7	UER	1	2	2	4	4	0	0	25
123	1	19	7	UER	2	2	2	4	4	0	0	8
122	1	19	7	UER	2	2	2	4	4	0	0	33
121	2	18	7	UER	2	2	2	4	4	0	0	10

Test of hypothesis: All hypotheses were tested using ANOVA in the General Linear Model procedure (GLM). The level of significance is $\alpha = 0.05$.

Rejection region: Reject the null hypothesis in favor of the alternative hypothesis if the probability associated with the F-value (pr > F) is less than $\alpha = 0.05$, otherwise we accept the null hypothesis.

Hypothesis one: Districts versus districts:
Ho: There is no significant difference in the level of computer knowledge across districts of the Upper East Region.

H1: There is difference in the level of computer knowledge across districts in Upper East Region.

Result:
Output 4.0
The SAS System
The GLM Procedure
Dependent variable: MARK

Source	DF	Sum of Squares	Mean square	F-value	Pr>F
Model	6	19850.28571	3308.38095	14.92	<0.0001
Error	133	29500.60000	221.80902		
Corrected Total	139	49350.88571			

Source	DF	Type III SS	Mean Square	F-value	Pr > F
District	6	19850.28571	3308.38095	14.92	<0.0001

Interpretation: From the result displayed above, the Pr>F is less than $\alpha = 0.05$ (that is 0.0001<0.05). This means that we do not have enough evidence to accept the null hypothesis. This is therefore an indication confirming the fact that the district in which a student is schooling has an effect on his/her performance in computer. This pattern was expected as there is no parity in terms of infrastructure and development in the districts.

Post ANOVA: Since there was an indication of a difference, another analysis was performed to find which districts were similar to each other in terms of performance. The option used for this test was Least Significant Difference (LSD) under the comparison of means. The result of the analyses is displayed below.

Output 4.1
The SAS System
The GLM Procedure
t-Tests (LSD) for MARK

Alpha	0.05000
Error degrees of freedom	133.00000
Error means square	221.80900
Critical value of t	1.97796
Least significant difference	9.31550

Means with the same letter are not significantly different

t Grouping		Mean	N	DISTRICT
	A	55.400	20	Talensi-Nabdam
	B	39.900	20	Kasena-Nankana District
	C	27.750	20	Bongo District
D	C	26.100	20	Bolgatanga Municipal
D	C	25.450	20	Bawku West District
D	C	22.650	20	Bawku Municipal
D		17.450	20	Builsa District

Questionnaire:
University for development studies:
Faculty of applied sciences:
Navrongo campus:
Assessing computer knowledge in senior high schools:
A case study of the upper east region:
Please tick the box that is applicable to you
Part A: Personal information

1. Sex Male Female
2. Age ……
3. Form ……..
4. Region of resident ……..
5. Have you ever used a computer? Yes No
6. At what age did you first use a computer? …….
7. At what level did you first use a computer? SHS JHS Primary Others (specify) ……

Part B: General assessment of computer teaching/facilities in the school

1. Do you have a computer lab in your school? Yes No
   1b if no, go to no. 8
2. Do you visit the lab for practical works? Yes No
3. How often do you go there? Once a month Once every two week Once a week Others (specify) …….
4. How many hours do you spend per visit? 30 min 1 h 2 h Others (specify) ……
5. How many computers do you have in your lab? Total Functioning Malfunctioning
6. Is the number of computers enough to satisfy each class at a time? Yes No
7. How many of you use one computer at a time? 1-1 2-1 5-1 Other (specify) ……..
8. How many computer teachers do you have? ……..
9. Is the number adequate for the whole school? Yes No
10. How would you grade the performance of your teacher(s) Excellent Very good Credit Good Poor
11. Do you have access to internet facilities in your school?
12. In your own view what do you think should be done to improve computer studies in your school? ....

Part C: General knowledge in computer

1. What is a computer? …… ……..…… ……..……..
2. Mention two uses of the computer
   i. ……
   ii. ……
3. Define the following:
   a) Input device …… ……..
   b) Output device ……..…… ……
4. List two examples each of the following
   a) Input device: i…….. ii……....
   b) Output device: i……. ii……..
   c) Storage device: i……. ii……..

5. State the full meaning of the following as applied to computer(s)
   a) RAM …….....
   b) ROM …….
   c) CPU ……...
6. Write one function each of the following keys on the keyboard
   a) Arrow keys ……..…… ……
   b) Space bar …….
   c) Caps lock …….
   d) Enter ……
7. Arrange the following in the correct order of opening a Microsoft word window; all programs, Microsoft office, start menu, Microsoft word.
   i) …… ii) …….. iii) …… iv) ……...
8. Mention two Microsoft office tools.
   i …….. ii ……
9. Arrange the following in the correct order of saving a fresh document in Microsoft office; file name, save as, file, save.
   i) …… ii) …… iii) …… iv) ……..
10. State the systematic order of shutting down a computer.
    …… …… ……..

Thank you

Interpretation: From the result above it can be seen that the performance of students from Talensi-Nabdam district differs from the rest of the districts. The same applies to Kassena-Nankana district. Meanwhile the performance of students from Bongo District, Balgatanga Municipal, Bawku West District and Bawku were not significantly different. The same applies to Balgatanga Municipal, Bawku West District, Bawku Municipal and Builsa District.

Hypothesis two: Males versus females:
Ho: There is no significant difference in the level of computer knowledge between Males and Females.

H1: Males have a higher knowledge in computer than females.

Result
Output 4.2
The SAS System
The GLM Procedure
Dependent Variable: MARK

Source	DF	Sum of Squares	Mean square	F-value	Pr > F
Model	1	617.40000	617.40000	1.75	0.1883
Error	138	48733.48571	353.14120		
Corrected Total	139	49350.88571			

Source	DF	Type III SS	Mean square	F-value	Pr > F
SEX	1	617.4000000	617.4000000	1.75	0.1883

Interpretation: From the result displayed above, the Pr>F is greater than $\alpha = 0.05$ (that is 0.1883>0.05). This means that we do not have enough evidence to reject the null hypothesis that there is no significant difference in the level of computer knowledge between Males and Females. We can therefore say that the knowledge of a student is independent on the gender of the student. In other words, it implies that you do not have to be a male or female to have in-depth knowledge in computer.

Hypothesis three: Schools with computer laboratory *versus* schools without computer laboratory:
Ho: Students from schools with computer laboratory and student from schools without computer laboratory have the same level of computer knowledge.

H1: Students from schools with computer laboratory have higher computer knowledge than students from schools without computer laboratory (Table 11).

Result
Output 4.3
The SAS System
The GLM Procedure
Dependent Variable: MARK

Source	DF	Sum of Squares	Mean Square	F-value	Pr > F
Model	1	4761.94571	4761.94571	14.74	0.0002
Error	138	44588.94000	323.10826		
Corrected Total	139	49350.88571			

Source	DF	Type III SS	Mean Square	F-value	Pr > F
COMP- Lab	1	4761.945714	4761.945714	14.74	0.0002

Interpretation: From the result displayed above, the Pr>F is less than $\alpha = 0.05$ (that is 0.0002<0.05). This means that we do not have enough evidence to accept the null hypothesis that Students from schools with computer laboratory and student from schools without computer laboratory have the same level of computer knowledge. In other words we are confirming that students from schools with computer laboratory will have more knowledge in computer than those students from schools without computer laboratory. This may be due to fact that students from schools with computer laboratory will have the chance to undertake practical lessons that will go a long way to enhance their understanding.

CONCLUSION

This study statistically assesses the knowledge of computer among Senior High School students in the Upper East Region of Ghana.

The results of the research indicate that the general performance of students in Senior High Schools of the Upper East Region in computer is very poor. The average mark score (in the test included in the questionnaire) of the 140 sampled students from 7 districts was 30.67 which is equivalent to F_9 (Failure). And 77% of 140 sampled students failed with only 23% pass. This means that an average student in Senior High School of the Upper East Region can not pass in computer assuming it was a gradable subject.

The research further revealed that gender has no influence on the level of computer knowledge of a student. This means the level of computer knowledge of males and females is not significantly different. Meanwhile the district in which a student is attending school and the availability of a computer laboratory to students had an influence on the level of computer knowledge of the students at $\alpha = 0.05$ level of significance. The difference in performance of students across districts may due to the disparity of infrastructure and development in the various districts. It was clear, that students from schools with computer laboratory performed better than those from schools without computer laboratory. This was not surprising as the students from schools with computer laboratory will have practical lessons that will go a long way to increase their understanding as the saying goes "practice makes perfect".

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