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RELATIONSHIP BETWEEN SECONDARY SCHOOL STUDENTS' COMPETENCE IN COMPUTER USE AND PERFORMANCE IN BIOLOGY

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Abstract

Students' performance in Kenya Certificate of Secondary Education (KCSE) examination has always been below average. Several interventions such as content reduction and reorganization, increased time allocation and in-servicing teacher training have been tried but have not borne fruits. Computers, which have become part of our lives are known to be highly efficient effective and versatile. This study investigated the relationship between competence in computer use and performance in biology. The study employed descriptive survey research design. Sample size was 971 students. The study found no relationship between competence in computer use and performance in biology.

Key words: Competence, computer, octile, performance.

1.0 INTRODUCTION

1.1 Background to the Study

Biology deals with the study of living things and how they relate with each other and with their environment. Its inclusion in Kenya's secondary school curriculum is aimed at enabling the learner to understand and deal with the problems of the self the environment, and the future (Republic of Kenya, 2002). The establishment of whether the objectives of teaching biology have been achieved is done through tests and examinations. However, just like other sciences, and in addition to mathematics, performance by secondary school students in biology examinations is generally poor as compared to non-science subjects. Among the reasons given for this poor performance is that biology is generally based on memorization.

In Kenya, the national biology performance in Kenya Certificate of Secondary Education (KCSE) has always been below average as shown in Table 1. In their research on *Factors that contribute to students' poor achievement in KCSE biology in secondary schools of Migori District, Kenya*, Khatete, Ondigi and Owiti (2009) found that the use of inappropriate teaching strategies is the main contributor. This is echoed by CEMASTEA (2012) and Republic of Kenya (2012).

Table 1: National KCSE percentage scores in biology by year

Year	National percentage mean score
1998	29.79
1999	31.21
2000	27.81
2001	27.49
2005	29.63
2006	27.45
2007	41.95
2008	30.32
2009	27.43
2011	32.44
2012	26.21

Source: Kenya National Examination Council (KNEC) (2002, 2007, 2008, 2010), Nation Correspondent (2013)

The poor performance in science (biology included) is a national concern and is articulated in the Session Paper Number 1 of 2005 (Ministry of Education, Science and Technology (MOEST), 2005b). Vihiga is one of the counties that perform poorly in biology, both in pre-KCSE assessment and final examination at the end of form four. For example, in addition to a national mean score of 4.63 in 2008 (Kwega, 2009) and 4.3629 in 2012 (Republic of Kenya, 2012), the biology mean scores in Vihiga County pre-KCSE assessments are as shown in Table 2. The mean scores are very much below average on a 12 point scale. Hence, there is need to put in place strategies that can lead to improvement. This study looked at whether computer use could be one of the strategies. Learners can use the computers in schools, homes or other places such as cyber cafes (Percival & Ellington, 1988). In school, they can use them in class or out of class. Nevertheless, although there is a lot of research on computer assisted instruction, very little research is available to show the influence of the various computer components on the learners' performance in biology, in Vihiga County.

Table 2: Vihiga county biology pre-KCSE mean scores by year

Year	Vihiga county biology mean scores in pre-KCSE assessment out of 12 points
2004	3.74
2005	4.36
2006	4.18
2007	4.37
2011	4.08

Source: Vihiga District (2007), Vihiga County Mock Results (2011)

The computers have a variety of software which can be used for a variety of purposes. Some of the software can be used for general purposes while others can only be used for specific purposes (Laudon, Laudon & Brabston, 2002). The software include word processors such as Microsoft (MS) Word, spreadsheets such as MS Excel, database software such as MS Access, presentation software such as MS PowerPoint, Internet, media software and games. These software have varying features which instill different skills in the learners. For example certain features in word-processing environments can facilitate writing and revising. It is also worth noting that

students' long term acquisition of word processing skills may contribute to the development of new writing styles or skills, influencing their handwriting (Ouston et al, 1992). Most document reading software provide the ability to highlight, add notes, and underline important text. This facilitates understanding of content (Reid, 2011).

Spreadsheets and databases appear as tools for learning mathematical concepts (Haspekian & Bruillard, 2009). Some concepts in biology need application of mathematical knowledge. In relation to Internet, Ogedebe (2012) found a positive correlation between Internet usage and academic performance among Nigerian undergraduates. Awais et al (n.d.) argue that Internet is 'alive', constantly moving, theoretically borderless, potentially infinite space for the production and circulation of information. This information can be true or not. Awais et al add that for effective Internet use, the students need instructor and technical expert support and training opportunities. If not helped the learners may access unnecessary content or waste a lot of learning time. The media software may be harmful or helpful to the learners. For example learners may waste a lot of time listening to music or watching video. Alternatively, the learners may use the software to listen to teachers or watch animated videos, which may concretize biological concepts.

The computer is also a facility for games. The games can be used to teach certain instructional objectives. From the games students can learn skills such as co-operation, quick decision making and so on. If the game is played by more than one student, then the students can acquire interpersonal skills. Mitchell and Savill-Smith (n.d.) point out that there is no causal relationship between gaming and academic performance. In their review they found signs of both positive and negative effects of games. Din and Calao (2001) in their study on the effect of playing educational video games on kindergarten achievement found that while the learners improved in spelling and reading it did not help learners in mathematics learning, perhaps because the children were not ready in terms of maturity. Therefore, the effects of games on performance depend on the subject being considered and the learners' maturity level. The gaming has both positive and negative effects on academics. For example frequent gaming reduces time for homework and makes players to be less positive towards school, which can negatively affect academic performance.

The use of computers in education is categorized into three overlapping terms: learning about computers; learning with computers, where students use computers as a tool; and learning through computers which involves use of computers as an aid for the teacher to do his/her presentation (Serin, 2011). The computers may be used to deliver instruction or as objects of instruction to teach about computers, manage instruction, and for producing reports or handouts (Geisert & Futrel, 2000). Teaching about computers is done in computer studies, computer science and computer literacy classes. In secondary schools teaching about computers is done in a subject called computer studies. However, some students or teachers may learn about them in computer literacy classes or coincidentally while interacting with them.

As a tool, the computer is used as an extension of humans (Jonassen, 1988) and is used to assist the teacher teach more effectively. This mode of learning is called computer based learning (CBL) and the teaching that brings about CBL is called computer based instruction (CBI). Cotton (1997) argues that CBL is broad and refers to virtually any kind of computer use in educational settings, including drill and practice, tutorials, simulations, instructional management, supplementary exercises, programming, database management, writing using word processors and other applications. These terms may refer either to stand alone computer learning activities or to computer activities which reinforce material introduced and taught by the teachers. For example a meta-analysis done by Kulik and Kulik (1991) on 254 studies showed that CBI usually produces positive effects on students' academic achievement and attitude towards computers and teaching. The average effect size in colleges was smallest (0.26) followed by secondary schools (0.32), elementary schools (0.46) and special education (0.56). This could be because developers of CBI programs have been most successful in designing programs to teach elementary skills but not higher order skills emphasized at higher educational levels. Robinette (n.d.) found that low performing students in mathematics improved their scores, attitude and motivation as a result of CBI remediation. Consequently, computers seem to concretize learning by bringing to class situations which are beyond the reach of the learner. Kiboss, Wekesa and Ndirangu (2006), Achuonye (2011), and Akwee et al (2012) have also done research in selected topics in biology and shown that CAI improves academic achievement.

As a tutee, the computer is not used to teach the user nor is it used to control the sequence or type of operation engaged by the user. However, the user controls the computer. Most tutee functions rely on programming languages or translators which enable the user to command the computer to accomplish some desired tasks. Such learners can gain and practice higher order cognitive skills. In so doing the learners become problem solvers and thinkers (Jonassen, 1988). The students who do computer studies in form three and four could be more competent in computer programming than the others. This is because computer programming is taught in form three (KNEC, 2010).

Research shows that the level of competence in one subject can influence performance in another. This is because knowledge, skills and attitudes acquired in one subject can be applied in another subject. Knowledge skills and attitudes acquired in one subject can also interfere with learning in another subject. For example a research conducted by Oudo (2010) to investigate *Effect of English language proficiency on academic performance in biology examinations* shows that there is a significant positive correlation between proficiency in English language and academic performance in biology. It became necessary to find out whether competencies in various computer software have any influence on biology students' performance. It is worth noting that very few researches have tried to show this relationship. For example competence in MS Excel could have an impact on biology students' performance because it can enable learners to acquire mathematical skills (Jaffer et al, 2007). These skills can be applicable in answering biology questions that require mathematical interpretation. For example there is a compulsory data related question in KCSE Biology Paper 2.

The language used in computer science is slightly different from the one used in other subjects such as biology. For example, some words which are traditionally separated are joined together and a capital letter can be found in the middle of a word. An example of such a word is PowerPoint. In addition, some words in the field of computers are common with those in biology but portray different meanings. For example whereas words like virus, worm, bug and horse are used to refer to living organisms in biology, they mean different things in computer studies. These words may confuse biology learners. Furthermore, some words used in computer studies are shortened and writers frequently use abbreviations. Some common ones are AFAIK ("as far

as I know"), CYA ("see ya"). Writers may also include emoticons (or smileys), which signal the emotion that the writer is trying to convey (Feldman, 2004). Emoticons often look like faces on their side, with facial expressions related to the meaning of the emoticon. Examples of emoticons are: angry [(:-&], bored [:I], crying [:,C], frown [:-(]. If this is transferred to biology, it may interfere with learning (Feldman, 2004). Some recent findings present that using chats and SMS could have a negative effect on writing because of the use of abbreviations and slang (Gamboa & Garcia-Suaza, 2011).

In Kenya, the importance of computers in education is acknowledged in the National ICT policy, and the Kenya Vision 2030 and one of the flagship projects in education and training is the establishment of a computer supply program that will equip students with modern information technology (IT) skills (Kenya Vision 2030, 2007; Glen, 2007). This supply programme is stipulated in Kenya Education Sector Support Programme (KESSP), which states that the government would make education the avenue for equipping the nation with ICT (MOEST, 2005a). One method used by the Kenya Government to increase the use of computers by school children is by supplying computers to schools. For example there is a computer supply program to selected secondary schools in each constituency through the economic stimulus program (ESP). During the 2013 campaigns, the current government also pledged to supply laptops to students, starting with those joining standard one. Furthermore, the increased installation of electricity in rural areas is likely to make many people to access computers, making computers to become part of our lives (Laudon et al., 2002). This is likely to have some effect on the education of children.

1.2 Statement of the Problem

Students' performance in Kenya Certificate of Secondary Education (KCSE) examinations in biology in Vihiga County has remained below average despite several interventions such as content reduction and reorganization; increased time allocation from 3 lessons in form 1 and 2, and 4 lessons in form 3 and 4 before the year 2003 to 4 and 5 lessons, respectively, starting with form 1 in 2003 (MOEST, 2000; MOEST, 2003); re-introduction of general sciences (KNEC, 2009) and Strengthening Mathematics and Science Education (SMASE) programme. SMASE is an in-service programme aimed at improving the teaching skills of science teachers (CEMASTEA, 2012). The continued poor performance in biology implies that the problem still

needs to be addressed. Moreover, some researchers, while studying some content areas have demonstrated that the use of computers in class influences academic performance positively. For example Wekesa, Wekesa, Mailuko and Maiyo (2008) and Akwee, Toili and Palapala (2012) in their research publications point out that computer based instruction (CBI) enhances scores in the subtopics *Cell Division* and *Gene Concepts*, respectively. However, Wekesa et al (2008) and Akwee et al (2012) only experimentally focused on the learners' use of computers in class without taking into consideration the learners' use of computers outside the class. Kirkorian, Wartella and Anderson (2008) argue that influences of electronic media on academic achievement can be for good and for ill. Moreover, most schools only have general computer software rather than the software that address specific curriculum objectives. Hence, this study investigated the effect of the use of various computer software on students' performance in biology.

2.0 METHODOLOGY

This study used descriptive survey research design. Sampling involved multistage sampling, purposive sampling, simple random sampling, and stratified proportionate random sampling. Multistage sampling was used to sample schools, streams, and then the learners who were included in the study. Purposive sampling was used to select the schools and the streams that were included in the study. The schools included those that offered computer studies, and/or SMASE centers. In the classes that all students did computer studies or computer literacy, sample streams were selected by simple random sampling. However, in the classes that had specific streams for computer studies, the streams that were included in the study were those that were offering computer studies. In form 1 and 2 sample students were selected by simple random sampling while in form 3 and 4 the learners in the sample streams were stratified into those that did computer studies and those that did not do computer studies. In the mixed schools, the learners were also stratified into boys and girls. After creating the strata, respondents were selected from each stratum by proportionate random sampling. The learners were then investigated on their computer use and performance in biology. Table 3 shows sampling procedures and the components of the study sampled.

Table 3: Sampling procedures and the components of the study sampled

Sampling procedure	Components of the study sampled			
Multistage	School	stream	gender	learners
Purposive	School	stream		
Simple random		stream		
Stratified proportionate random			gender	learners

The teachers who took part in the study were obtained by multistage sampling and purposive sampling. Multistage sampling was used to sample schools and then teachers who took part in the study. Purposive sampling was used to sample the schools whose teachers participated in the study. All the trained biology teachers in the schools that provided learners for the study were included in the sample.

To calculate sample size, n, there was need to have some idea of the standard deviation in the population and also decide how large a standard error that could be tolerated. According to Frankfort-Nachmias and Nachmias (1996), sample size can be calculated using the formular:

$n=S^2/ (SE)^2$

where

S^2 = Sample variance

SE=Standard error

However, Frankfort-Nachmias and Nachmias (1996) add that if the sample size is too large relative to the population, the finite population correction is added and the final sample size is thereby calculated by the formular:

$$nf = \frac{n}{1 + n / N}$$

Where

N= population size. In this study the population size, N, was 40564 students.

n= sample size

nf =optimal sample size

This study considered a standard error of 0.03 to be acceptable. Moreover, the standard deviation during KCSE 2011 form four county evaluation in biology was 0.95 (Vihiga County Mock Results, 2011).

Hence,

$n=0.95^2/0.03^2$

$=1002.77$

$=1003$ students

Optimal sample size would therefore be

$$nf = \frac{n}{1+n/N}$$

$=1003/ (1+1003/40564)$

$=978.796$

$=979$ students

Nevertheless, a boy school, a girl school and a mixed school were purposively sampled in each of the four districts of the county. The sample schools had a total of 8342 students. The optimum calculated sample formed 11.73% of the students in the sample schools. This was approximately 12%. Consequently, this study used a sample of 12% students in each of the sample schools. However, as a result of rounding off some of the figures, a total sample of 1003 students was arrived at. Kathuri and Pals (1993) argue that it is a rule to use the largest sample possible in order to avoid the likelihood of making an error in hypothesis testing. Furthermore, because the study involved correlation and because Kathuri and Pals (1993) recommend a minimum sample size of 30 cases for studies involving correlation, then the sample size of 1003 students was considered very adequate. Apart from students, this study used a sample of 37 teachers. This is considered adequate because Kathuri and Pals (1993) recommend a minimum sample size of 20-50 individuals for the minor subgroup in survey research, and 15 cases for causal comparative and experimental research.

The data collection instruments that were used in this study were questionnaires (Biology Students' Questionnaire (BSQ), Biology Teachers' Questionnaire (BTQ), interview schedule (Biology Students' Interview Schedule (BSIS), and Mark Book Analysis Schedule (MBAS). A

questionnaire is a collection of items or questions to which a research subject is expected to respond (Kathuri & Pals, 1993). The questions are used to elicit information from respondents and are not intended to show whether the respondent is right or wrong. A questionnaire is used in educational research to obtain information about certain conditions and practices and to inquire into opinions and attitudes of individuals or groups (Koul, 1993). A questionnaire is cheaper and can also be used on many respondents at a lower cost (Frankfort – Nachmias & Nachmias, 1996). Among the questionnaires that were used in this study were BSQ and BTQ. BSQ was used to collect data concerning competence in computer use (on a likert scale), attitude towards computer use, and the relationship between computer use and performance in biology. BTQ was used to collect data concerning factors that influence computer use by secondary school biology students. The problem with questionnaires is that respondents can misunderstand the questions or could give biased answers. In order to deal with this problem, the questionnaires were piloted, in order to be validated.

An interview schedule is an outline of questions that form a basis for and guide the interviewing process (Kathuri & Pals, 1993). Among the advantages of interview are that it is flexible and probes the respondents deeper (Frankfort-Nachmias & Nachmias, 1996). Moreover, interview has a higher response rate than questionnaires. The interview schedule that was used to collect data in this study was the Biology Students' Interview Schedule (BSIS), which was used to collect the same data as BSQ. Document analysis involves analyzing the data obtained from records and documents (Frankfort-Nachmias and Nachmias, 1996). In this study, Mark Book Analysis Schedule (MBAS) was used to collect data from students' mark books or files that contained students' marks.

The instruments were developed by the researcher with the guidance of experts in Masinde Muliro University of Science and Technology. The instruments were used together for triangulation purposes. Triangulation is the use of two or more methods of data collection to test hypotheses or measure variables (Frankfort-Nachmias & Nachmias, 1996). This is done in order to enhance the validity of the results. The instruments for data collection were piloted in order to assess their appropriateness. Mugenda and Mugenda (1999) recommend a pilot sample of between 1% and 10%. Piloting was done in one school from Kakamega County. The pilot school was chosen purposively. Cronbach's coefficient alpha was used to estimate reliability.

Cronbach's coefficient alpha is the average split-half correlation based on all possible divisions of the measuring instrument into two parts. Cronbach's coefficient alpha was considered appropriate for this study because it is suitable for both open ended and closed items (Gall, Borg & Gall, 1996; Salvia & Ysseldyke, 2001). Instruments in this study had both open-ended and closed items. The reliability co-efficients of the tools were considered acceptable because they were more than 0.7 (Frankfort-Nachmias & Nachmias, 1996). The reliability coefficients for the tools were 0.9073 for BSQ, 0.8957 for BSIS and 0.7688 for BTQ.

BSQ and BTQ were delivered to the respondents by the researcher himself. The respondents completed the questionnaires and returned them to the researcher. Those who were not in a position to complete them were allowed more time after which the researcher came to collect them. This was done in order to ensure that the response rate was high (Ndagi, 1984). A biology teacher in the sample schools administered the interview. The teacher who conducted the interview was trained on how to do it. The researcher himself administered document analysis.

Out of the 1003 questionnaires that were delivered to schools, only 974 were returned. This gives a response rate of 97.11%. This response rate is above the 70% response rate that is considered to be very good (Mugenda & Mugenda, 1999). However, out of the questionnaires that were returned, three of them were not filled to completion. Consequently, they were not included in the analysis. Hence, 971 questionnaires were the ones that were analysed. Moreover, all the interview schedules that were delivered to schools were returned, giving a response rate of 100%. Furthermore, out of the 37 BTQs that were delivered to schools, only 34 were returned, giving a response rate of 91.89%.

Data was collected concerning students' competence in computer use, and their performance in biology. Performance in biology involved scores attained by learners in tests and examinations. The scores were converted to octiles to make them comparable across schools. The octiles ranged from 8-First octile to 1-Eighth octile. Competence in computer use was measured on a likert scale ranging from 1-Very incompetent to 5-Very competent. The instruments that were used for data collection had both open-ended and closed items. The data was coded and then entered into a computer. Both descriptive and inferential statistics were used for data analyses. The descriptive statistics that were used for data analysis included frequencies, percentages and

means. These were summarized using tables and graphs. The inferential statistic that was used for data analysis was Pearson's r. Pearson's r is used to measure the association between pairs of interval variables (Frankfort-Nachmias & Nachmias, 1996). The significance of the statistical tests was done at the alpha value of 0.05. The analyses of the data were done using Statistical Package for Social Sciences (SPSS).

3.0 RESULTS AND DISCUSSIONS

3.1 Introduction

Both qualitative and quantitative data were obtained from the instruments that were used for data collection. The instruments were BSQ, BSIS, BTQ and MBAS. The instruments contained closed questions that provided quantitative data and open ended questions that provided qualitative data. Descriptive as well as inferential statistics were used in data analyses. These statistics included frequencies, percentages, means and Pearson's r. Inferential statistics were used to test the hypothesis of this study. This chapter presents the analyses and discussions of the results obtained from the instruments.

3.2 Relationship between competence in computer use and performance in biology

The students were investigated with regard to their competence level in the use of computers and whether this competence affected their performance in biology tests. Competence in computer use involved how well the students could use the computers and the various computer software. The competence was measured on a likert scale ranging from 5-very competent to 1-never used. Performance in biology involved the octiles occupied by the students' scores. The octiles range from 8-first octile to 1-eighth octile.

It was found that students generally have low competence in computer use. This is because all the competence levels scored an average of about 3.3364 and below on a scale ranging from 1 to 5 (Table 4). For example, questionnaire results indicate that the competence in use of MS Word is 2.9392; computer games, 2.8877; Media player, 2.3502; MS Excel, 2.4398; Internet is 2.3502; MS Access, 2.1761; PowerPoint, 2.2255; and PageMaker, 2.0937. On the other hand interview results indicate that the competence in use of MS Word is 3.3738; computer games, 3.3364; Media player, 3.1589; MS Excel, 2.9626; Internet is 2.3738; MS Access, 2.6542; PowerPoint, 2.4112; and PageMaker, 2.1121. Although all except one of the schools that were studied had computers, the low competence levels could be due to the fact that more focus by students and

even teachers is on preparing for KCSE rather than learning about computers (Tekbiyik & Akneniz, 2010). Higgins (n.d.) blames the ineffective use of ICT on curriculum and its assessment. In addition, the computers in the secondary schools are inadequate for the student population (Odera, 2011). Some schools also restrict access to the computers.

The students look more competent in the use of MS Word because most of the computer documents they use are in MS Word. They include examinations, notes, assignments and even letters. In addition, MS Word is part of the computer studies syllabus in Kenya's secondary schools (KNEC, 2010). The students also seem to be more competent in use of computer games and media player because they mostly use computers for entertainment. They could mostly be using the computers for playing computer games, listening to music and watching videos. The students seem to be incompetent in the use of Internet because it is not readily accessible, partly because it is costly and also Vihiga County has very few cyber cafes (Republic of Kenya, 2009).

The students seem to be incompetent in the use of MS PowerPoint and PageMaker. They are incompetent in the use of PowerPoint because most of them are not involved in data presentation to audience. Those who are competent in the use of MS PowerPoint could be involved in data presentation such as during symposia. Most students are incompetent in PageMaker because they lack much academic use for it. Those who could be competent could be due to helping their friends or relatives to make cards for various purposes. In schools, they do it for ceremonies such as fund raising or prize giving ceremonies. Moreover, although the competence in use of MS Excel and MS PowerPoint were 2.4398 and 2.2255, respectively, these scores look higher than the other competencies because they are part of the secondary school computer studies syllabus. Consequently, some students could be learning about them in the computer studies lessons.

Table 4: Mean competence in use of various computer components

Competence in use of	Min	Max	Questionnaire		Interview results	
			Mean	Std. Deviation	Mean	Std. Deviation
MS Word	1	5	2.9392	1.5336	3.3738	1.4891
MS Excel	1	5	2.4398	1.4088	2.9626	1.4916
MS Access	1	5	2.1761	1.3550	2.6542	1.4015
MS PowerPoint	1	5	2.2255	1.2809	2.4112	1.4403
PageMaker	1	5	2.0937	1.3020	2.1121	1.2688
Media Player	1	5	2.3502	1.4843	3.1589	1.6719
Computer Games	1	5	2.8877	1.5979	3.3364	1.6249
Internet	1	5	2.3502	1.4843	2.3738	1.5633

N=971

The relationship between biology students' performance and the competence in use of MS Word, MS Excel, MS Access, MS PowerPoint, PageMaker, Media Player, Computer Games and Internet was investigated using Pearson product-moment correlation coefficient and a correlation matrix was generated from the research data. The questionnaire results are shown in Table 5. From this table, it can be observed that although the coefficients of correlation between competence in the above components and performance in biology are below 0.10 that Pallant (2007) considers to be a small correlation, that for MS Word, MS Excel, MS Access, PageMaker and MS PowerPoint are positive while those for media player, computer games and Internet are negative. Long-term acquisition of word processing skills may contribute to the development of new writing styles or skills, possibly influencing the quality of hand written work (Ouston et al, 1992). MS Excel impacts positively on biology because it enables learners to acquire mathematical skills (Jaffer et al, 2007). These skills can be applicable in answering biology questions that require mathematical interpretation. For example there is a compulsory data related question in KCSE Biology Paper 2 (KNEC, 2010).

These results also indicate that the correlations between the performance in biology and competence in use of MS Word, media player and Internet are statistically significant at the alpha value of 0.05. On the other hand the correlation between performance in biology and

competence in use of MS Access, MS Excel, MS PowerPoint, and computer games are not statistically significant at the alpha value of 0.05 and 0.01. The percentage of variance between the competence in use of the above components and performance in biology was calculated in order to get an idea of how much variance the two variables shared. The percentage of shared variance between the octiles and the competence in use of: MS Word, MS Excel, MS Access, MS PowerPoint, MS PageMaker, media player, computer games and Internet are 0.4225, 0.1296, 0.0676, 0.0196, 0.0529, 0.6724, 0.0625, and 0.6724, respectively. This implies that there was very little overlap between the variances of the octiles and each of the competence in use of the computer components. This is because all the components had a percentage of variance of less than 1.

Table 5: Coefficients of correlation between the competencies in the various computer components and the octiles as indicated by questionnaire results

	Octile	MS Word	MS Excel	MS Access	Power-Point	Page-maker	Media player	Games	Inter net
Octile	1								
MS Word	.065*	1							
MS Excel	.036	.469**	1						
MS Access	.026	.369**	.496**	1					
MS Powrpoint	.014	.451**	.575**	.516**	1				
Pagemaker	.023	.357*	.510**	.919**	.547**	1			
Media player	-.082*	.329**	.483**	.517**	.493**	.527**	1		
Games	-.025	.348**	.333**	.298**	.367**	.317**	.425**	1	
Internet	-.082*	.329**	.483**	.517**	.495**	.527**	1.000**	.425**	1

*Correlation is significant at 0.05 level (2-tailed)

**Correlation is significant at 0.01 level (2-tailed)

Although the correlations are belw 0.10, the positive correlations between the octiles and MS Word, MS Excel, MS Access, MS PowerPoint, and MS PageMaker implies that they affect biology students' performance positively. This is because these programs mostly contain instructional materials rather than materials for entertainment. On the other hand the negative

correlation between the octiles and media player, computer games and Internet implies that these programs influence biology students' performance negatively. This could be because students mostly use them for entertainment. Blurton (1999) argues that although Internet is beneficial, it also has negative aspects. For example there are concerns about pornography, violence and crime that are widespread on the Internet. Mitchell and Savill-Smith (n.d.) point out that the best results of games are found in mathematics, physics and language arts as opposed to social studies, biology and logic. In addition, the best effects of games are most likely to be found when specific content and objectives are targeted. The negative effects of media player, Internet and computer games could be due to the fact that they reduce the time available for studying.

The questionnaire results are corroborated by interview results as shown in Table 6 below. This is because just as in the questionnaire results, the r values for the interview results are less than 0.10.

Table 6: Coefficients of correlation between the competencies in the various computer components and the octiles as indicated by interview results

	Octile	**Word**	**Excel**	**Access**	**Powr-point**	**Page-maker**	**Media player**	**Games**	**Inter net**
Octile	1								
MS Word	.000	1							
MS Excel	-.014	.750**	1						
MS Access	-.087	.578**	.680**	1					
MS Powrpoint	.036	.491**	.574**	.436**	1				
Pagemaker	.073	.502*	.481**	.404**	.615**	1			
Media player	-.070	.529**	.453**	.458**	.548**	.552**	1		
Games	-.056	.591**	.503**	.532**	.472**	.471**	.803**	1	
Internet	-.065	.422**	.366**	.288**	.430**	.597**	.598**	.641**	1

*Correlation is significant at 0.05 level (2-tailed)

**Correlation is significant at 0.01 level (2-tailed)

4.0 CONCLUSION

Due to the fact that all the relationships between the computer components and performance in biology gave r values of less than 0.10 implies that there is no relationship between the competence in use of MS Word, MS Excel, MS Access, MS PowerPoint, PageMaker, Media Player, Computer Games and Internet and performance in biology. Therefore, competence in computer use cannot be used to predict biology students' performance and vice versa. Consequently, the null hypothesis that there is no relationship between secondary school students' competence in computer use and performance in biology is accepted.

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