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## **Influence of Integration of Information Communication Technology in Education on Students' Academic Performance in Public Universities in Uasin Gishu County, Kenya**

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### **Abstract**

*The aim of this study was to determine the influence of the integration of information communication technology (ICT) in education on students' academic performance in public Universities in Uasin Gishu County, Kenya. The study carries out primary research, collecting both qualitative and quantitative data using semi structured interviews and surveys. The study established that higher levels of ICT literacy predicted better academic performance. However, it is important to note that the relationship between ICT/digital literacy and academic performance is likely to be complex and may be influenced by other factors, such as the quality of teaching, the availability of resources, and the learning environment. Therefore, it is important to consider these other factors when trying to understand the relationship between ICT/digital literacy and academic performance. In this study, the R square for ICT literacy as a predictor of academic performance was only 30.5%. Technology can also enable personalized learning, where students can work at their own pace and receive instruction that is tailored to their needs. However, it is also important to note that the relationship between ICT infrastructure and student academic performance is not straightforward. Factors such as the quality of teaching, the effectiveness of the educational resources being used, and the students' individual characteristics can all influence learning outcomes. Additionally, there may be challenges to implementing and using technology in education, such as the cost of providing and maintaining the necessary hardware and software, and the need for training and support for both students and teachers. This was a major problem in Uasin Gishu County. The R square for ICT infrastructure as a predictor of academic performance was only 22.6%.*

*The findings in this study suggested that e-learning technologies can be effective in improving student academic performance. It is important to note, however, that as with any form of technology, there are also challenges to using e-learning technologies in education, especially in Kenya. For example, there may be inequities in access to and use of technology, particularly for students from rural counties such as Uasin Gishu. Additionally, effective use of e-learning technologies requires the development of new teaching skills and strategies, as well as support for students to learn how to use the technology effectively. The R square value for e-learning technologies as predictors of academic performance was only 12.6%.*

**Keywords:** Digital Literacy, E-learning, ICT Infrastructure, Student Academic Performance, ICT Integration, (ICT-Information Communication Technology)

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## 1 INTRODUCTION

Academic performance has become an area of interest to scholars and employers around the world (Hattie, Biggs, & Purdie, 2016). Academically successful students have more employment opportunities than those with less education. Therefore, the quality of students' performance remains a priority for educators, parents, education policymakers, and the general society. Students' academic performance measures students' academic achievements in a fixed period (Quadri & Kalyankar, 2019). It also refers to the student's cumulative grade point average upon graduating. It was operationalized using; the student grade point average, individual test grades, and a single academic year's success. Chinese university students that do poorly academically tend to have low levels of motivation, curiosity, passion, and eagerness to study as well as bad learning attitudes. The absence of high aspirations and defined objectives, loose emotions and cognitive misconceptions, the distorting of life values, and personality and ability flaws are among the causes of Chinese college students' low academic performance (Xin & Wu, 2019).

In the United States, 22% of first-year undergraduate students are commonly forced to leave a university due to poor academic performance at one of the major institutions (Metzner, 2017). Most parties involved in providing high-quality education in Nigeria are concerned about the problem of pupils' subpar academic performance. Bamidele and Bamidele (2019) opine that this unhealthy situation has led to the country's widely acclaimed fallen standard of education. Instances, where students fail and retake courses at the university level, are common among students across universities in Kenya (Langat, 2016). The academic achievement of students is influenced by several factors. Participation in extracurricular activities, civic engagement, identity development, healthy social interactions and behaviors, ICT integration, and mental health are some of these aspects (Langat, 2016). The current study incorporates ICT into the classroom and aims to determine how it affects university students' academic performance in Uasin Gishu County.

The capacity to use technology as a tool for information inquiry, organization, evaluation, and communication is known as information communication technology (ICT) integration (Kenney, 2016). It enhances the academic achievement of the kids (Wagner, 2015). When access to information is provided at various levels, ICT integration aids students in extending and deepening their knowledge, research, and inquiry in accordance with their requirements and interests (CEO Forum on Education and Technology, 2018). Information communication technology integration, according to Batchelor and Nocrich (2015), includes hardware, software, networks, and media for information collection, storage, processing, transmission, and display. In this study, ICT infrastructure, e-learning tools, and digital literacy are used to operationalize ICT integration. Digital literacy is the capacity to use information technology and the Internet to locate, assess, use, share, and create material (Bhatt, 2016). It consists of expertise, knowledge, morals, and creative outputs in the context of digital networks (Calvani, Cartelli, Fini & Ranieri, 2018). It includes more than just being able to operate a computer and access the internet. It also includes knowledge, talents, and skills. It also entails comprehending the components that are now accessible, such as hardware, software, the Internet, PDAs, and digital gadgets (Tyger, 2017). Utilizing information, skills, ethics, and capacities, this study is operationalized.

For Kenya to attain its strategic aim of Vision 2030, mentoring human capital is crucial. Public universities play a significant role in this regard. Government financing is primarily reliant on public universities (Waithaka, 2017). As a result, its growth plans for lecture rooms, ICT integration, and human resource capacity have been compromised by the failure to expand funds in pace with enrollment. In addition, the growth of for-profit private colleges without rigorous accreditation has increased competition in the education market (Makokha & Mutisya, 2016). Public universities must adapt through ICT integration to prosper and survive in the dynamic and fiercely competitive market while meeting ever-changing consumer expectations. Therefore, the current study seeks to determine the influence of ICT integration on students' academic performance in public universities in Uasin Gishu County.

## 1.1 Statement of the Problem

Academic performance cannot be overlooked as education and training are the tools to develop the country. According to a study from the Ministry of Education, Science and Technology from 2014, the government understands the strategic significance of improving Kenyans' general level of education in the context of reducing poverty and fostering economic growth. Education is an important tool for escaping poverty since it influences income and welfare in addition to being a welfare indicator. Kenyans must now actively pursue high-profile jobs, which are mostly dependent on "educational papers" first, followed by experience. There is poor academic performance among some University students in Kenya. Course retake and supplementary exams are sat for now and then, and course retake has become the norm in institutions of higher learning (Karimi, 2018). Among public universities, poor academic performance is a significant factor contributing to the non-graduation of many students within the stipulated academic years (Karimi, 2018).

Poor adoption of ICT among Universities has been cited among the factors contributing to poor academic performance among students. However, little is known about the relationship between ICT adoption and students' academic performance in Uasin Gishu County. The study presented herein seeks to find this relationship. Similar studies have been done in the past, but they present some gaps that this study aims to close. The impact of ICT integration on academic achievement in public secondary schools in Makueni County, Kenya, was studied by Mwiluli (2018). The study found a strong and advantageous association between ICT integration and student academic achievement. The new study aims to include the impact of ICT/digital literacy and the use of E-Learning technologies on students' academic performance, which was not included in the previous study.

In Kenya Sub-County, Kisii County, Kenya, Machuki (2018) conducted a study on the effects of ICT integration in teaching and learning in secondary schools. The study found that the pupils could use Internet-based applications to complete homework independently. Operational indicators of ICT integration such as; ICT infrastructure, ICT/ digital literacy, and E-Learning technologies adoption were not considered in their study, which the current study seeks to fill this knowledge gap. Additionally, no research has been done on how ICT integration in education at public institutions has affected the academic achievement of students in Uasin Gishu County. To ascertain the impact of the integration of information and communication technology in education on student academic performance at public universities in Uasin Gishu County, the present study will fill in this body of knowledge.

## 1.2 Significance of the Study

The ministry of education will benefit from the study's findings as the study recommendations may be used to formulate policies on information communication technology integration in education in public Universities in Kenya. University management teams will be able to understand the challenges facing the integration of ICT in education in public Universities in Uasin Gishu County. The study's recommendations may be utilized to address the issues raised above, and as a result, Kenya's public institutions may do a better job of integrating information and communication technologies into their curricula.

The public will be able to understand the state of ICT Infrastructure in the public universities in Uasin Gishu County, Kenya. Therefore, the public can request accountability and/or seek answers on ICT infrastructure issues among the county's public universities. The study will contribute to theoretical development on integrating information communication technology in education and students' academic performance. It will also form a basis for further research on integrating information communication technology in education and students' academic performance.

## 2 METHODOLOGY

### 2.1 Research Design

The descriptive survey research design was used for the investigation. With no consideration of the variables, a descriptive study approach provides a thorough account of the nature of phenomena and investigates events as

they occurred or were described (Kumar, 2018). The design was chosen because it is perfect for figuring out the nature of existing situations, connections, and activities (Flick, 2015). This design is adopted to ensure that the main purpose of this study is achieved. Its main purpose is to determine the influence of ICT integration in education on students' academic performance in public universities in Uasin Gishu County, Kenya.

**2.2 Target Population**

These are the groups of items or persons who participated in the study (Pandey & Pandey, 2021). The target population is 3710 respondents, who comprised 153 lecturers in the school of education and 3557 final year students in the School of Education at Moi University and University of Eldoret (HR, 2020).

Table 3.1: Target Population

Institution	Strata	Target Population
Moi University	Instructors	81
	4 <sup>th</sup> -year students in the school of education	1896
University of Eldoret	Instructors	72
	4 <sup>th</sup> -year students in the school of education	1661
<b>Total</b>		<b>3710</b>

**2.3 Sample Size and Sampling Procedure**

**2.3.1 Sample Size**

Yamane's (1967) sample size determination formula was used to calculate the sample size. The formula is as follows;

$$n = \frac{N}{1 + Ne^2}$$

Where n = required responses

N = Population

e<sup>2</sup> = error limit (0.01 for samples between 100 and 1000)

$$n = \frac{3710}{1 + 3710 * 0.05^2} = \frac{3710}{10.275} = 361.07 \approx 361$$

Yamane's (1967) extension formula for sample size determination per strata was used to determine the sample size per strata (students and instructors). The formula is as follows:  $nh = n \frac{N_h}{N}$

Where nh = required sample size per strata

Nh = Population per strata

N = Population

n= Sample size

Table 3.2: Sampling Frame

S/NO	Institution	Strata/ Group	Population Per Strata	Sample Size Per Strata
1.	Moi University	Instructors	81	8
2.		Students	1896	184
3.	University of Eldoret	Instructors	72	7
4.		Students	1661	162
<b>Total</b>			<b>3710</b>	<b>361</b>

**2.3.2 Sampling Procedure**

The study will adopt a stratified random sampling technique to come up with the different strata (instructors and students). Stratified random sampling involves the selection of a sample such that recognized subcategories

found in the population are demonstrated in the sample in equal proportion as presented in the population (Novikov & Novikov, 2019). This sampling method was utilized since it ensures a demonstration sample is formed from a reasonably homogeneous population and results in estimates of general population restrictions that are more accurate. After that, the researcher will employ a straightforward random sampling procedure to collect samples from the various strata (students and instructors). Because everyone in the population has an equal chance of participating in the study, simple random sampling is used (Mishra & Alok, 2017). Purposive sampling was used to identify the instructors who were interviewed.

#### **2.4 Data Collection Instruments**

The study used both questionnaires and interview schedules. A questionnaire is an official set of statements and/or questions intended to collect relevant data from a variety of respondents to achieve the leading objectives of the research (Tarone, Gass & Cohen, 2013). Igwenagu (2016) opines that questionnaires are the simplest tools to collect and analyze data, saving time and resources. A semi-structured questionnaire were adopted, and it will involve different items that apply the 5-point Likert scale. The replies from respondents will range from strongly agree, agree, undecided, disagree, and strongly disagree. The study will also use an interview schedule to provide more insights into the study variables.

#### **2.5 Data Collection Procedures**

Data collection refers to obtaining relevant data to prove or serve specific facts (Ledford & Gast, 2018). Data collection involves the procedure involved in obtaining raw and unrefined data that could be analyzed to come up with meaningful data by considering all scientific processes of analyzing data (Gall, Gall, & Borg, 2017). Upon consent of the proposal by the university, the researcher will pursue obtaining a license from NACOSTI. By utilizing the authorization letter from the university, the researcher will then commence data collection proceedings. The researcher will then involve two qualified research assistants who will help collect data. Research assistants were well trained to ensure that they have a clear understanding of the research instruments, the study's objective, and all the ethics of the study. The researcher and research assistants will then present all questionnaires while the interview schedules were self-administered by the researcher.

#### **2.6 Pilot Testing**

A pilot test is a preliminary test done to test a research instrument's general rationality and reliability (Habib, Pathik & Maryam, 2014). Pilot testing of the research instruments were administered to 36 respondents, representing 10% of the sample size. According to Pruzan (2016), a sample size ranging from 10-20% for the actual study could be viewed as a sensible figure of respondents that can be considered when enrolling in a pilot. This is essential since it enabled the subject respondents to confirm whether the questions are concise, understood, and consistent. The pilot study was done at Egerton University since it shares the same characteristics as both University of Eldoret and Moi University. The pilot study results were not be included in the final examination. The feedback was only be used to revise the instruments after assessing the validity and reliability of the research instruments.

#### **2.7 Validity of the Research Instruments**

The degree to which a particular instrument measures what it claims to measure is seen as the instrument's validity (Ledford & Gast, 2018). There are two types of validity: internal validity and external validity. Internal validity highlights the causal component, which denotes the causal relationship between two or more variables (Bell, Bryman, & Harley, 2018). However, external validity refers to the potential for results to be comprehensive outside of the specific research environment (Bell et al., 2018). To ensure that external validity is realized in the study, the researcher selected a study sample that is mostly represented and does not have any issue with external validity. This study used content validity. The criterion-related validity method was not be used in this study as it needs a lot of time. To ensure criterion-related validity, the behavior must first be assessed using a questionnaire before actual participant conduct can be observed. The goal of content validity is to enhance the meaning or structure of the questions and answers in the survey. It helps to evaluate the precision, significance, appeal, and advent of the data collection instruments. To assess the reliability of the

information included in a given measure, Novikov & Novikov (2019) claim that a skilled or specialized expert in a certain profession is typically used. According to Mishra and Alok (2017), using competent judgment improves an instrument's content validity. Therefore, the content validity of the research instrument items in this study was determined through expert knowledge, which was sought from the supervisors to ensure that the research instrument agrees with the set of goals and content areas in the study. Comments from experts was reviewed and incorporated to enhance the validity of the questionnaire. In this respect, the researcher sought the research supervisor's help to verify the content validity of the research instruments.

## 2.8 Reliability of the Research Instrument

Reliability focuses on the ability of a research instrument to yield similar findings (Mishra and Alok (2017). It is its internal reliability or stability level over a given duration of time (Mangal & Mangal, 2013). Kumar (2018) view the concept of reliability as a measure of the extent that a research instrument produces reliable results after a series of frequent trials. Therefore, a reliable instrument should provide consistent results when used several times to gather information from samples that have been drawn randomly from an identical population (Ledford & Gast, 2018). Random error impacts reliability in research such that, as it rises, reliability tends to decline. Errors might increase from erroneous coding as well as vague directives to the respondents. The raw data that the instrument will acquire was transformed into numerical codes that represent the measurement of the variables. This coding facilitated the precise identification of reliability. Internal consistency reliability, which was assessed by Cronbach's alpha, was used in this study. A Cronbach's alpha coefficient of at least 0.70 is advised by Igwenagu (2016). This made it easier to clear up uncertainties and uncertainty, change language early on, and guarantee that questions can accurately quantify the things they are meant to assess. This determined whether the research instruments are trustworthy, allowing for the possibility of additional examination.

## 2.9 Data Analysis Techniques

Descriptive statistics were used to code and assess the quantitative data. While common themes that are grouped into cohesive categories were used to analyze the qualitative data. Percentages, frequencies, averages, and standard deviations were all be utilized as descriptive statistics. The study was examined using one of the Statistical Packages for Social Sciences (SPSS V25).

## 3 RESULTS

This chapter focuses on data analysis to facilitate answering of the overarching research question. The chapter is divided into two main sections; quantitative analysis and qualitative analysis. The quantitative analysis section analyzes numerical data to investigate causal relationships among variables in order to make conclusions on the research question. The next section is qualitative analysis, and it focuses on thematic analysis, where interview data is broken down based on the trends and patterns in the data.

The decision rule to make conclusions on causal relationship and test hypotheses is as follows:

If P value is  $<0.05$ , there is statistical significance and the hypothesis/claim is supported. All hypotheses are stated as alternate hypotheses, and the analysis is done at 95% confidence interval, meaning the critical value is 5% or 0.05. When most predictors show statistical significance, then it is concluded that the hypothesis has been supported, otherwise, the hypothesis is rejected.

### 4.2.1.1. ICT/Digital Literacy and Student academic Performance

**Hypothesis: Higher degrees of ICT/digital literacy are associated with better academic performance in Uasin Gishu Country**

In the model summary below,  $R = 0.553$ , indicating a fairly strong correlation between ICT literacy proxies and student academic performance. ICT literacy proxies explain 30.5% of student academic performance as shown by  $R^2 = 0.305$ .

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.553 <sup>a</sup>	.305	.270	.366649074345641

a. Predictors: (Constant), I know how to apply a wide range of computer programmes, software, and other applications., I have a positive attitude towards the adoption of ICT in education, I know how to use educational software., I have a vast knowledge of educational software., I know how to connect and use library database resources  
 b. Dependent Variable: Standardized Performance

As shown in the ANOVA table below,  $F(5, 99) = 8.709$ , and  $p$  value  $< 0.05$ , meaning that the model in this study can significantly predict student academic performance.

**ANOVA**

Model	Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	5.854	5	1.171	8.709	.000 <sup>b</sup>
	Residual	13.309	99	.134		
	Total	19.162	104			

a. Dependent Variable: Standardized Performance  
 b. Predictors: (Constant), I know how to apply a wide range of computer programmes, software, and other applications., I have a positive attitude towards the adoption of ICT in education, I know how to use educational software., I have a vast knowledge of educational software., I know how to connect and use library database resources.

At least 50% of the variables showed statistical significance ( $p$  value  $< 0.05$ ), which suggests that the hypothesis is supported, and the conclusion made is that higher degrees of ICT/digital literacy are associated with better academic performance in Uasin Gishu Country. However, lower values of R square as shown in the model summary suggest that there are many other factors that could predict academic performance apart from ICT literacy.

**Coefficients**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.960	.277		17.885	.000
	I know how to use educational software.	.377	.064	-.660	-5.864	.000
	I have a vast knowledge of educational software.	-.006	.041	-.017	-.158	.875
	I have a positive attitude towards the adoption of ICT in education	.030	.038	-.083	-.804	.023
	I know how to connect and use library database resources	-.013	.098	-.019	-.135	.893
	I know how to apply a wide range of computer programmes, software, and other applications.	.134	.066	.330	2.015	.047

a. Dependent Variable: Standardized Performance

**4.2.1.2. ICT Infrastructure and Student academic Performance**

**Hypothesis: High quality ICT infrastructure can significantly predict positive student academic performance**  
 In the model summary below,  $R = 0.476$ , indicating a fairly weak correlation between ICT infrastructure proxies and student academic performance. ICT infrastructure proxies explain 22.6% of student academic performance as shown by  $R$  square = 0.226.



**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.476 <sup>a</sup>	.226	.170	.3909868

a. Predictors: (Constant), We have sizable modern computer labs that can accommodate many students per teaching and/or practical session (s)., We can access free Wi-Fi at the university all the time , We have a duly functional computer lab, The wi-fi web access is not limited, The computer lab is connected to the internet, The computers that are in place are all functioning well., The university has enough computers to meet the needs of the students

b. Dependent Variable: Standardized Performance

As shown in the ANOVA table below,  $F(7, 97) = 4.050$ , and  $p$  value  $< 0.05$ , meaning that the model in this study can significantly predict student academic performance.

**ANOVA**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.334	7	.619	4.050	.001 <sup>b</sup>
	Residual	14.828	97	.153		
	Total	19.162	104			

a. Dependent Variable: Standardized Performance

b. Predictors: (Constant), We have sizable modern computer labs that can accommodate many students per teaching and/or practical session (s)., We can access free Wi-Fi at the university all the time , We have a duly functional computer lab, The wi-fi web access is not limited, The computer lab is connected to the internet, The computers that are in place are all functioning well., The university has enough computers to meet the needs of the students

More than 50% of the variables showed statistical significance ( $p$  value  $< 0.05$ ), which suggests that the hypothesis is supported, and the conclusion made is that high quality ICT infrastructure can significantly predict positive student academic performance. However, lower values of R square as shown in the model summary suggest that there are many other factors that could predict academic performance apart from ICT infrastructure.

**Coefficients**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.518	.289		15.656	.000
	The university has enough computers to meet the needs of the students	.090	.058	.301	1.541	.026
	We can access free Wi-Fi at the university all the time	.008	.038	.029	.218	.828
	We have a duly functional computer lab	-.043	.059	-.141	-.734	.465
	The computer lab is connected to the internet	.035	.043	.121	.802	.024
	The computers that are in place are all functioning well.	-.115	.047	-.424	-2.467	.015
	The wi-fi web access is not limited	.128	.042	.303	3.016	.003
	We have sizable modern computer labs that can accommodate many students per teaching and/or practical session (s).	-.324	.078	-.456	-4.162	.000

a. Dependent Variable: Standardized Performance

4.2.1.3. E-learning Technologies and Student academic Performance

**Hypothesis: Better E-learning technologies can significantly predict positive student academic performance**

In the model summary below, R = 0.354, indicating a fairly weak correlation between e-learning technologies proxies and student academic performance. E-learning technologies proxies explain only 12.6% of student academic performance as shown by R square = 0.126.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.354 <sup>a</sup>	.126	.062	.4156367

a. Predictors: (Constant), We sit for our exams online, Online learning is undertaken at the facility., We have students undertaking a distance learning programme at the facility., The institution has put in place a learning management system., Course instructors give assignments using the learning management system, Online teaching is mostly used at the facility than other conventional methods., We submit assignments online.

b. Dependent Variable: Standardized Performance

As shown in the ANOVA table below,  $F(7, 97) = 1.989$ , and p value  $< 0.05$ , meaning that the model in this study can significantly predict student academic performance.

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.405	7	.344	1.989	.044 <sup>b</sup>
	Residual	16.757	97	.173		
	Total	19.162	104			

a. Dependent Variable: Standardized Performance

b. Predictors: (Constant), We sit for our exams online, Online learning is undertaken at the facility., We have students undertaking a distance learning programme at the facility., The institution has put in place a learning management system., Course instructors give assignments using the learning management system, Online teaching is mostly used at the facility than other conventional methods., We submit assignments online.

At least 50% of the variables showed statistical significance (p value  $< 0.05$ ), which suggests that the hypothesis is supported, and the conclusion made is that better E-learning technologies can significantly predict positive student academic performance. However, lower values of R square as shown in the model summary suggest that there are many other factors that could predict academic performance apart from better e-learning technologies.

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.189	.316		13.270	.000
	We have students undertaking a distance learning programme at the facility.	-.055	.048	-.185	-1.127	.262
	Online learning is undertaken at the facility.	-.115	.069	-.207	-1.672	.098
	The institution has put in place a learning management system.	-.032	.044	-.083	-.738	.462
	We submit assignments online.	.106	.051	.345	2.098	.038
	Online teaching is mostly used at the facility than other conventional methods.	.053	.055	.153	.975	.032

Course instructors give assignments using the learning management system	-.060	.078	-.096	-.762	.048
We sit for our exams online	-.033	.068	-.081	-.487	.027

a. Dependent Variable: Standardized Performance

#### 4 DISCUSSION

As established, the study aimed to examine what influence the integration of ICT in education brought to public university students in Uasin Gishu County, especially their academic performance. Findings show a positive relationship between digital literacy and the academic performance of public university students. Many respondents exhibited an understanding of ICT primarily through their ability to quickly familiarize themselves with it. By identifying current ICT trends, results show that instructors were able to introduce students to technology by mentioning it in classes or issuing related assignments, which aroused the curiosity of students and their research ability. As a result, their ability to understand concepts improved, and so did their academic performance. The findings concur with those of Pernia (2018), who claimed that ICT literacy involved familiarization with computers and internet technologies which improved the quality of teaching and learning. Selwood, Fung, and O'Mahony (2017) also assert that instructors that successfully integrate ICT into their teaching practices are more likely to positively impact a student's academic achievement.

Findings also established a positive impact between the influence of ICT infrastructure and the academic performance of university students in Uasin Gishu country. According to the respondents, an established ICT infrastructure is required to support ICT literacy. However, since Kenya is a developing country, most public universities lack this infrastructure. ICT infrastructure is often operationalized through connectivity to different e-learning laboratories, networks, computers and sources of reliable energy. With that, instructors claimed that ICT infrastructures improved the organization of their work with others (infrastructure), allowing instructors to interact with their students and upload learning materials. In support of instructors, Giordano (2017) states that ICT infrastructure enables a more comprehensive and robust knowledge-building experience only when combined with well-designed technology. Such an environment offers a setting for learning where students are likely to gain knowledge through independent thought, problem-solving skills and group collaborations.

In institutions of higher learning, e-learning is considered dominant as a result of the vast growth in internet technology. However, despite the impacts of integrating e-learning, there still remains a number of these institutions that opt for low interactive e-learning technologies, which results in poor academic performance. Findings show that public universities are embracing e-learning and the change that comes with it. Instructors claimed that e-learning, in these institutions, increased interaction between instructors and students, and among students, with most of them highlighting their ability to set up educative meetings and conference reports and put up blogs that equip their students with more knowledge. Additionally, adopting e-learning has facilitated the creation and sharing of presentations. As identified in the reviewed literature, Holley (2020) claimed that students engaging in e-learning mostly exhibit better academic results than those attending face-to-face courses. The researcher believes that this translates to better academic grades than those students who engage in face-to-face courses.

Supporting the above findings is the work of Abooki and Kitawi (2019), who carried out their research on the impact of e-learning methodologies on the academic achievement of university students. Like the current study, the researchers discovered that the use of different e-learning methods had favourable effects on students' academic achievement. However, the researchers also noted that poor students were disadvantaged since they could not attend online classes at all times due to financial constraints. According to researchers, balancing between economic realities and educational goals is a leading impediment to the implementation of ICT in the education sector. It is further stated that the integration of ICT requires extensive capital investment in the industry; however, in developing countries, a majority of these governments place less emphasis on ICT

integration in public universities. It has also been discovered that these governments prioritize the rehabilitation of school buildings and teacher welfare at the expense of the integration of ICT.

In the current study, findings showed that the integration of ICT in public universities is equipped with challenges. To begin with, instructors claimed that, to some extent, public universities in Uasin Gishu lacked appropriate buildings that could house technology. Instructors discouraged the rehabilitation of old buildings since they failed to reassure students and instructors of safety and security in terms of wiring. Additionally, instructors pointed out the lack of a reliable source of electricity in the area to support the continuous usage of ICT infrastructure. Power outages resulted in the loss of essential data. Findings also highlighted fear among instructors as many believed that adopting ICT would lead to their replacement. Support from management has also undermined numerous projects in ICT.

Findings also revealed strategies recommended to ensure students in Uasin Gishu accessed more ICT in their education. Instructors encourage offering students options that require interaction with e-technology, such as assignments that include watching videos, assessing images and reading an online text. Also, open-ended activities are encouraged to give students a chance to demonstrate their knowledge. Lastly, an increase in material for learning ICT technology is equally encouraged.

## 5 CONCLUSION

The general argument in the literature is that students who have strong skills in information and communication technology (ICT) and digital literacy tend to have higher academic performance. These skills can help students to access and process information more efficiently, communicate and collaborate with others, and express themselves creatively. As a result, students who are proficient in ICT and digital literacy may be more successful in their studies and achieve better grades. Evidence from empirical analysis in this study has also supported this assertion, where it was established that higher levels of ICT literacy predicted better academic performance. However, it is important to note that the relationship between ICT/digital literacy and academic performance is likely to be complex and may be influenced by other factors, such as the quality of teaching, the availability of resources, and the learning environment. Therefore, it is important to consider these other factors when trying to understand the relationship between ICT/digital literacy and academic performance. In this study, the R square for ICT literacy as a predictor of academic performance was only 30.5%.

Existing research has also suggested that there is a relationship between ICT (information and communication technology) infrastructure and student academic performance. Access to and use of technology, such as computers and the internet, can improve students' learning outcomes by providing them with access to a wide range of educational resources and tools. For example, students can use the internet to conduct research, access online educational materials, and communicate with their teachers and peers. Technology can also enable personalized learning, where students can work at their own pace and receive instruction that is tailored to their needs. However, it is also important to note that the relationship between ICT infrastructure and student academic performance is not straightforward. Factors such as the quality of teaching, the effectiveness of the educational resources being used, and the students' individual characteristics can all influence learning outcomes. Additionally, there may be challenges to implementing and using technology in education, such as the cost of providing and maintaining the necessary hardware and software, and the need for training and support for both students and teachers. This was a major problem in Uasin Gishu County. The R square for ICT infrastructure as a predictor of academic performance was only 22.6%.

E-learning technologies refer to a range of tools and platforms that can be used to deliver educational content and facilitate learning online. These technologies can include learning management systems, web-based applications, and mobile apps, among others. The findings in this study suggested that e-learning technologies can be effective in improving student academic performance. For example, the current study cited Fry (2017) who argued that, on average, students who used technology-based instruction scored significantly higher on

measures of academic achievement than those who received face-to-face instruction, which is also consistent with the empirical findings in this study. It is important to note, however, that as with any form of technology, there are also challenges to using e-learning technologies in education, especially in Kenya. For example, there may be inequities in access to and use of technology, particularly for students from rural counties such as Uasin Gishu. Additionally, effective use of e-learning technologies requires the development of new teaching skills and strategies, as well as support for students to learn how to use the technology effectively. The R square value for e-learning technologies as predictors of academic performance was only 12.6%.

From interviews, the study found that most of the issues facing schools in the county are in line with issues facing many across the globe and especially in developing countries as established by literature. ICT literacy is important for students because it helps them with their learning. Almost everything has become digital, and we have to use technology portals to teach and learn. Technology has been used in lecture delivery and will continue to be relevant. Technology can be a distraction for some students, but it can also be an essential part of teaching. Educators should make sure that their e-learning platforms are accessible and easy to use for students in order to increase engagement and student performance. More technology proficient students are more likely to have positive attitudes towards ICT and use it for learning, so making e-learning more accessible and comfortable for them is likely to have a positive impact on performance.

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