British Journal of Education
Vol.10, Issue 13, pp.1-19, 2022
Online ISSN: 2054-636X (Online)
Print ISSN: 2054-6351(Print)

Extensiveness of E-Learning Platform in Secondary Schools towards Improving Science and Mathematics Performance in Moshi District, Tanzania

[1]Augustino Kayombo, [2]Rev. Dr. Victorini Salema, [3]Dr. Adam Chidyau
Mwenge Catholic University

Citation: Augustino Kayombo, Victorini Salema, and Adam Chidyau (2022) Extensiveness of E-Learning Platform in Secondary Schools towards Improving Science and Mathematics Performance in Moshi District, Tanzania, *British Journal of Education*, Vol.10, Issue 13, pp.1-19

ABSTRACT: *This study evaluated the Extensiveness of E-Learning Platform in Church Secondary Schools to Improve Science and Mathematics Performance. The study was summative evaluation which was guided by (CIPP) model. This evaluation adopted an embedded model of the convergent design whereby qualitative and quantitative data sets were collected at the same time and then integration of the information in the interpretation was done in report writing. Both probability and non-probability sampling techniques were used to select 127 respondents from the target population. Both qualitative and quantitative instruments were used to collect data and that were descriptively and inferentially analyzed. Validity of the quantitative instruments was determined and the reliability coefficient was calculated using Cronbach's Alpha (r=0.762 for teachers' questionnaire and r=0.737 for students' questionnaire). Quantitative data were analyzed using frequencies, and percentage and presented in tables by the aid of SPSS. Qualitative data was coded, analyzed, and presented in themes and direct quotations. The key findings indicated that E-learning platform was effectively operating. It has made improvement in students' performance not only in science and mathematics subjects but even in social science subjects. The study concludes that the E-leaning project by CSSC proves positive achievement in teaching of science and mathematics subjects in the project schools. The study recommends that ICT and E-learning should be used for teaching and learning in all learning institutions.*

KEYWORDS: Christian social service commission, e-learning, science and mathematics, ICT

INTRODUCTION

The Christian Social Services Commission (CSSC) is an ecumenical body established in 1992 jointly by the Christian Council of Tanzania (CCT), the umbrella organisation of protestant churches and the Tanzania Episcopal Conference (TEC), the Assembly of Catholic Bishops of Tanzania, to coordinate and facilitate the delivery of social services – health and education. Early 1990s onwards, the Government of Tanzania had desired to improve science and mathematics subjects, which started to decline in the 1980s. The poor performance of secondary school students, particularly in science and mathematics, is of considerable concern to the Government, as well as to the private sector and development partners. In spite of efforts to increase access to secondary

education, quality and equity remain poor. In an effort to contribute towards improving performance in science and mathematics subjects the Christian Social Services Commission (CSSC) with financial support from the Italian Bishops' Conference developed an E-learning platform for mathematics and science subjects. This was a three-year project which started July 2018 to June 2021 (SCCS, 2018).

The E-learning project by CSSC was introduced so as to raise interest and performance of science and mathematics subjects in faith-based secondary schools owned by Tanzania Episcopal Conference (TEC) and Christian Council of Tanzania (CCT) through the whole country. Due to the development in science and technology teaching and learning has also advanced on the same line. E-learning refers to knowledge acquisition system based on formalised teaching but with the help of electronic resources. While teaching can be based in or out of the classrooms, the use of computers and the Internet forms the major component of E-learning. In order to meet this objective the project intended that the hardware, software and network architecture of the E-learning platform are enhanced in secondary schools by the CSSC. Modify the platform to enable compatibility with existing devices (tablets, laptops & desktops). The E-learning platform was intended to be compatible for use with exiting devices.

A study conducted by Arthur-Nyarko et al. (2019) insist that access to ICTs and access to power/electricity influence performance for E-learning delivery mode. This evaluation on the E-learning project collected data, made observation and analysed documents in order to see if the E–learning platform was effectively operating in secondary schools in favour of the good performance in science and mathematics subjects.

Purpose of Evaluation

This study is summative. The summative evaluation involves five stages which are: assessment of relevance, this is the extent to which the objectives of a project intervention are consistent with beneficiary requirements, country needs, global priorities and partner and donor policies. The extent to which the project is addressing and pressing needs of the beneficiaries. The evaluator of this project wanted to see if the project had met the intended objective which is: the E-learning platform is effective in church secondary schools to improve science and mathematics performance. Therefore, this was a summative evaluation since the three-year E-learning project ended in 2021 and no summative evaluation had been done.

Evaluation Questions

To what extent the E-learning platform is effectively operating in secondary schools to improve science and mathematics performance?

Significance of Evaluation

Evaluating a project means performing a rigorous analysis of completed goals, objectives and activities to determine whether the project has produced planned results, delivered expected benefits and made desired change. Hence, this evaluation would help the Christian Social Services Commission (CSSC) management to decide on this project and make some improvements as the

E-learning project carry on in this country. The immediate beneficiaries of this evaluation would be mathematics and science subject teachers and students because the findings and the recommendations suggested ways for improving E-learning and teaching mathematics and science subjects. Also, other education stakeholders like parents, government officials benefit with this evaluation because their participation in the project had create awareness and learnt how the project had benefited or not to the learners. The evaluation has provided credible information for improving programmes, identifying lessons learned, and informing decisions about future resource allocation. Another significance of the evaluation has based on knowing how the E-learning platform was operating effectively in the CSSC secondary.

CONCEPTUAL FRAMEWORK

This evaluation study was guided by Context, Input, Process and Product (CIPP) model proposed by Stufflebeam in 1971. The purpose of this model was to provide relevant information to decision makers for judging decision alternatives. This model suggests the cyclical approach in which evaluation and feedback were continuously provided to decision makers. Under the guidance of the model the evaluator had to deeply investigate the objectives of the E-learning project from the Christian Social Service Commission (CSSC).

Context Evaluation

The evaluator at this level got full understanding of the situation which led to the introduction and implementation of E-learning project for improving science and mathematics subjects in CSSC' secondary schools. The vision, mission, goals and objectives of the project were carefully analysed and evaluated. Moreover, the evaluator managed to understand the project document by finding out how well the baseline study had assisted in decision making process about the policy implementation planning process of the E-learning project. For the E-learning project the vision was an enlightened and well-educated community that was enjoying quality life and was free from diseases of poverty. The mission was to facilitate the delivery of people – centered social services by church institutions in Tanzania through partnership, advocacy, capacity building and cost-effective interventions, with the compassion and love of Christ. The goal of the project based on the interest and performance of secondary students in science and mathematics. The E-learning project's objectives based on: the E-learning platform was operational and in use at targeted CSSC secondary schools. Teachers in targeted CSSC secondary schools meant to provide quality education in mathematics and sciences subjects. The Government, church owners and other stakeholders were interested to expand the E-learning platform to other public and non-government schools. The project was managed efficiently and effectively, in an outcome and impact-oriented manner.

Input Evaluation

At the input stage, the evaluator collected the information based on the teaching and learning science and mathematics subjects in the CSSC secondary schools, availability and use of ICT equipment such as: Computers, iPads, internet and internet access, availability of technical

assistance as well as supportive infrastructure such as electricity and ICT lab. Moreover, the evaluator assessed the human resource and the target group.

Process Evaluation

In process stage, the evaluator investigated the processes leading to the impacts derived from the project implementation such as teaching and learning process through E-learning. The evaluator assessed the project activities and documented them. The key objective of the evaluator was to provide feedback regarding the extent to which planned activities as stated by the project document were carried out.

Product Evaluation

In this stage, the evaluator measured and interpreted attainments of the E-learning project. The evaluator assessed the positive and negative impacts which the project implementation had generated at school level. During this stage both short- term and long-term outcomes were judged and the results were noted in assisting the verification of evaluation findings.

Strength of the CIPP Model

The CIPP model encourages evaluation to take place at each stage of the object of evaluation; the CIPP model is sensitive to feedback (Kiminza et al. 2021). This means that it provides opportunity to the project implementers to pursue feedback to the implementers/stakeholders about the context, input, process and output of the project. CIPP Model enabled the evaluator to assess the extent to which the policy objectives had been achieved on the entire implementation process and how they facilitated teaching and learning of science and mathematics subjects.

Limitation of the CIPP Model

This model has the following as its limitations. It lays little emphasis on value concerns. In evaluating one component it might lead to incomplete judgment since success or failure of the project or program is brought about by assessing all the stages. This may lead to a serious problem to the evaluation study due to the fact that it is very difficult to identify whether the failure of the program was due to the context, input, or process. As a result, the evaluator must evaluate the entire process again to identify the reason for the failure which is very expensive in terms of funds and time.

Application of CIPP model to this study

The application of this model based on the fact that the evaluator understood the context of the project, the inputs, and process as well as the product of the teaching and learning science and mathematics through E-learning program. Hence, a careful examination of the stages, observation of the performance indicators with the project objectives helped the evaluator to determine the extent to which the E-learning project has been implemented and yielded the desired results.

Review of Empirical Studies

The main aim of empirical study is to review different literatures on the discipline so as to identify different knowledge gapes that may arise in order to have a stand and direction on the present study.

The Extent to which E-Learning Platform is Effectively Operating in Secondary Schools to Improve Science and Mathematics Performance

A study done by So et al. (2019) in China aimed at exploring primary school learner's perceptions and experiences of self-regulated science learning in multimedia-supported E-learning environment. This study by So et al (2019) used observation and interview as the only instruments for data collection. The results obtained from the study by So et al (2019) revealed that the combination use of the discussion forum and statistics table seemed to facilitate the student's diagnosis of their prior knowledge of natural phenomena in the forethought phase. This study used only two instruments excluding questionnaire while this evaluation will use more than two instruments including questionnaire, in-depth interview guide, observation schedule and document analysis guide. Also, this study was conducted to primary school learners whom some learning experiences and social life are not well founded in them. Hence, this evaluation was conducted in secondary school level in which learners were able to correctly write and explain themselves without much problems in revealing that the project was operating in the schools.

Arthur-Nyarko et al. (2019) conducted a study on learner's access to resources for E-learning and preference for E-learning delivery mode in distance education programs in Ghana. The study employed an analytical survey in data collection. The result of this study was that, access to ICTs and access to power/electricity influence performance for E-learning delivery mode. This study by Arthur-Nyarko et al. (2019) was used in general distance E-learning delivery mode without specifying subjects. The evaluation by CSSC on E-learning project did not use analytical survey as an instrument in data collection but used questionnaire, in-depth interview guide, and document analysis guide and this evaluation by CSSC focused specifically on the E – learning platform operating and in use in secondary schools in favor of the good performance in science and mathematics subjects.

Mwakisole et al. (2019) conducted a study on the cloud computing architecture for E-learning system in secondary schools in Tanzania. The effectiveness of this study; which was evaluated by comparing its performance with a similar traditional web-based E-learning system using the Moodle benchmark tool and Apache JMeter as means of obtaining data. The study by Mwakisole et al. (2019) found that E-Learning systems implemented in the cloud-based infrastructure had better performance metrics than web-based E-learning systems on school premises. This evaluation of the CSSC project on E-learning was not a comparative study but used data collection instruments in obtaining the information on how the project was operating in the secondary schools rather than comparing the results.

A study by Hoerunnisa et al. (2019) done in South Africa on the effectiveness of the use of E-learning in Multimedia classes to improve vocational students' learning achievement and motivation. The study by Hoerunnisa et al. (2019) used the Quasi - experiment method as means

of obtaining data. The result in this study by Hoerunnisa et al. (2019) revealed that the use of E-learning can significantly improve student achievement and motivation and increase student participation in learning. This study by Hoerunnisa et al. (2019) based on vocational learning achievement and used Quasi-experiment method. The E-learning project evaluation by CSSC was not evaluating the vocational studies but the evaluation based on basic science subjects and mathematics performance.

Study done by Mahyoob (2020) on the evaluation of the learners' new experiences in online education and to assess the feasibility of the virtual methods of learning. The study by Mahyoob (2020) was conducted in Saud Arabia by analyzing 184 learners' responses to the survey-based questionnaire as instrument for data collection. The study results showed that most of the English Language Learners (ELL) were not satisfied with continuing online learning, as they could not fulfill the expected progress in language learning performance Mahyoob (2020). This means that there may be well established ICT infrastructure but learners may prefer using blackboard rather than electronic learning. Family and social background of the learners and teachers might also lead to the disliking of learning electronically. This study by Mahyoob (2020) used only survey-based questionnaire to get source of information but this evaluation of the E-learning by CSSC used other data collection instruments like in – depth interview guides, questionnaires, observation schedule and document analysis guide.

Khan et al. (2021) conducted a study on teachers' perception on E-learning implementation in Pakistani. The study by Khan et al. (2021) used an online survey as means of data collection after six months of teaching without any in-person class to discover how instructors perceived the procedure of E-learning. The study by Khan et al. (2021) investigated the perceptions of instructors on online learning through an online survey. The study participants consisted of 70 faculty members to underpin the usefulness, problems, and potential benefits (Khan et al., 2021). The analysis by Khan et al. (2021) discovered that the most popular online technologies in Pakistan were Zoom, Microsoft Teams, and WhatsApp, used by the instructors for academic purposes during the lockdown period. The results of the survey discovered that teachers' views regarding remote learning were neither positive nor negative (Khan et al., 2021). Survey results by Khan et al. (2021) also indicated that learners lacked interaction, motivation, technical hurdles, Internet cost and connectivity, data privacy, and security when using online learning. Face-to-face learning could not be replaced by online learning owing to COVID-19. The study encouraged more use of blended learning for an intensive educational environment (Khan et al., 2021). The online technology used by the study of Khan et al. (2021) was different from that of CSSC E-learning project on improving performance in science and mathematics subjects and used instruments for data collection such as questionnaire to get source of information but this evaluation of the E-learning by CSSC used other data collection instruments like in – depth interview guides, questionnaires, and document analysis guide.

A study by Apriani et al. (2021) done in Indonesia which explored the E-learning training implementation which covered the lecturers' perspective. The research population was 50 postgraduate lecturers; however, only 9 English education postgraduate lecturers joined this

training. The research design of this study was qualitative research which applied observation checklist, interview, and note taking as the instruments to collect the data (Apriani et al., 2021). The findings of the study by Apriani et al. (2021) showed that the implementation of E-learning had been done by the trainer and the lecturers followed it and was important for the lecturers to use it in teaching. This study by Apriani et al. (2021) was done for the lecturers in English language teaching. The evaluation of E-learning by CSSC sought to know how the E-learning platform for secondary school science and mathematics learners' performance improvement had been due to its implementation as it operated in the schools. Due to these studies, there was a need for the student to be guided through practical though E-learning could be in operation. Learning by doing matters a lot especially laboratory practical and kinetic learning.

EVALUATION METHODOLOGY

The evaluation employed convergent design under mixed method approach. The purpose of using this design was to collect both quantitative and qualitative data simultaneously and compare the results to obtain a more complete understanding of the research problem. The evaluator mixed the two databases by merging the results during interpretation to ensure the two data sets conform. Convergent design helped in interpreting the findings of two databases to see if there was convergence between two sources of information. The design enabled the evaluator to collect large amount of data for a short period of time from variety of respondents. (Creswell and Creswell, 2018). The target population under this evaluation was all CSSC secondary schools in Moshi district. There were 26 secondary schools that had implemented the E-learning project. The total of 17,600 students was part of the target population to see to what extent they have benefited from the implementation of the project. Moreover, there were 176 science and mathematics teachers, 26 heads of schools, 1 project manager and 1 district secondary education officer.

The probability and non-probability sampling procedures were employed by the study in which direct inclusion was used to get heads of schools, science and mathematics teachers, district secondary education officer and project manager, stratified simple random was used to get students. The sample for the study included 5 secondary schools, 5 heads of schools, 20 science and mathematics teachers, and 100 science and mathematics students. The instruments for data collection were questionnaire, in-depth interview guide, and documents analysis guide. Questionnaire was used to collect quantitative data while in-depth interview guide was used to collect qualitative data. The reliability of quantitative data was established through Cronbach Alpha; ($r = 0.762$ for teachers' questionnaire and $r = 0.737$ for students' questionnaire) while the reliability for the qualitative data was established through detailed field notes, used recording devices, transcribed and made triangulation of data. Quantitative data was coded and analyzed using percentage, mean and frequencies through statistical Package of social science (SPSS) Version 22 and presented in tables. Qualitative data was analysed by summarizing, coding contents into themes and presented in narrative form and direct quotations from respondents. The research findings were summarized into descriptive statistics in relation to evaluation question.

EVALUATION FINDINGS AND DISCUSSION

The study evaluated the extent to which E-learning platform was effectively operating in secondary schools in Moshi district, Tanzania in order to improve science and mathematics performance. Questionnaires' responses for students are summarized in table 1.

Table 1: Summary of students' responses on The Extent to which E-Learning Platform is Effectively Operating in Secondary Schools to Improve Science and Mathematics Performance (N=100)

	Strongly disagree		Disagree		Undecided		Agree		Strongly agree	
	f	%	f	%	f	%	F	%	f	%
E-learning project is effectively operating in your school	1	1	2	2	4	4	37	37	56	56
E-learning project has managed to increase the performance of students	2	2	6	6	11	11	44	44	37	37
The number of science students has increased due to the implementation of E-learning project in your classes	7	7	27	27	26	26	24	24	16	16
E-learning system has helped students to complete their homework on time	8	8	15	15	15	15	31	31	31	31
Science and mathematics teachers are competent on ICT	2	2	15	15	18	18	41	41	24	24
Social science teachers and students use E-learning system for teaching and learning in your school	8	8	10	10	3	3	40	40	39	39
E-learning project is helpful in compilation and report making	0	0	2	2	10	10	33	33	55	55
Training on ICT is done to teachers regularly	10	10	28	28	24	24	26	26	12	12
All teachers know how to operate ICT devices	12	12	20	20	19	19	31	31	18	18
It is easier to teach and learn by using E-learning system	4	4	2	2	3	3	24	24	67	67

Source: Field data (2022)

Key: f= Number of respondents and % = percentage

Data in Table 1 show that 93% which is the great majority of science and mathematics students agreed and strongly agreed that E-learning project was effectively operating in their schools. This implies that the E-learning project was well established and used by students and teachers for teaching and learning processes. This means that the E-learning project by CSSC in the intended schools was very well disposed to the learners. This concurs with the study done by Zalat et al. (2021), whose findings revealed that learners should be exposed to ICT knowledge for education. This means that when students are exposed to the ICT devices they may be familiar with and use

them for their learning. This would help students to be exposed to the E-learning system and become family with the E-learning platforms.

The data from Table 1 revealed that great majority (81%) of science and mathematics learners agreed and strongly agreed that E-learning project had managed to increase the performance of students while the minority (8%) of the respondents indicated that they disagreed and strongly disagreed with the statement and few (11%) were not sure of the statement. This implies that the E-learning project by CSSC had managed to increase performance of the students since its implementation. This concurs with head of school whose response was, *"yes E-learning has improved performance because they were in position to search materials themselves, they were in position to present materials themselves, to exchange materials themselves and so the performance of the students is highly improved" (Personal interview with head of school "X" on July 6, 2022).* This means that most of the science and mathematics students specified clearly that E-learning project had managed to increase the performance of students as they applied it in the process of teaching and learning. The study conducted by Hoerunnisa et al. (2019) the findings revealed that the use of E-learning can significantly improve students' achievement and motivation and increase student participation in learning. This implies that in the process of teaching, the facilitator may employ different ways of teaching through which learning takes place, including teaching electronically or manually. Therefore, E-learning project had managed to increase students' performance as intended by the CSSC management.

From the data in Table 1 science and mathematics students' responses revealed that less than half (40%) of students who participated in the evaluation agreed and strongly agreed that the number of science students had increased due to the implementation of E-learning project; while some (34%) of students rejected that the number of science students had increased due to the implementation of E-learning project. Moreover, few (26%) of science and mathematics students failed to decide that the number of science students had increased due to the implementation of E-learning project. This implies that though not more than half of students who participated in the study agreed that the number of science students increased due to the introduction of E-learning project, the fact is that they had no proper data since they were not part of the management but they could experience it. This means that the number of science and mathematics had increased though not in big number. The findings concur with that of Clark (2018) who found that the psychological theory of behaviorism is used as an educational theory when the learning experience is based on a stimulus and a response and by rewarding behavior that will meet the educational goal and ignoring (or correcting) behavior that is not goal directed. This implies that motivation in the process of teaching and learning is very important. In order to increase the number of science takers motivation could be involved like the assurance of scholarships, employments and gifts. This means that the number of students could increase or decrease because of the motivation that is present.

Data summarised in Table 1 indicated that majority (62%) of science and mathematics students who participated in the study agreed and strongly agreed that E-learning system had helped students to complete their homework on time, only few (23%) of the respondents disagreed that

E-learning system had helped students to complete their homework on time while minority (15%) of the participants were not sure if E-learning system had helped students to complete their homework on time. This implies that students were provided with homework to be done on their own time whether they used E-learning system or not. This means that E-learning system had helped those students who used E-learning program to complete their homework on time due to the fact that they could not do it at home because the system was not installed at their homes only at school. Effective utilisation of the ICT increase users' performance and commitment as it was revealed by Kanani (2018) the findings show that the implementation of effective ICT in the learning institution results to good and timely performance of the users. This implies that when students are well trained on speed and time management in using the E-learning they could complete their homework on time. Follow up by teachers also could be one of the factors that made students to have done their homework timely.

Summarized data from Table 1 indicated that more than half (65%) of science and mathematics students agreed and strongly agreed that science and mathematics teachers were competent on ICT; while minority (17%) of the respondents disagreed that science and mathematics teachers were competent on ICT and few (18%) of the participants did not know that science and mathematics teachers were competent or not on ICT. This implies that teachers were competent on ICT since many of them were graduate and in colleges and universities one cannot go without ABCs on ICT knowledge. This showed that the majority of science and mathematics students were satisfied with the competence of their teachers on ICT since they were direct affected by their teaching and learning activities through E-learning program in their schools that was facilitated by their teachers. This is very important as it was suggested by Heba at el. (2019) that students who used the mathematics Z Moodle system for their preparation for the school-leaving examination did improve their competencies in the taught areas of mathematics. Competence of teacher facilitate learning and helps to build competence to learners.

Data from Table 1 satisfactory majority (79%) of science and mathematics students who participated in the study agreed and strongly agreed that social science teachers and students used E-learning system for teaching and learning in their schools, while few (18%) disagreed and strongly disagreed that social science teachers and students used E-learning system for teaching and learning in their schools and very few (3%) of science and mathematics students were not aware of social science teachers and students used E-learning system for teaching and learning in their schools. This shows that the majority of teachers who were familiar with ICT used E-learning system for teaching other subjects which were not science or mathematics. This implies that E-learning programme is not only for science and mathematics subjects. One of the teachers who teaches Biology and Geography said, "*I use to teach for example, mountains formation or magma eruption though video by displaying in the class through projector" (Personal interview with subject teacher "Y" on June 26th, 2022).* This implies that teachers who had ICT knowledge to teach their respective subject through the aid of ICT devices provided by the CSSC project. Apriani et al. (2021) cements this idea by the findings which highlighted that E-learning helped in training towards English virtual lecturers. This implies that E-learning program is open to all kinds of

teaching and learning processes. Therefore, it has to be kept in mind that E-learning program is helpful in teaching and learning all subjects.

From the data in Table 1 science and mathematics students' responses indicated that majority (88%) of the participants said that E-learning project was helpful in compilation and report making while very few (2%) of the respondents disagreed that E-learning project was helpful in compilation and report making and small number (10%) of science and mathematics student were not aware that E-learning project was helpful in compilation and report making. Majority of science and mathematics students confirmed that E-learning project was helpful in compilation and report making. This implies that E-learning project was not only helpful in teaching and learning processes but also simplified office works like report making and official communications. This was supported by the responses of one of the head of school who said, *"E-learning system has simplified report making since the system is installed and what we are doing is just editing and producing the report within short time (Personal interview with head of school "X" on July 6, 2022).* This implies that E-learning project was also used by the administration to facilitate office works. This is possible because the head of school is the one to produce and communicate student's reports to the parents or guardians.

Summary of data in Table 1 showed that 38% of science and mathematics students agreed and strongly agreed that training on ICT was done to teachers regularly, while 38% of science and mathematics students disagreed and strongly disagreed that training on ICT was done to teachers regularly and 24% of science and mathematics students were not aware if training on ICT was done to teachers regularly. This shows that students were half way divided on knowing and not knowing if teachers were getting training on ICT regularly. This implies that students were not direct reporters for their teachers. Since teachers were the ones to get into training it was difficult for the students to know what was going on to their teachers. This is in the same line with the responses from the project manager who in answering if they offered any training to teachers on ICT to enhance competence he said, "*yes, they did training once per year" (Personal interview with project manager on July 11th, 2022).* This implies that training was done but not as expected due to the development of science and technology. This means that there was insufficiency training to teachers which is dangerous because technology is changing faster. The study according to Kisanjara (2020) insists that universities in Tanzania should restructure the ICT policy to capture the E-learning implementation through conducting training and sensitization. This implies that regular training on ICT is necessary in order to keep the teachers with up to date knowledge and information about the ICT.

Furthermore, from data in Table 1 science and mathematics students' responses showed that 49% most of teachers knew how to operate ICT devices while 32% of science and mathematics students disagreed and strongly disagreed that all teachers knew how to operate ICT devices; and 19% of science and mathematics students were not aware if all teachers knew how to operate ICT devices. A good number 49% of students understood that their teachers knew how to operate ICT devices. This implies that since students were the direct witnesses of their teachers when they were operating ICT devices during teaching and learning process could respond positively. However,

this is not the reality since there are those teachers who are unwilling to use ICT in teaching. This was supported by the response from project manager when responding to the challenges on implementing the project, he said, *"unwillingness of some teachers to use ICT devices" (Personal interview with project manager on July 11th, 2022).* This implies that not all teachers were using ICT devices provided by CSSC project in their respective schools. This could be due to the fact that not all teachers in their learning process learnt about ICT in their colleges or negative attitude towards ICT and old age of the teachers.

The data in Table 1 science and mathematics students' responses indicated that great majority (91%) of the participants agreed and strongly agreed that it was easier to teach and learn by using E-learning system while only few (6%) of the respondents disagreed and strongly disagree that it was easier to teach and learn by using E-learning system and very few (3%) of the participants were not aware if it was easier to teach and learn by using E-learning system. Great majority (91%) agreed that it was easier to teach and learn by using E-learning system. This implies that E-learning project by CSSC helped to easy the processes of teaching and learning. This means that it was so because they had been directly experiencing the effect of the E-learning as users in their respective schools. This concurs with the study by Lepellere et al. (2019) who cemented that E-learning was more helpful and effective to some of the learners who were employed and had no time to attend class hours the only solution was E-learning. This means that with E-learning program, teaching and learning can take place at any time and in any convenient place.

Findings revealed that the E-learning project was effectively operating in CSSC secondary schools and the project had managed to increase the performance of students. On the other hand, findings revealed that number of science students increased due to the influence of E-learning program that had been established in the respective schools. Moreover, findings revealed that E-learning program helped participants to be competent with ICT devices in which it helped even social science teachers and students to use E-learning program in teaching and learning in social science classes. Findings also revealed that E-learning program was helpful in office works/activities through which reports were easily produced and communicated to the parents. Lastly, findings revealed that it was easier to teach and learn by using E-learning program.

The data in Table 2 summarizes the responses of science and mathematics teachers' on how E-learning platform was effectively operating in school for the improvement of performance in science and mathematics subjects. Moreover, the evaluator sought to know the challenges that faced the implementation of the project and the possible suggested solutions of the challenges listed.

Table 2: Summary of teachers' responses on the Extent to which E-Learning Platform is Effectively Operating in Secondary Schools to Improve Science and Mathematics Performance (N=20)

	Strong disagree		Disagree		Undecided		Agree		Strongly agree	
	f	%	f	%	f	%	F	%	f	%
E-learning project is effectively operating in your school	0	0	0	0	0	0	7	35	13	65
E-learning project has managed to increase the performance of students	0	0	0	0	1	5	17	85	2	10
The number of science students has increased due to the implementation of E-learning project in your classes	0	0	3	15	5	25	11	55	1	5
E-learning system has helped students to complete their homework on time	0	0	7	35	6	30	2	10	5	25
Science and mathematics teachers are competent on ICT	0	0	3	15	2	10	13	65	2	10
Social science teachers and students use E-learning system for teaching and learning in your school	0	0	0	0	3	15	14	70	3	15
E-learning project is helpful in compilation and report making	0	0	1	5	3	15	8	40	8	40
Training on ICT is done to teachers regularly	0	0	10	50	3	15	7	35	0	0
All teachers know how to operate ICT devices	1	5	11	55	5	25	2	10	1	5
It is easier to teach and learn by using E-learning system	0	0	0	0	0	0	10	50	10	50

Source: Field data (2022)

Key: f= Number of respondents and % = percentage

Data in Table 2 on science and mathematics teachers' responses showed that all of the participants (100%) who participated in the study agreed and strongly agreed that E-learning project was effectively operating in their schools. This implies that teachers were well informed of the project and they were directly facilitators on learning through the E-leaning project as implemented in their schools through CSSC. This means that majority of teachers in all secondary schools were familiar with the E-learning programme by CSSC that had been established in order to facilitate science and mathematics performance of the students. This might be so because teachers were used to the E-learning programme and used it for teaching and learning process in their particular schools. This was in line with the answers from the interviews conducted to the heads of schools whereby all answered, *"Yes… I am aware of the e-learning programme in my school" (Personal Interview with heads of schools on June 22nd, 23rd, 24th and July 6th, 2022*) to the question if they were aware of E-learning project implemented in their respective schools; through which their role

was supervision, provision of the materials, financial and moral support for the implementation of the E-learning project in their schools as local contribution for each particular secondary school. This implies that heads of schools were the sole people for the implementation of the project and no implementation of the E-learning project by the CSSC in any secondary school without the will and support from the head of school. This means that the heads of schools were the ones to provide the progressive report on how the E-learning was operating and had brought impact on students' performance in their schools.

The data summarised in Table 2 revealed that great majority (95%) of science and mathematics teachers who participated in the study agreed and strongly agreed that E-learning project had managed to increase the performance of students while 5% were not aware whether E-learning project had managed to increase the performance of students in their schools. This implies that the E-learning project had effect on students' performance. This means that the E-learning project had greatly contributed to the students' performance as revealed in tables 5.4 and 5.3 respectively as confirmed by students and teachers. This might be so because these two group were directly involved in the processes of teaching and learning and experienced the effects of the project as they were direct beneficiaries.

From the data in Table 2 science and mathematics teachers' responses indicated that the majority of participants (60%) agreed and strongly agreed that the number of science students had increased due to the implementation of E-learning project in their classes while 25% were not aware whether the number of science students had increased due to the implementation of E-learning project in their classes and few (15%) of science and mathematics teachers who participated in the study disagreed that the number of science students had increased due to the implementation of E-learning project in their classes. This implies that yearly the number of science takers increased and teachers were involved to advice students in selection of the subjects due to student's capacity on a given subject. This means that subject selection by learners in schools is due to many factors which are coming from different angles being social, economic, family, political and individual person. The findings concur with that of Hoerunnisa et al. (2019) who asserted that the use of E-learning can significantly improve students' achievement and motivation and increase student participation in learning. This implies that most students have to be exposed to good learning environment that will include school environment, home environment and government policy on education and person free choice of the subjects to be studied. Hence, subjects selection is influenced by many factors.

Data in Table 2 indicated that less than half (35%) of science and mathematics teachers who participated in the study agreed and strongly agreed that E-learning system had helped students to complete their homework on time and less than half (35%) of teachers disagreed that E-learning system had helped students to complete their homework on time while few (30%) of science and mathematics teachers opted undecided on E-learning system had helped students to complete their homework on time. This indicates that less than half of the teachers who participated in the study agree and also less than half disagree on the fact that E-learning system had helped students to complete their homework on time. This implies that each teach had his/her own ways of making

sure that homework were submitted due to agreed time. This could mean that not all homework were to be done with the help of E-learning program. Moreover, this could be due to the fact that some schools had emergency solutions to those problems which could hinder students to complete their homework such as if there was electricity problem; some of schools had standby generators that could solve the problem of electricity, which ensured availability of workable and agreed on mechanisms of providing effective teaching and learning. Also support from parents or guardian at home has a great contribution on students completing their homework.

Summarised data from Table 2 sufficient majority (75%) of science and mathematics teachers who participated in the study agreed that science and mathematics teachers were competent on ICT while few (15%) of the participants disagreed that science and mathematics teachers were competent on ICT and minority (10%) who participated in the study were not aware if science and mathematics teachers were competent on ICT. This implies that effectiveness of any skills depends personal efforts and teachers studied in different colleges and universities which had different insistence of ICT knowledge. This means that teachers who operated the ICT devices and used in teaching and learning process were well versed in the field and students experienced their competence. The findings agree with the response from science and mathematics students in Table 5.3 who also indicated that their teachers were competent on ICT. This shows that the majority of secondary schools teachers under CSSC had been trained on ICT and some obtained the knowledge from their respective colleges. This is cemented by the study conducted by Kisanjara (2020) which came with the results that universities in Tanzania should restructure the ICT policy to capture the E-learning implementation through conducting training and sensitization that would raise users' awareness in teaching and learning.

The data in Table 2 responses indicated that great majority (85%) of science and mathematics teachers agreed and strongly agreed that social science teachers and students used E-learning system for teaching and learning in their schools while few (15%) of the participants were not aware if social science teachers and students used E-learning system for teaching and learning in their schools. The majority of teachers' and students' response indicated that social science teachers and students used E-learning system for teaching and learning in schools. This implies that E-learning program was not specifically discovered for only science and mathematics subjects but in teaching all subjects. This is evidenced from the time of COVID 19 whereby all subjects were thought through online programme before the opening up of the schools and face to face teaching in normal classes. The findings concurs with Mtebe (2020) who insists that government should prepare teachers to effectively use the ICT in their teaching practices. Collages should be equipped with computers connected to the internet, firms like airtel, Vodacom, tigo etc.; should be involved in order to help in connecting the ICT equipment with internet. This means that there is no specific subjects to be taught through E-learning program in any learning institution.

Responses from Table 2 show that great majority (80%) of science and mathematics teachers who were involved in the study agreed that E-learning project was helpful in compilation and report making while minority (5%) of teachers disagreed that E-learning project was helpful in compilation and report making and few (15%) of science and mathematics teachers who were

involved in the study undecided that E-learning project was helpful in compilation and report making. Generally, it indicated that the majority of teachers as it was to students agreed that E-learning project was helpful in compilation and report making. This implies that report making was done through the help of E-learning program which had been installed in respective school. The head of schools through their working system produce and communicate students' report as it was noted from one of the head of school, *"E-learning system has simplified report making since the system is installed and what we are doing is just editing and producing the report within short time" (Personal Interview with head of school "X" on July 6th, 2022*). This implies that E-learning system had many programs in it as per its installations. This means that E-learning project has not only helped in facilitating performance of students in science and mathematics subjects but it had helped in many activities concerning teaching and learning and other office works in the schools where E-learning had been implemented by the CSSC.

From responses in Table 2 science and mathematics teachers' responses showed by 50% disagreed and strongly disagreed that training on ICT was done to teachers regularly while less than half (35%) of the respondents agreed and strongly agreed that training on ICT was done to teachers regularly and few (15%) of the respondents were not aware if training on ICT was done to teachers regularly. Majority of teachers rejected that training on ICT was done to teachers regularly. This implies that training on ICT was not carried out as planned and expected during the project planning and write up. This can be due to shortage of fund to facilitate the training, pressure of time and shortage of the proper personnel. This is supported by the information obtained from the project manager who said training was done "*once per year to the science and mathematics teachers" (Personal interview with project manager on July 11th, 2022).* Very few trainings were done. This implies that training was done but not as required by the project activities. This could be an obstacle to teachers who are to be equipped with current knowledge on ICT because always there are some changes in technology that needs a lot of training and workshops in order to cope with. This is in agreement with the study conducted by Mtebe (2020) findings indicated that in order to enhance good performance of teaching activities and build competence to teachers, regular training on ICT should be conducted due to the fact that technology is keeping on changing. This implies that training is very necessary.

Data in Table 2 indicate that more than half (60%) of science and mathematics teachers who were involved in the study disagreed and strongly disagreed that all teachers knew how to operate ICT devices while minority (15%) agreed and strongly agreed that all teachers knew how to operate ICT devices and 25% of science and mathematics teachers were not aware if all teachers knew how to operate ICT devices. From the finding it shows that majority of teachers did not know how to operate ICT devices. This implies that since ICT knowledge is not a compulsory to student teachers it is possible that not all teachers could possess ICT knowledge. This means that teachers are free to struggle for ICT knowledge and use it for teaching and learning processes. This is in line with the answers obtained from the project manager who responded on one of the challenges in the implementation of the E-learning project as he said, *"unwillingness of some teachers to use ICT devices in teaching" (Personal interview with project manager on July 11th, 2022).* Not all teachers willed to use ICT devices in teaching. This implies that personal willingness leads to personal

stand on any usage and choices of a certain thing. This is in agreement with the study conducted by Apriani et al. (2021) who findings revealed that lack of discipline during training, poor material understanding, bad electricity, bad internet connection, unavailable modules of E-learning and the old age of the participants together with willingness to training and time management hindered some teachers to operate ICT devices during teaching and learning processes. This implies that during training trainers have no much control on the trainees who are matured and old enough to decide on their own. This means that teaching and learning depends on the decision of an individual though supervision is necessary.

Responses from Table 2 show that all (100%) of science and mathematics teachers strongly agreed that it was easier to teach and learn by using E-learning system. This implies that E-learning program was a solution and partner to traditional way of teaching. This means that those teacher with ICT knowledge could feel at home when teaching by using E-learning program. This is in line with the information obtained from science and mathematics students whereby majority of students agreed that it was easier to teach and learn by using E-learning system as indicated in Table 5.3. This implies that teachers and students who were directly using the ICT knowledge had different experience to those students and teachers without. This concurs with the study by Lepellere et al. (2019) findings indicated that E-learning was more helpful and effective to some of the learners who were employed and had no time to attend class hours the only solution was E-learning. This means that E-learning program is easier and helpful to those who have ICT knowledge and who are willing to have it. Also, those teachers without ICT knowledge would teach well with traditional way of teaching. This implies that teaching is a professional which is guided by different ways and methods of teaching. Performance of the students depends on the delivering of the proper material and the efforts of the students on learning and willing to performance better in their subjects.

Findings have revealed that E-Learning platform was effectively operating in secondary schools to improve science and mathematics performance and that science and mathematics students and teachers were aware of the E-learning program. Also the findings showed that the project had managed to increase students' performance this had led to the increase the number of students who opted science subjects. Moreover, the findings indicated that teachers were competent on the ICT which helped students to be competent on E-learning program. Findings also revealed that E-learning program had also helped other social science subjects to be taught through ICT knowledge and the office works had been simplified due to the installation of the E-learning program in schools. Lastly, findings revealed that it was easier to teach and learn through E-learning program.

CONCLUSIONS AND RECOMMENDATIONS

The study concluded that E-learning project was effectively operating in CSSC secondary schools as intended by the project. Also number of science students increased due to the introduction of E-learning program. Moreover, the study concluded that E-learning program helped participants to be competent with ICT devices in which it helped even social science teachers and learners to use the program during teaching and learning processes. Lastly, it was concluded that, it was easier to

teach and learn by using E-learning program.

The evaluation recommends that the E-learning project by CSSC should be more funded so as to implement the programme in the remaining CSSC secondary schools. ICT and E-learning should be used for teaching and learning in all learning institutions and training programs should be designed to ensure learners' practical skills matching with reality outside school, societal needs and demands. This goes hand in hand with recommending that teachers should be prepared well and trained to face the rapid technological challenges. Lastly, further studies to be undertaken to find out the effectiveness of the E-learning project in facilitating performance of the learners.

REFERENCES

Apriani, E., Inderawati, R., Arianti, A., Wati, S., & Hakim, I. N. (2021). Implementing E-learning Training toward English Virtual Lecturers: The Process, Perspectives, Challenges and Solutions. *International Journal of Emerging Technologies in Learning*, *16*(4).

Arthur-Nyarko, E., & Kariuki, M. G. (2019). Learner access to resources for eLearning and preference for eLearning delivery mode in distance education programs in Ghana. *International Journal of Educational Technology*, *6*(2), 1-8.

Clark, K. R. (2018). Learning theories: behaviorism. *Radiologic technology*, *90*(2), 172-175.

Creswell and Creswell (2018). Qualitative inquiry and research design (international student edition): Choosing among five approaches. *Language*, *25*(459p), 23cm.

CSSC (2018). Analysis of Student Performance in E-learning Schools - an Assessment of Performance of Form II Students.

Heba, A., Smyrnova-Trybulska, E., & Kapounová, J. Objectives and content of the mathematics e-learning course preparing. *Psychology of Learning and Motivation*, *57*, 147-181.

Hoerunnisa, A., Suryani, N., & Efendi, A. (2019). The effectiveness of the use of e-learning in multimedia classes to improve vocational students' learning achievement and motivation. *Kwangsan: Jurnal Teknologi Pendidikan*, *7*(2), 123.

Kanani, M. (2018).Effectiveness of administrative communication system on teachers' performance in secondary schools in Singida Municipality, Tanzania.

Khan, R. M. I., Khan, M. S., Khan, I., & Al-Fadl, M. M. A. (2021). Teachers' perception on E-Learning Implementation: A Perspective of Pakistani Teachers. *Journal of ISOSS*, *7*(2), 67-78.

Kisanjara, S. (2020). *Modelling e-learning implementation in Tanzanian universities* (Doctoral dissertation, Mzumbe University-Faculty of Science & Technology).

Kyara, R. (2020). The invisibility of "other languages" in an early years language program in England: An examination of monolingual discourses and ways to forge culturally inclusive practice. *Journal of Research in Childhood Education*, *34*(1), 28-42.

Lepellere, M. A., Cristea, I., & Gubiani, D. (2019). The E-learning system for teaching bridging mathematics course to applied degree studies. In *Models and Theories in Social Systems* (pp. 295-309). Springer, Cham.

Mahyoob, M. (2020). Challenges of E-Learning during the COVID-19 Pandemic Experienced by EFL Learners. Arab World English Journal, 11 (4) 351-362. DOI: https:/ /dx.doi. org/10. 24093/awej/vol11no4.23

Mtebe, J. S. (2020). Applying UNESCO ICT Competency Framework to Evaluate Teachers' ICT Competence Levels in Tanzania. In *Handbook of Research on Innovative Pedagogies and Best Practices in Teacher Education* (pp. 350-366). IGI Global.

Mugenda, O. M. & Mugenda, A. G. (2003).*Research Methods in Quantitative and Qualitative Approaches.* Nairobi: African Centre for Technology Studies Press.

Mwakisole, K. F., Kissaka Dr, M. M., & Mtebe PhD, J. S. (2019). Cloud computing architecture for e-learning systems in secondary schools in Tanzania. *The African Journal of Information Systems*, *11*(4), 4.

Mwakisole, K. F., Kissaka, M. M., & Mtebe, J. S. (2018). Feasibility of Cloud Computing Implementation for eLearning in Secondary Schools in Tanzania. *International Journal of Education and Development Using Information and Communication Technology* (IJEDICT), 14(1), 91–102. Retrieved from http:// ijedict. dec.uwi. edu/viewarticle.php?id=2396

So, W. W. M., Chen, Y., & Wan, Z. H. (2019). Multimedia e-learning and self-regulated science learning: A study of primary school learners' experiences and perceptions. *Journal of Science Education and Technology*, *28*(5), 508-522.

Zalat, M. M., Hamed, M. S., & Bolbol, S. A. (2021). The experiences, challenges, and acceptance of e-learning as a tool for teaching during the COVID-19 pandemic among university medical staff. *PLoS One*, *16*(3), e0248758.