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Fostering Students Mastery of Culinary Competencies through Computer-Based Scaffolding in Secondary Schools in Kenya

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Abstract The use of computer-based scaffolding (CBS) is one of the 21st century pedagogies being embraced in education. Home Science is a practical subject taught in primary and secondary schools in Kenya. Culinary is an area of Home science which imparts learners with knowledge and skills on methods of cooking, food hygiene, food nutrients, nutritional disorders, food preservation, flour mixtures, réchauffé cookery, convenience foods, meal preparation, management and service. The competencies mastered in Culinary in primary and secondary schools empower the learner to practice principles of good health with respect to themselves and others in their environment. Moreover, the learner is enabled to manage and improvise resources, develop artistic skills and values in making of appropriate food choices. They also learn to prepare, cook, serve food and drinks from given ingredients, adhering to the principles of nutrition and individual requirements. To meet the current requirements of the rapidly shifting culinary industry, students need to be taught using modern strategies. CBS in teaching and learning of culinary concepts and skills involves the application of computer-based technologies (CBT) to engage learners in problem-based situations, through models, simulations or visualizations to introduce new knowledge. CBS employs the use of pictorials, educational cooking videos, live streams which are accessed online and recorded cooking shows from media agencies. The purpose of this study was to establish the use of computer-based scaffolding in fostering the learners' culinary competences in secondary schools in Kenya and the sample size was drawn from the learners and teachers of Home science and Nutrition. Quasi-experimental design was adopted and the findings showed that Computer-based scaffolding in teaching and learning yielded positive results.

Keywords Computer-Based Scaffolding, Culinary Competencies, Computer-Based Technology

1. Introduction

Computer-based scaffolding is a pedagogical approach in which computer-based technologies are used as supports provided by the teacher which empower the learner to actively engage themselves as they gain skills on tasks that could be considered difficult to be successfully completed without assistance [1,2]. CBS engages the learners to collaboratively work together through the computer-based technologies in a learning situation, supported by web based tools, thus enabling them to solve problems, execute tasks and attain goals that they would not have been Abe to accomplish independently [3].

In Kenya, culinary is a practical programme for students of the Home Science discipline. The discipline is offered in

primary and secondary school competency-based curriculum, colleges as well as universities. Culinary involves classroom and hands-on learning experiences that adequately equip the students with necessary knowledge and skills for their respective occupations o According to Jack and Normanr further education in the food service industry [4]. Culinary curriculum objective mainly builds and enhances mastery of competencies in planning menus, food estimations for service, identifying nutritional individual requirements and controlling the food cost by following the correct procedures during preparation.

Findings by Yee et al. [5] indicated that there are barriers existing in the instruction of Culinary and nutritional concepts, including limited instructor knowledge in the teaching of the nutritional competencies. Therefore, students are not motivated to learn and find it difficult to apply nutrition-related knowledge during menu planning and meal preparation. It is imperative that culinary educators should be more innovative in their instruction, especially by comprehensively focusing on the area of nutrition. Early intervention may grant knowledge impartation and increases the student's ability to apply concepts and skills throughout the years of study and into their daily lives [5]. One way to intervene is for educators to take advantage of Information, Communication and Technology (ICT) by incorporating them in culinary instruction.

The integration of technological applications enables students to gain durable and generative understanding of concepts and skills, consequently, enhancing the self - directed discovery learning approach. Learners are more capable to recall the concepts and knowledge discovered on their own by sorting out concepts in diverse contexts and at innumerable levels of analysis [6]. Therefore, computer-based technologies provide the support that students need, which enables them to formulate higher level concepts, often in collaboration with others, in a technology enhanced environment.

Bruner [7] added that discovery learning in a technology enhanced environment encourages the learner's active engagement, promotes motivation, autonomy, a sense of responsibility and independence. Additionally, the student is able to develop high order problem solving skills, critical thinking skills and creativity skills. Successful customized supports for stimulating queries aids learners to point out ideologies by engaging them in situations such as Problem Based Learning (PBL). Technology supports that have been enhanced successfully provide a short disclosure of information to the learners, by taking advantage of the entry behavior, teaching models, texts, sequence of images to introduce new knowledge and skills, which is referred to as scaffolding [6].

The process of scaffolding involves accurate and clear steps. Belland [1] coined the scaffolding customization. Scaffolding customization is the change of scaffolding recurrence which is based on how the student's current abilities are assessed. Scaffold customization involves fading and adding supports for learning. According to Belland, Andrew and Nam Ju Kim [1] fading means that scaffolds are slowly withdrawn for example, web-based inquiry. Faded scaffolding considers the level of the students learning processes by providing, in the beginning, fully functional scaffolds during the lesson without withdrawing any scaffolding in the advance steps. According to, Chu Hwang and Tsai [8], fading occurs when the set key indicators dictate the competency required gained by students as they execute the target task independently. Adding support entails gradually increasing the recurrence of the performance indicators which shows that the students need more support. Adding involves providing immediate feedback, and the prompts frequency increased until the objective is achieved [1].

CBS provides the support that learners need to fully comprehend and eventually complete tasks independently. This ensures that teachers are deliberately modelling and effectively utilizing technologies alongside learners during the lesson [9]. This clearly demands the need for culinary educator's investment in more time, the required energy, and the required resources in lesson preparation. In addition to that, combining nutritional content and enhancing acquisition of self-efficacy, attitude, knowledge, leadership with the learning outcome requirements that could be reinforced in the application of the competencies in school at home and in their real life [10].

Kirogo [11] findings revealed that adequate training of teachers in the use of computers plays a critical role towards successful integration of technologies such as computers in teaching. The teaching staff are required to prepare well to use computers which in turn dictates the success of the integration [11]. Eshiwani [12] pointed out that education policies and pedagogy should be put in place for Home Science during the transition process. Therefore, for Kenya's aspiration in industrialization with the use of technology, a critical component such as Home Science would play a pivotal role in development in both formal and informal sectors. Home Science helps to develop critical skills that for daily requirements and employability [13].

It is instructive to note that, research findings by Abwao [14] revealed that the correlation between Home Science skills and the employment among youths in County of Kakamega was positive. The research also noted that, higher order skills like problem solving, deliberate planning together with organizational skills, creative and critical thinking skills, interpersonal skills, with eagerness to risks as acquired core competencies skills as in the County [14]. In retrospect, the higher order skills could be acquired when these learners are exposed to the use of computers as scaffolds towards solving a problem, this allows the learner to better visualize processes and have a higher understanding of the nutritional concepts. The facilitator must be able to adapt to the learners needs, therefore, the learner requires development from their actual state. The teacher must concurrently progress

towards the student's potential states by effectively relaying requisite guidance and concepts based on the performance of the learner through the use of CBS approach.

2. Materials and Methods

This study adopted a quasi-experimental study design. This design was suitable for this study as it aimed to establish the causal relationship of CBS to teaching and learning of culinary arts in secondary schools. This study included an experimental group and a control group respectively.

Both experimental and control groups were pre-tested to determine entry behavior and baseline performance. Application of interventions to treatment groups and observation of participants with both conditions were performed. Investigators hypothesized each effect of the intervention on each group through a post test to determine the effect of CBS. The treatment exposure (the independent variable), computer-based scaffolding, was hypothesized which led to changes in the outcome (dependent variable), the students' mastery of culinary competencies.

2.1. Locale of the Study

This study was conducted in Kakamega County. It is located 0.2827 ° N and 34. 7519 ° E. Shinyalu and Mumias sub counties were selected for the study. The choice of this location was guided by the lowest students' performance in culinary of 12.14 as compared to the national mean of 13.33 which is relatively low. Majority of the government sponsored secondary boarding schools in the County offer Home Science and are equipped with ICT infrastructure. There is limited literature on CBS for the teaching and learning of Culinary within the area, and this captured the interest of the researcher.

2.2. Sampling Technique

The sample for this study was government-sponsored boarding secondary schools in Kakamega County in Kenya, offering Home Science. Purposeful selection method was used to select the schools that offered Home Science and performed the least in culinary. Moreover, the method was used to select the schools that were equipped with computer-based technologies for the teaching and learning for Home Science. In addition to that, the teachers of Home Science and the form three students were the participants of the study. students' questionnaires the experimental group as evident during the practical activity

2.3. Research Instruments

The study used multiple study instruments to collect data. This was for triangulation purposes during data analysis. The instruments include; observation schedules, questionnaires and performance achievement tests (pretest and post-test).

2.3.1 Observation Schedules

This data instrument required observation and recording information. An observational checklist was used to identify computational techniques available at CBS in cooking and learning. The classroom observation performance schedule contained tasks and skills required of the participants during lesson preparation and delivery. The observation schedule was used to assess the teachers and learner's skill levels and the behavior of the students when using the computer technologies during the lesson. The instrument was used alongside with the performance achievement test to investigate the effect of CBS on students' acquisition and mastery of culinary competencies by recording teaching and learning activities during the lesson.

2.3.2. Questionnaires

Questionnaires were used to collect data for surveys and collected a large amount of information in a short period of time. The questionnaire items were both open and closed questions. To investigate further, respondents answered questions on Likert scales. Items were open-ended and closed-ended. The questionnaire was filled out by teachers and students. The data collected was used to assess skill levels, teachers' perceptions of using CBS, and the challenges CBS students face in their learning environment. The questionnaire contained five sections. In the first section, biographical information was collected. In the second section, data was collected on knowledge and skills in working with computer-assisted technology. In the third section, data was collected on the teachers' ability to utilize computer-assisted technology in teaching culinary concepts. In the fourth section, data was collected on the teachers' perceptions of using CBS to acquire cooking skills. In the fifth section, data was collected on the CBS challenges in teaching cooking concepts and skills.

2.3.3. Students' Questionnaires

A questionnaire was filled out after the CBS lesson. The questionnaire contained two sections. In the first section, data on students' perceptions of the use of CBS in acquiring culinary skills were collected. In this section, data on student engagement in CBS culinary classes was collected.

2.3.4. Performance Achievement Test

According to Jack and Norman [15] the performance achievement test measures the individual's performance on the learning of particular tasks, and this test is important in research as it provides accurate results regarding the overall purpose of the study. A criterion-based test was used in this study. The Education Glossary (2014) noted that the criterion referenced tests are designed to measure

the students' performance against a fixed set of pre-determined criteria of learning standards. The test included task related activities in menu planning, meal preparation and meal presentation respectively. The pre-determined criteria mark sheets were standardized adhering to the Kenyan Secondary Home Science Syllabus according to the 8-4-4 curriculum. Experimental and control groups were evaluated. They were used to analyze student performance before and after treatment (pretest and posttest). The test was used to determine the effect of CBS on students' acquisition and mastery of culinary skills.

2.4. Data Analysis

This study relied heavily on quantitative and qualitative data. Pre- and post-test data were generated from research equipment. The raw data from the questionnaires and the observation schedule were edited so that any errors or omissions are corrected, which ensured that the data is accurate, relevant and consistent for analysis. The questionnaire and the observation forms contained serial numbers, which were used to identify each case of the individual respondent. Data from the questionnaire were analyzed using the Statistical Package for Social Sciences (SPSS), software version 21. Qualitative data was analyzed using thematic analysis and presented in written narratives.and presented on pie charts, bar charts and graphs. Descriptive data was presented in quotations, frequency distributions and percentages.

The quantitative data acquired from the performance test and documents were analyzed and diagrammatically presented in tables. Data collected from experimental and control groups were compared using Pearson's product-moment correlation coefficient. This formula is the main technique used to determine the strength of the linear relationship between two variables [16]. A t-test was used to determine whether there was a statistically significant difference between the experimental and control groups. A significance value of 0.05 was used to test the results obtained. Data were presented graphically and tabularly. The effect of CBS on students' acquisition of culinary skills was measured using Cohen's D large size effect.

3. Research Findings

The study established that CBS has the potential to improve the learner's ability in the mastery culinary competencies. Data was collected through the classroom observation performance schedule, students' questionnaires and performance achievement tests (pretests and posttests).

3.1. Performance Achievement Tests

Two groups of Home Science students participated in the study: the experimental group was subjected to a collaborative practical activity by exposing them to fading and adding scaffolding when necessary, through online recorded video performances and pictures. The multimedia was accessed through a hypertext mark-up language on the computer, which presented a chef preparing and presenting a meal. The multimedia was presented repeatedly for clarity purposes. Thereafter, there was a question and answer session prior the practical activity in the culinary laboratory. For the control group, the culinary instructor used the lecture method of the same recipe as to the experimental, there was a question and answer session before the practical activity. Finally, both groups took a performance achievement test (post- test). Assessment was done during and after the practical activity. A control group is very important because it allows researchers to determine whether an experimental treatment was successful, more effective than the control treatment by evaluating the performance of both treatments [15]. This is illustrated in figure 1.

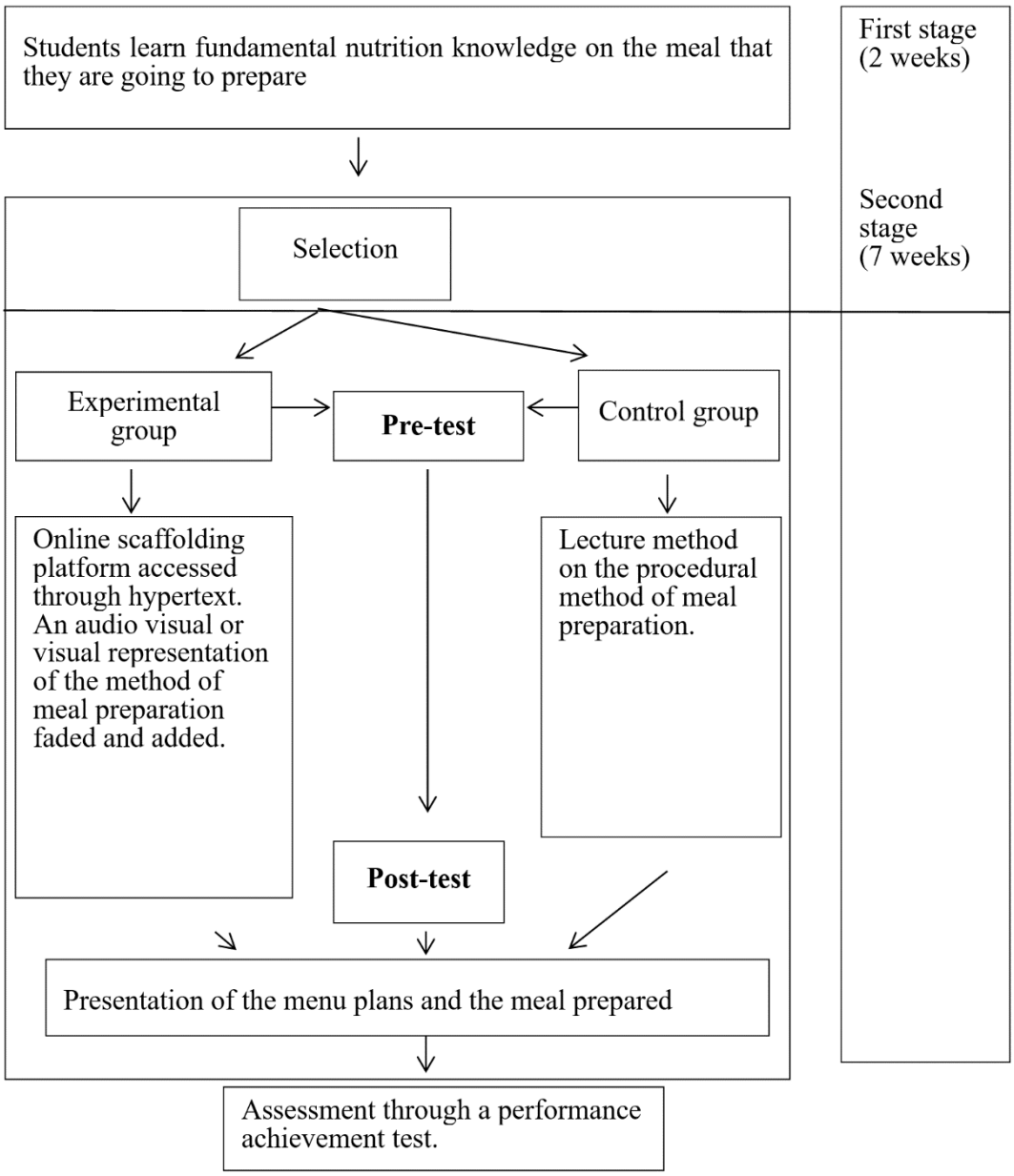

Figure 1. The procedure of treatment

3.2. Lesson Observation Schedules

For the theoretical lesson observation, the teachers in both groups were well prepared with lesson plans. The control groups' teachers presented charts showing the important points to consider when planning meals and Home Science text book for the latter. The experimental group teachers used textbooks and a video presentation on the nutrition needs of a convalescent. In both groups, the teachers introduced the lesson with a question and answer session. The learners in the control group were able to take notes. The learners in the experimental group were using the computers and engaged in discussions.

The teachers in the control group used lecture method on the meal presentation in reference to the course book. The experimental group was exposed to CBS through multimedia that presented pictures and audio-visual presentations that showed model instructors cooking, setting the table and creative techniques of food presentation.

The students prepared the menu plans that could be used during the practical activity. During the practical lesson, both groups were assigned into smaller group sets of 4. The teachers in both groups supported learning through moving around each group and giving necessary guidance.

3.3. Pre-test Analysis of the Control and Experimental Groups

The pretest assessment tool was used to determine the learner's prior knowledge and competence mastery. Further, the pre-existing knowledge and skills could

positively influence the domain knowledge hence the acquisition and the mastery of culinary competencies. Mean values for the control group were 8.36 in the preliminary study and 9.92 in the experimental group. The pretest control group standard deviation was 4.523 and the test group standard deviation was 3.734.

The study found that some learners in the control group were unable to write good menu plans to guide their practice; the methods of preparation were incomplete, lack of logical sequencing in the order of work and inappropriate menus in consideration of the convalescent. As observed, the learners in both groups lacked the proper nutrition competencies that ought to be applied during the planning and food preparation, which was evident during the practical activity. Moreover, the learners failed to preserve nutrients, and table setting was inappropriately done and garnishing lacked creativity. It is important to note teachers have to clarify the nutrition concepts to the learners, so that they can focus on the nutritional needs of the individual [14].

This pretest analysis of both groups denotes that the students who were below the learning expectations in the first test would still present similar learning outcomes. Therefore, teachers needed to improve students' understanding of nutrition concepts in the direction of developing culinary skills. A t-test was used to compare the means of the two groups. Table 1 shows the pre-test comparison of the control and experimental groups.

The findings in table 1 show the p-value for Levine's test is greater than 0.05 ($p \geq 0.05$), so the top row of indicators is used. F=0.574, p=0.05. The results show that there were no significant differences between the experimental and control groups in the preliminary tests performed. The t-test value was 0.092. Where, t (79) = 0.092; this indicates that the mean performance of the control group (M=8.4, SD=4.5) was not significantly different from that of the experimental group (M=9.9, SD=3.7) in the pretest. Further, the findings in table 2 show the pretest group statistics among the participants in control group and experimental group. The findings show that the experimental group had a higher mean score of 9.92 compared to 8.36 for control group which is an indication that there was a slight difference in performance in the two groups.

Table 1. Pretest comparison of the control and experimental groups

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
pretest	Equal variances assumed	.319	.574	-1.703	79	.092	-1.563	.918	-3.390	.263
	Equal variances not assumed			-1.683	71.982	.097	-1.563	.929	-3.415	.288

Table 2. Pretest group statistics

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pretest	CG	82	8.36	4.523	.734
	EG	89	9.92	3.734	.569

3.4. Post-test Analysis of the Control and Experimental Group

The experimental group was exposed to CBS in teaching and learning of Culinary. The control group was exposed to lecture methods and teacher demonstrations. The students took the same practical exam and had a maximum of 25 points. A t-test was used to determine whether treatment affected student performance between her two groups. The mean test scores for the control group are 15.43 and 19.50 for the experimental group, respectively. Table 3 shows the post-test results scores for the experimental and control groups.

The p value in Levine's test is less than 0.05 ($p \leq 0.05$) hence the bottom row indicators are used; $F = 10.58$, $p = 0.02$. The results indicate there was a significant difference between the Experimental and the Control group in the Post-test conducted. The T-test indicated a value of 0.000 where: $t(43.3) = 0.000$; meaning the average performance of the Control Group ($M=15.4$, $SD=6.0$) was significantly different from the performance of the Experimental Group ($M=19.5$, $SD=1.9$) in the Post-Test. The standard deviation of the control group is 6.009 and the experimental group at 1.861, this shows that there is a significant difference in the learning outcomes, as the experimental group performed better than the control group. Further, group statistics in table 4 show that, in the post test the experimental group had a high mean of 19.50 as compared to the control with mean of 15.43. This is an indication that learners taught through computer-based scaffolding have a chance of mastering the culinary competencies and many teachers teaching Home science and nutrition should be encouraged to use technology in their instruction.

3.5. Cohen D's Effect Size

Cohens D Large size effect was used in the study, which is used to determine if the research has a practical significance Cohens D Effect size = 0.9556; which is above the 0.8 Cohens D definition of a Large Effect size. Thus, the implementation of computer-based scaffolding in teaching and learning culinary skills in Home science has a positive effect on student performance. Also, studies observed during the experiment, the web-based multimedia presented during the lesson enhanced differentiated learning as the learners were able to acquire the domain nutrition content through pictures and videos, processes and make sense of the new knowledge on food presentation in a logical sequence.

Additionally, the students in the experimental group were able to apply the knowledge they had learned in the CBS class, they prepared food, set the table appropriately and garnished the food creatively better than the experimental group. This could be attributed to the student's ability to create mental pictures, which enhanced creativity and critical thinking.

Table 3. Posttest comparison of the control group and experimental groups

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Posttest	Equal variances assumed	10.575	.002	-4.217	79	.000	-4.066	.964	-5.985	-2.147
	Equal variances not assumed			-4.005	43.266	.000	-4.066	1.015	-6.113	-2.019

Table 4. Posttest group statistics

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Posttest	CG	82	15.43	6.009	.975
	EG	89	19.50	1.861	.284

3.6. Students' Questionnaire

Learners' Ability to Follow the Meal Preparation Method in a CBS Lesson

The meal plan contains the meal preparation procedure of the food items selected by the learner. The ability to follow the meal plan is crucial during the culinary practical. Then meal plan acts as a guide to enable the student to follow the correct methodology during food preparation and service. The learner's ability to follow the plan is attributed to the following characteristics: comprehension, ability to create mental pictures, proper organization, ability to multitask and time management. The experimental groups were assessed which is illustrated in Figure 2.

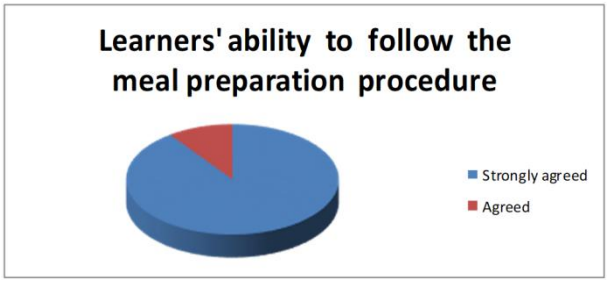

Figure 2. Learners' ability to follow the meal preparation method in a CBS lesson

The study established that 90% of the learners strongly agreed and 10% agreed that they were able to follow the meal preparation method using the online video during practical activity. This meant that all learners were able to follow and probably understand better on how to prepare a meal using the online videos during practical lessons, as compared to being lectured or taught verbally only. In this study, it was observed that learners in the experimental group were better at following meal plans than the control group. This can be attributed to visual cues that stimulate the ability to create mental images. Visual cues combined with audio play an important role in student comprehension and retention. The visual cues presented by the models who acted as role models sanctioned the learners in terms of motivation, autonomy, comprehension, synthesis, application, critical and creative thinking.

Learners' Active Engagement during the CBS Lesson

Numerous studies have supported that active learning is priority to encourage student engagement during the lesson. Engaging learners actively increases their attention, motivation, problem solving and focus. Technology engages the learners as they are able to put in more effort and time in participating in learning activities. Moreover, the learners are engaged emotionally as their interests are impacted positively. The students also benefit cognitively as they are engaged mentally and are able to comprehend what is being taught. In the study, the experimental groups were actively engaged during the CBS lesson as well as the practical lesson. The students responded on how they were engaged during the lesson, which is illustrated in Figure 3.

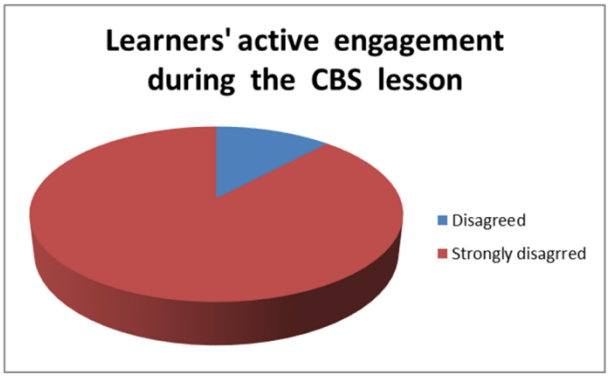

Figure 3. Learners' active engagement during the CBS lesson

The study also noted that the learners were more active during the CBS lessons as compared to the lessons that were not using technologies for learning. 88% strongly disagreed that they were idle in the CBS lessons while 12% disagreed on the same, as compared to the lessons that were not using technologies. This is due to the nature of the CBS learning environment, the classroom observation schedule observed that students were able to pace, direct their learning, navigate through the hyperlinks provided and construct the new knowledge in a way that they can place where and when the domain nutrition knowledge can be applied in meal planning and presentation.

Note Taking during the CBS Lesson

While most of the learners had indicated that they were most active during CBS lessons as compared to lessons that did not employ technologies. 71% of the learners reported that they were not able to take sufficient notes during the CBS lesson. This poses as challenge in CBS, the lesson notes are vital, as they enable the learners to recall what was taught. The findings are illustrated in Figure 4.

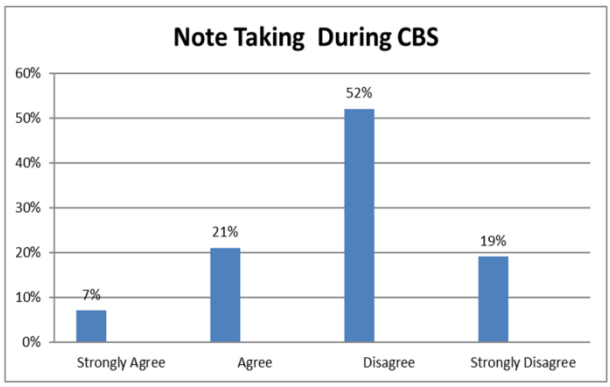

Figure 4. Note taking during the CBS lesson

A greater majority, 52% of the learners disagreed to the fact that they were able to make notes during CBS lessons more than other times and 19% strongly disagreed,

meaning they were totally unable to make notes. Only 21% and 7% agreed and strongly agreed that they were able to make notes. This poses a challenge to the teaching and learning process as students have limited reference materials. This may be due to irregularities in computer technology and time constraints. The study also found that learners in the experimental group were exposed to more information than contained in the curriculum, students took note of that and asked questions. The teacher responded to the queries and advised the learners to access online videos in culinary during their free time.

Ability to Query more during the CBS Lesson

The question and answer lesson activity is vital in CBS as it enables the teacher to diagnose the degree of scaffolding the learner needs. The teacher monitors this by the learner's response and queries to determine the adding or the fading of the computer scaffolds. This is presented in Figure 5.

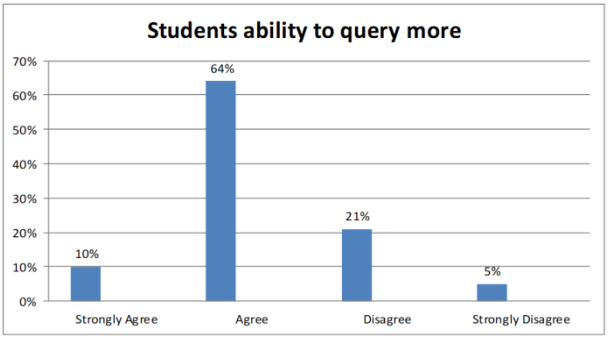

Figure 5. Students' ability to query more

In the study, 64% of the learners agreed, while 10% strongly agreed that use of CBS influenced their understanding as they were able to answer more questions while 21% disagreed and only 5% strongly disagreed. This indicates that use of technology to support the teaching and learning of culinary does positively influence learner's understanding of concepts and skills.

Learners' Ability to Complete the Practical Activity on the Time Allocated

The school-based food and nutrition examinations is allocated for 30 minutes for planning and 1hr 15 minutes for the practical session respectively, which was adhered to during the study. Data collected is presented in Figure 6.

This shows that 81% of the learners were positively affected by the use of CBS in mastering of culinary competencies as 45% strongly agreed that they were able to successfully complete their practical work on time, while 36% indicated that they agreed to the same. Only 19% of the learners disagreed that CBS helps them in successfully completing their work on time. Costanzia (2016) pointed out that mental imagery can enhance learning and improve the performance on demonstrated skills. As observed in the practical lesson observation, it was noted that the majority of the students' ability to complete the practical on time is contributed to the creation of mental pictures. After observing the multimedia, the learner is able to logically sequence the method of preparation and the presentation of the food items. The students that disagreed could be as a result of lack of logical sequencing, difficulty in creating visualizations on the method of food preparation and presenting higher order skills, for instance creativity on table setting and garnishing.

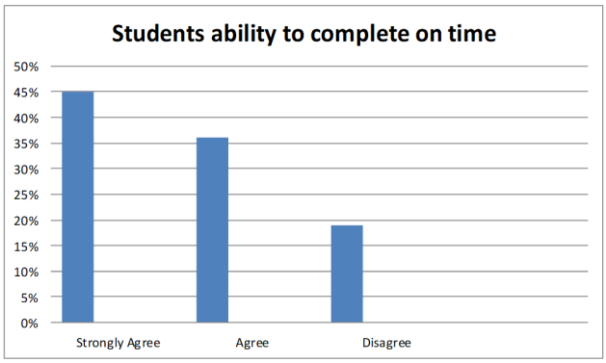

Figure 6. Learners' ability to complete on time

3.7. CBT Tools Influence in Learners' Collaboration Skills

In the study, the practical activity was done in groups of 4. This created a collaborative learning environment where the students had the ability to learn and gain important skills, such as interpersonal, team work, peer scaffolding, problem solving, critical and creative thinking. As a cross analysis presented on Figure 7.

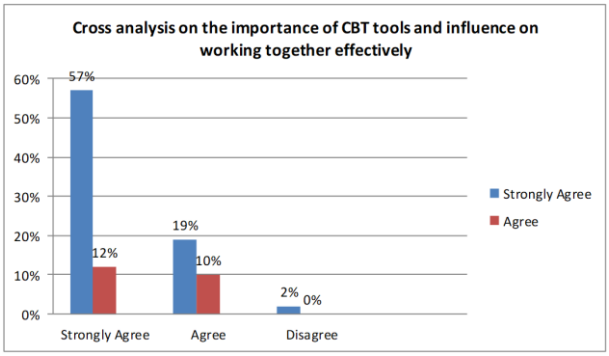

Figure 7. Cross analysis on the importance of CBT tools and the influence on working together effectively

On the perceived importance of CBS tools by the learners and its respective influence on their ability to coordinate and work together effectively, the study realized that 57% and 12% of the learners strongly agreed and agreed respectively that CBS tools were of great importance and had helped them work together effectively. Only 2% of the learners disagreed that the CBS tools were important and it didn't aid in working together effectively as for learners. The minority of the learners that disagreed

to this could be due to inability to work in groups in a way that 1-2 students taking most of the responsibilities whilst the rest barely contribute individually.

4. Discussion

This study found that CBS improves the Home Science performance, especially in diet and nutrition (cooking) practices in schools. The performance of the experimental group was significantly higher than that of the control group. The experimental group average was 19.50, while the control group average was 15.43. The Cohens effect size is 0.9556, which exceeds the Cohens D definition of 0.8. This shows that CBS has a positive effect on teaching and learning of Culinary. The finding corroborates the assertion that CBS enhances learner's autonomy and increases the level of mastering Culinary competencies. This could be attributed to the presence of fading and adding multiple representations according to the learner's difficulties and needs. Moreover, CBS provides assistance to the learners by utilizing the web-based technologies to support learning. As the scaffold is added, the acquisition of the competency increases, therefore enabling the learner to develop better comprehension beyond their immediate state. The experimental group presented better learning outcomes which was statistically significant ($p \leq 0.01$).

The teacher used multimedia to support the learners through adding and fading the scaffold tailored to the needs of the students. The teacher guided the learners, which enabled them to navigate the hyperlinks and observe the expert models in videos and pictures illustrating different concepts of Culinary. Thereafter, the learners were engaged in a practical activity, to demonstrate the skills learnt. From the classroom observation schedule, the researcher found out that the learners were able to perform the skills taught by following the meal preparation and presentation procedures. Then learners were able to follow the meal preparation procedures in a logical sequence. They were also able to query more which directed the teacher on how to add and fade the scaffold. The learners were able to complete the practical activity on the specific time allocated. However, they found it difficult to take sufficient notes due to the engagement of the scaffolds during the lesson time allocated in the school timetable.

It was observable that most learner's interest was aroused when the teacher used CBS as the learners were actively engaged as they were hands on in the computer laboratory and later in the cookery laboratory. Higher order skills such as collaborative skills, problem solving, application, analysis and evaluation were developed, which manifested when the learners were able to mimic and creatively present the foods by setting the tables appropriately and creatively garnish the food items. This would have been difficult if the teachers had only mentioned or demonstrated to the students. Learners were able to learn practically by doing, using multiple senses and were able to work at their own pace.

The experiment proved that CBS helps learners to easily conceptualize the domain nutrition knowledge and thereby, increasing their ability in the application process during the practical activities. Moreover, the learners were able to recall the concepts learnt in the CBS lesson during the practical activity. The ability to recall the concepts enabled the learners to draw information from the diverse computer scaffolds that offer support from a problem-based learning state towards progressively stronger understanding of the nutrition concepts, the acquisition and mastery of the Culinary competencies.

5. Conclusions and Recommendation

The study investigated the influence of computer-based scaffolding in fostering the culinary competencies among the learners of Home science and nutrition in secondary schools in Kakamega county in Kenya. The study used a quasi-experimental study design that consisted of control and experimental groups. Both groups were subjected to pretest and posttest. The control group was taught culinary skills using conventional strategies while experimental group after training the teachers used computer-based scaffolding approach. The findings showed that learners taught using computer-based app-broach mastered the culinary competencies than those that were taught using conventional methods.

The study recommends that teachers teaching Home science and nutrition should use the findings of this study to improve and adopt computer-based scaffolding as a strategy to enhance the competencies among their learners.

The government of Kenya through the ministry of education should equip the schools whether in urban or rural areas with digital resources to enable the teachers and learners use it in teaching and learning. This will enable the learners acquire the competencies required.

The curriculum developers should come up with digital resources that are relevant to the content of Home science and nutrition. They should also come up with tips on how the teachers can come up with improvisation of some of the related resources to make the delivery of that content easy.

The institutions of higher learning like universities and colleges should strive to equip the trainees with relevant digital skills to enable them integrate in teaching and learning of Home science and nutrition.

The study used a small sample drawn in one county in Kenya and was limited to only teachers and learners of Home science and nutrition. The study recommends that similar studies can be done using a larger population and targeting different geographical regions for comparisons. Similar studies can be done based on gender to show the differences in performance given that the sampled population in this study showed gender disparities with female teachers dominating the teaching of Home science in secondary schools in Kenya.

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