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Attitudes of teachers of biology and students towards computer-assisted instruction and conventional instruction in secondary schools in Nandi South Sub-County

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Abstract
With the introduction of computer technology into the educational system, schools have come to realize that teaching and learning can be done in a more flexible way through the application of Computer-Assisted Instruction. This method attracts greater responsiveness among students. The study investigated the influence of computer-assisted instruction and conventional instruction on academic achievements of secondary school students in Biology in national examinations in Nandi South Sub-County. Based on the study, this paper examines teachers' and students' attitudes towards Computer-Assisted Instruction (CAI) and conventional Instruction (CI) in secondary schools in Nandi South Sub-County. The study was based on Cognitive Theory of Multimedia Learning which states that active learning occurs when a learner engages in three cognitive processes: selection, organization and integration. The study adopted a descriptive research design approach. The target population for the study comprised all head teachers, students and teachers of Biology in all secondary schools in the Sub-County. Secondary schools were selected using simple random sampling technique while head teachers and teachers of Biology were selected using purposive sampling. The students were selected using simple random sampling technique. Questionnaires and interview schedules were the main data collection tools. Responses from all questionnaire items and interview schedule items were cross-checked to facilitate coding and processing for analysis. Responses from interview schedules were analysed descriptively. Chi-square correlation analysis was computed to investigate the relationship between attitude of teachers and students towards CAI and CI and academic achievement in Biology. The findings of the study were presented in form of cumulative frequency tables, percentages, charts and graphs. The study established that majority of students preferred that Biology be taught entirely using CAI as opposed to CI. In addition, majority of the teachers preferred CI over CAI. They believe that CAI wastes time and is more complicated. The study recommends that in order to promote the use of CAI in teaching Biology, pre-service and in-service training should be given to both teachers to help them develop instructional materials for CAI.

Keywords: Attitudes, Teachers, Biology, Students, Computer-Assisted Instruction, Conventional Instruction, Kenya

1. Introduction
Teachers and students' attitudes towards computer-assisted instruction (CAI) are key, not only in the use of CAI in curriculum implementation but also to the academic achievement of students in specific disciplines. However, effective CAI may not be utilized in the classroom if it lacks the acceptance of teachers, students, or both groups (Barron *et al*., 2003) [23].

Teachers' Attitudes towards Computer-Assisted Instruction (CAI)
Previous studies have examined the usage patterns of CAI by classroom teachers. These studies have established that a majority of teachers do not use CAI to assist their students in the learning process (Barron *et al*., 2003) [2]. This is especially true of science subjects. Becker *et al*. (2007) [3] observe that the overall average usage rate of CAI in the classroom in this group of teachers was less than 20%.
Similarly, Wilson and Notar (2010) [12] have found that across all subject areas and specializations, teachers are eight more times more likely to use computers in their schools to track student grades than for teaching. Investigations to determine the reason for this reluctance among classroom teachers has been conducted by Benson (2004) [4]. By surveying and personally interviewing classroom teachers, the researcher found that most teachers are reluctant to use CAI in their classroom because of their negative attitudes towards CAI majorly because they lack proper training on how to use CAI programmes (Benson, 2004) [4]. According to Benson (2004) [4], the failure to use CAI by teachers has tremendously derailed students' academic achievement in science subjects.

Students' Attitudes towards Computer-Assisted Instruction (CAI)
Research has found that the attitudes of students towards CAI have generally been positive (Howard *et al*., 2004) [9]. Burton (2008) [6] and Inoue (2009) [10] observe that students' interest in new methods of learning, such as CAI, is very high in areas where the students struggled academically. It is a reasonable hypothesis to state that students who are struggling in a subject find the individualized instruction offered by CAI more inviting to them than learning in the conventional/traditional instruction approach.
Contemporary students are more technologically inclined than any other generation (Howard *et al*., 2004) [9]. Therefore, students are often more open than their teachers to new methods of computerized instruction. However, these technologically advanced methods of instruction must be effective and efficient to be adopted in the classroom.
D'Angelo and Wooley (2007) [7] have conducted research in

three areas relating to CAI: the technologies students experience in the classroom; students' perceptions of technological learning environments, and the different ways in which subpopulations of students view the effectiveness of technological learning environments. Their study took place at a large Midwestern university with students enrolled in criminal justice courses. The research participants were from four different courses and almost equally represented the freshman, sophomore, junior and senior classes. No incentive was offered for participation in the study. The racial breakdown of the subjects was "88% Caucasian, 6% African-American, 5% Latino, and 1% different racial/ethnic background" (D'Angelo & Wooley, 2007, p. 465) [7].

In their study, D'Angelo and Wooley (2007) [7] established that 98% of the students had been exposed to technology in the classroom. Consistent with other research findings by Bartsch and Cobern (2003) [1] and Hansen and Williams (2008) [8], the participants perceived that learning was enhanced when PowerPoint presentation method of instruction was used in class. Participants felt that the PowerPoint presentation method of instruction was more effective then classes that employed the chalk and lecture method and classes using Blackboard© and online course activities. For the subpopulations, there was no difference in students' perception along the characteristics of "gender, race, academic major and college status" (D'Angelo & Wooley, 2007) [7].

Studies such as those of D'Angelo and Wooley (2007) [7] should be replicated in other colleges and universities. Of great significance would be studies in schools that are noted for their technological use and those that lack the technological means. Another area where D'Angelo and Wooley (2007) [7] could improve their study would be to identify the positive and negative aspects of PowerPoint as perceived by students. Their study could also be replicated in a more racially or culturally balanced institution.

Burke and James (2005) [5] sought to discover students' perceptions of the effectiveness of PowerPoint instruction in college business courses. The authors wanted to ascertain students' insights as to what makes PowerPoint presentations effective and determine the frequency of use by professors. The setting for the study was an urban university in the South. Data was collected over a two-week period starting with 230 participants. Some professors offered extra credit to students to encourage participation in the research study. Students were asked to answer the Likert type questionnaire only once, as they could have been enrolled in two or more classes participating in the study.

Burke and James (2005) [5] found that almost 33% of the faculty stated they never used PowerPoint presentations in class. Twenty-seven per cent of the faculty claimed to utilize PowerPoint always and 14.3% claimed to use PowerPoint frequently. The student participants rated PowerPoint presentations effectiveness in their class. The results indicated that the subjects that registered the most effective use of PowerPoint instructional method were their management courses followed by marketing and economics. Accounting was the one class that students did not deem PowerPoint as an effective teaching tool.

To gain a clear understanding of students' perceptions, Burke and James (2005) [5] asked them to articulate what they deemed as positive and negative about the faculty using the PowerPoint presentation method of instruction in class. The positive aspects of using PowerPoint instruction included organization and structure, graphics, pictures and visuals. The negative aspects of PowerPoint as viewed by the students were related to the instructor not using the presentation software properly. The two authors also sought to distinguish the effectiveness of PowerPoint instruction by course content. PowerPoint was found to be ineffective for courses that emphasize mathematical or quantitative fundamentals where demonstration for working out problems is necessary (Burke & James, 2005) [5].

The method used by Burke and James (2005) [5] were quite unorthodox. Students had the option to participate with the enticement of extra credit or class participation points. There were various reasons as to whether or not a student would choose to participate. There was no way to determine if a student answered more than one questionnaire in other business classes, especially with the enticement of extra points.

2. Statement of the Problem

The overall performance in Biology in secondary schools in Kenya and particularly in Nandi South Sub-County has been below average over the years (Nandi South Sub-County Education Office, 2013). This low performance of students in the KCSE Biology examinations has raised serious concerns among educational researchers, parents and other educational stakeholders. The teaching of Biology, being a vital science subject, has always been pivotal to the overall academic achievement of students.

How teachers incorporate innovative pedagogical skills into their instruction has a lot of influence on their classroom practices and the subsequent achievements of students in Biology. A review of existing literature has shown that inadequate studies have been conducted in Nandi South Sub-County to determine the relationship between computer-assisted instruction and students' academic achievement in Biology. Although Kenya expects increased utilization of computers in education from primary to secondary schools, the potential impact of computer assisted instruction is not fully documented. Does the use of computer instruction make a difference in students' achievement in Biology? It was, therefore, necessary to investigate the influence of selected instructional methods on academic achievement of students in secondary schools in Nandi South Sub-County.

3. Materials and Methods

The research was conducted in Nandi South Sub-County. This locale was randomly selected. The Sub-County is located in Nandi County in Kenya's North Rift Valley region. Nandi County is located in the former Rift Valley Province and borders the following counties: Uasin Gishu to the North and East, Kericho to the South East, Kisumu to the South, Vihiga to the South West, and Kakamega to the West.

This study adopted a quasi-experimental research design. Since this study involved selecting groups upon which the independent variable (CAI) was tested, without any random pre-selection processes, this design was found appropriate. This design involved the pre-test and post-test for all of the comparison groups that were considered in the study. The target population for the study comprised all secondary schools in Nandi County. Statistics from the County Education Office indicated that there were 136 secondary schools in Nandi County at the time of the study. The accessible population

comprised 38 secondary schools in Nandi South Sub-County with a student population of 8,723 at the time the study was conducted. The number of teachers of Biology in the secondary schools in the Sub-County was 81 (Nandi South Sub-County Education Office, 2014). Students' population was drawn from Form Three and Form Four classes.

Secondary schools were selected basing on the 30% formula of sampling recommended by Mugenda and Mugenda (2003) [11]. Therefore, eleven (11) secondary schools were randomly selected. This meant that 11 head teachers were purposively selected to participate in the study. Teachers of Biology were selected purposively. A sample of twenty-four (24) teachers of Biology from those who teach Form Three and Form Four classes was selected using random sampling technique. Therefore, a total of 368 students were sampled for the study. The students were selected using stratified random sampling technique. The basis of stratification was the Form level of the students. The total number of respondents for the study was, therefore, 403.

The main data collection tools for the study included a questionnaire (for students and teachers of Biology) and interview schedule for head teachers. After data collection, responses from all questionnaire items and interview schedule items were cross-checked to facilitate coding and processing for analysis using the Statistical Package for Social Sciences (SPSS) computer program version 20.0. Responses from the interview schedules were analysed basing on emerging themes. Chi-square correlation analysis was computed to establish the influence of CAI and CI on the academic achievement of students in Biology. T-test ratios were computed to establish significant differences between the mean scores of experimental and control groups at the pre-test and post-test levels. The findings of the study were presented in form of tables, charts and graphs.

4. Results and Discussion

Attitude of Teachers of Biology towards CAI and CI

The study sought to establish the attitude of teachers of Biology hold for Computer-Assisted Instruction (CAI) and Conventional Instruction (CI). This was done with the aid of a five-point Likert scale of Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D) and Strongly Disagree (SD). When asked to indicate whether or not CAI assumes a more biological background than CI, majority of the respondents agreed. There were mixed reactions on whether or not CAI follows a more logical sequence in presenting the Biology content than CI. Majority of the respondents disagreed with the fact that CAI allows for students' deeper understanding of the content of Biology compared to CI.

Majority of the respondents were generally in agreement that CAI was a total waste of time compared to CI. Besides, majority of the respondents indicated that CAI was generally more complicated than CI in application. Only a few of the respondents agreed with the view that CAI was more interesting to students than CI. Few of the respondents indicated that CAI was not complicated to them, but majority observed that CAI was too complicated for them in Biology instruction. Generally, a few teachers of Biology expressed satisfaction with the application of CAI. However, majority of teachers preferred the application of CI in the instruction of the content in Biology. Table 1 presents a summary of these findings.

Table 1: Attitude of teachers towards CAI and CI

Statement	SA	A	U	D	SD	Mean
I have always employed CI in teaching Biology	12	9	1	2	0	4.3
CAI lessons assume a more biological background than what I have	9	10	2	3	0	4.0
CAI follows a logical sequence	7	5	5	4	3	3.4
CAI presents concepts in a manner that allows for students' deeper understanding	2	7	5	5	5	2.8
CAI is more interesting to students	11	9	1	2	1	4.1
Use of CAI is a waste of time	12	7	3	2	2	4.3
CAI is too complicated for me	13	9	0	1	1	4.3

***Source*:** Field Data (2014)

Majority of the teachers indicated that they have been applying CI in the teaching of Biology as opposed to CAI (mean = 4.3). Teachers' negative attitudes towards CAI was evident as majority of them indicated that the use of CAI is a waste of time (mean = 4.3) and that CAI is too complicated for them (mean = 4.3). This finding was attributed to low computer literacy levels among teachers of Biology.

Some, 8(33.3%), teachers indicated that they had no computer skills. Many, 13(54.2%), of them said they had basic computer skills, 2(8.3%) had intermediate skills while only 1(4.2%) had advanced computer skills. These findings are illustrated in Figure 1 below.

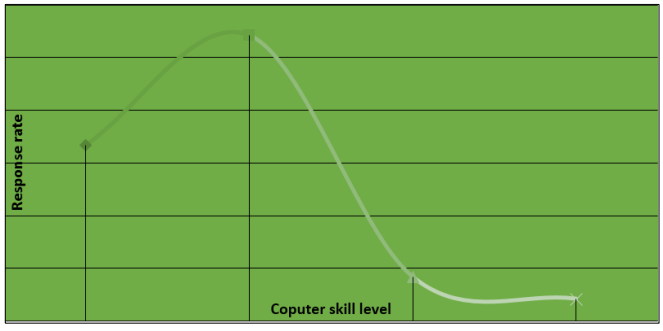

Fig 1: Teachers' computer skills' level

The research found that most teachers were reluctant to use CAI in their classrooms because of their negative attitudes towards CAI and majorly because they lacked proper training on how to use CAI programmes. Benson (2004) [4] argues that the lack of application of CAI by teachers has negatively affected students' academic achievements in the sciences.

Attitude of Students towards CAI and CI

The study also sought to establish the attitudes of students towards CAI and CI in the teaching and learning of Biology. When asked to indicate whether or not they more easily understood Biology content through CAI than CI, majority of them were undecided. Few of them disagreed and agreed that they better understood Biology content when taught using CAI than with CI. The large proportion of students who were undecided is a clear indication that majority of the teachers of Biology never employed CAI in teaching Biology.

The students were, therefore, unable to compare CAI and CI since most teachers only employed CI in their teaching. However, majority of the students indicated that they had adequate skills in computer applications and were, therefore, of the opinion that using computers in learning did not amount to a waste of time. Some of the students were still undecided mainly because they had not interacted with computers in the context of Biology learning in their schools. The few students who said they were taught Biology through CAI indicated that this instructional method had sharpened their computer skills. These students disagreed that learning Biology using computers is complicated. Overall, majority of the students either affirmed that learning Biology through CAI was complicated or were simply undecided. These findings were as presented in Table 2 below.

Table 2: Number of students with positive and negative attitude towards CAI and CI

Attribute	Positive	Negative	Total
CAI	97	56	153
CI	65	85	150
Total	162	141	303

***Source*:** Field Data (2014)

To establish the relationship between attitudes and teaching methodology employed, a Chi-square test was computed. The results of the analysis were as illustrated in Table 3 below.

Table 3: Correlation between Attitude and Teaching Methodology

Correlations			
		Attitude	**Teaching methodology**
Attitude	Chi-square Correlation	1.000	.897
	Sig. (2-tailed)		.002
	N	303	301
Teaching methodology	Chi square Correlation	.897	1.000
	Sig. (2-tailed)	.002	
	N	303	303

The study establish a strong correlation that was significant (χ^2 (301) =.897, p <.05). The null hypothesis was therefore rejected. Consequently, attitude has a strong impact on the teaching methodology employed in the instruction of Biology. Howard *et al*. (2004) [9] indicates that research has found out that the attitudes of students towards CAI have generally been positive. In addition, Burton (2008) [6] and Inoue (2009) [10] have found that students' interest in new methods of learning, such as CAI, is very high in areas where the students struggled academically. It is, therefore, reasonable to assume that students who are struggling in a subject find the individualized instruction offered by CAI more inviting for them than does learning through the conventional/traditional instruction approach.

Contemporary students are more technologically inclined than those of other generation. Therefore, students are often more open than their teachers to new methods of computerized instruction. However, these technologically advanced methods of instruction must be made effective and efficient as they are being applied in the classroom. It, therefore, follows from these findings that students are ever willing to learn through CAI. On the other hand, majority of the teachers in Nandi South Sub-County have been reluctant to adopt CAI. This could partly explain the dismal performance in national examinations in Biology in secondary schools in Nandi South Sub-County.

5. Conclusion

In conclusion, the study established that majority of the students preferred that Biology be taught entirely through CAI as opposed to CI. Most students find CI to be boring and teacher-centred. This method does not provide room for their full participation in such classes. Majority of the students were averagely trained in computer skills and are, therefore, comfortable being taught through CAI.

Majority of teachers prefer CI over CAI methods. They believe that the application of CAI is a waste of time. They also find this approach too complicated for them. This is, however, mainly attributable to the inadequate computer skills that these teachers indicated. However, those teachers who have intermediary training in computer applications tend to believe that CAI should be fully implemented in the teaching of Biology.

6. Recommendations

In order to promote the use of CAI in teaching Biology, training should be given to both pre-service and in-service teachers to help them in developing instructional materials for CAI. Besides, development of CAI material should be made part of teaching subjects and the student teachers should develop computer-assisted instructional material for at least one unit of a particular class. The teacher educators should motivate the pre-service as well as the in-service teachers to develop positive attitudes towards the application of CAI in the teaching-learning process.

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