Factors Influencing Utilization of ICT Facilities in Teaching and Learning of Agricultural Sciences. (A Case Study of Sokoine University of Agriculture, Tanzania)

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ABSTRACT

This study investigated the factors influencing utilization of ICT facilities in teaching and learning of agricultural sciences at Sokoine University of Agriculture (SUA), Tanzania. A descriptive survey design was adopted in this study; and a mixed research approach was employed whereby, a questionnaire with a reliability of 0.83 and interview schedule checklist were used for data collection. Data were collected from the College of Agriculture (CoA) at SUA involving a sample population of 65 instructors, 4 Heads of Department and the Head of ICT services who were all purposively selected. Data were analysed using descriptive statistics, content analysis and binary logistic model. The findings revealed that institutional factors such as the availability and accessibility of ICT facilities, and technical support influence instructors toward using ICTs in teaching and learning processes. The findings also revealed that, personal factors such as instructors' positive attitude, sex, age and teaching experience play significant roles in influencing ICT utilization at the university. The study findings also point out that inadequacy of ICT facilities, slow internet connectivity, unreliable power supply, inadequate ICT infrastructures, lack of in-service training, problems of handling large classes, inadequacy of ICT manpower/ technical support, and lack administrative support i.e. provision of funds as challenges that deter instructors from utilizing ICTs. Among other things, it was recommended that, the university should strive to address the existing challenges by at least ensuring alternative source of power is installed, ensuring regular training of instructors is organized and adequate ICT infrastructures are available at the university.

Key words: ICT facilities, institutional and personal factors, Challenges

INTRODUCTION

Information and communication technology (ICT) has increasingly become an integral part of today's educational system throughout the world (Aidoo, *et al.,* 2022). This is mainly because information and communication technologies are at the very heart of any educational system. ICT utilization has the potential to support many educational functions, such as teaching and learning, research and scholarship as well as management and administration (Yashau & Nanim, 2020; Al-Mamary, 2020). These technologies enhance the sharing of information; increase collaboration among students, academicians and administrators; enhance provision of distance education; and have resulted in new forms of pedagogy (SUA, 2014; Makundi *et al.,* 2023; Onu & Ezhim, 2019).

The term "Information and communication technologies" (ICTs) refers to a diverse array of technological

tools and resources utilized for creation, communication, dissemination, storage, and management of information (Yashau and Nanim, 2020; Apagu and Wakili, 2015; Haliso, 2011). ICTs encompass a wide range of rapidly evolving technologies, including telecommunication technologies such as telephone, television and radio, computer-mediated conferencing, and video conferencing. They also encompass digital technologies like computers, information networks such as the internet, as well as software applications (Olatunde-Aiyedun *et al.,* 2022).

The impact of ICTs in the field of education has been widely recognized. The integration of information and communication technology in education has revolutionized teaching and learning across various disciplines, including agricultural sciences. ICT facilities such as computers, internet connectivity, multimedia tools, and educational software offer numerous opportunities to enhance the delivery of agricultural education (Onu & Ezhim, 2019). The utilization of information and communication technologies in educational settings specifically in the field of agricultural sciences, not only creates a dynamic learning environment but also revolutionizes the learning and teaching process, encouraging students to actively engage with knowledge in a self-directed and constructive manner (Agbo, 2015; Yashau & Nanim, 2020; SUA, 2014).

Recognizing the influence of ICT on both professional environments and everyday life, educational institutions are striving to restructure their curricula and classroom facilities to bridge the existing technology gap in teaching and learning. Due to the disruption caused by the COVID-19 pandemic, numerous education institutions across the globe transitioned to remote instruction delivery and learning, replacing traditional in-person classroom gatherings (Aidoo, *et al.,* 2022). The impact of this disruption appears to have significant consequences for teaching methods, particularly in terms of communication between instructors and students. As a result, there is a need for alternative approaches to teaching and learning, as highlighted by Yashau & Nanim (2020); and Al-Mamary, (2020). These alternative methods necessitated a swift shift towards digitalization and the utilization of available information and communication technology resources in educational institutions including universities (McFarlane, 2019).

Utilization of information and communication technologies holds significant potential as a valuable instrument in expanding educational possibilities and facilitating remote learning (Chirwa, 2018; Aidoo, *et al.,* 2022). For more than two decades, the Governments across the globe have placed significant emphasis on incorporating information and communication technologies into educational institutions through various initiatives. For instance, in Malaysia, the National IT Council (NITC) was formed to ensure the integration of ICT into Malaysia education system and to reform the education and training system through lifelong learning via multiple ICT related media (Al-Mamary, 2020; Hoque *et. al.,* 2012; Aldheleai *et al.,* 2019). In Tanzania, the Government of the United Republic of Tanzania since early 2000's has been introducing various schemes to assist the wider adoption of ICT in every field including education (URT, 2018). In recognizing the importance of ICTs in education institutions like schools, colleges and universities, the government has put up policy frameworks including the National ICT policy of 2003 which was revised in 2016 in keeping with the Tanzania Development Vision 2025. One of the policy statements of NICTP of 2016 was to ensure effective use of ICT in teaching and learning throughout the formal and non-formal education system (URT, 2016).

The Government of the United Republic of Tanzania recognizes that, effective use of teaching and learning facilities including ICT facilities are essential for the purposes of enhancing students' performance and achievement including transfer of learning. Along this initiative, the Government through the Ministry of Education and Vocational Training (MoEVT) in partnership with the Sweden International Development Cooperation Agency (SIDA) also emphasized ICT development and deployment in teacher education colleges (TCs) starting from 2005 onwards. The main goal of this initiative was to improve the quality of pre-service and in-service teacher education by using ICTs (MoEVT 2007; Chirwa, 2018; Mwalongo, 2011 and Swarts & Wachira, 2010). Other policies introduced by the government of Tanzania in favor of ICT are Science Technology and Innovations (STI) Policy of 1996 and the National Research and Development

Policy of 2010 (Malero *et al.,* 2015).

Sokoine University of Agriculture (SUA) is one of the public universities in Tanzania that has been offering agricultural science courses since 1965 when it was first established as an agricultural college offering diploma courses. In early 1980s, the University experienced an alarming rate of failures and repeaters hence, decided to launch a programme known as "University Teaching, Learning and Improvement Programme" (UTLIP) with the goal of trying to look for alternative forms of instruction which would provide students/learners and members of academic staff/instructors with more opportunities for interpersonal interactions and exchange of ideas (SUACSP, 2016; 2021; SUA, UTLIP, 2013; 2017). Accordingly, SUA formulated an ICT Policy and guidelines in 2002 and later reviewed in 2014 and 2023 to guide the identification, promotion and appropriate utilization of ICT at SUA by ensuring that ICT applications are integrated into the planning and implementation of university functions including teaching and learning. This Policy aligns with the Corporate Strategic Plan (2021/22 – 2025/26), which advocates for the use of ICT to increase efficiency, cost effectiveness and competitiveness in teaching and learning process (SUA, 2021).

It is an established fact that the application of ICTs has significantly altered the way and manner we do things in all aspects of life (Makundi *et al.,* 2023). In the field of education in particular, the use of ICTs has ushered in a new era of educational techniques/approaches, drastically altering traditional methods of information transmission and usage patterns in the field while also providing instructors and students with modern learning opportunities (Wokocha *et al.,* 2018; Al-Mamary, 2020). Numerous efforts have been made to promote ICT integration in higher learning institutions including colleges and universities, one of which is Sida-MoEVT project by the government and UTLIP workshops by the Sokoine University of Agriculture (SUA) (SUACSP, 2016; 2021; Chirwa, 2018; Swarts & Wachira, 2010). Despite efforts made, ICT facilities are not fully utilized and it is unclear what factors deter instructors from using ICT facilities at the university, specifically during teaching and learning process. This paper, therefore, explores factors that influence the utilization of ICT facilities in teaching and learning agricultural sciences at Sokoine University of Agriculture. Specifically, the study intended to;

1. Describe the factors that influence the use of ICT facilities in teaching and learning of agricultural sciences; and
2. Determine the challenges that deter instructors from effectively utilizing ICT facilities in teaching and learning of agricultural sciences.

Research Questions

The following research questions were raised to guide this study:

1. What are the factors that influence instructors to use of ICT facilities in teaching and learning of agricultural sciences?
2. What are the challenges facing instructors from effectively utilizing ICT facilities in teaching and learning of agricultural sciences?

Theoretical Framework

Theoretically, many models have been used to explain technology acceptance among individuals specifically in teaching and learning process. However, this study adopted the Technology Acceptance Model (TAM). The Technology Acceptance Model propounded by Davis in 1989 is considered as a useful theoretical framework for this study because of its successes in predicting and explaining how people come to accept and use a given technology or ICT. Venkatesh (2000) asserts that TAM is the most widely applied model of user's acceptance and usage of ICT. TAM is said to replace many of the Theory of Reasoned

Action (TRA)'s attitude measures with the two technology acceptance measures –ease of use and usefulness. As alluded to earlier, TAM was developed from the Theory of Reasoned Action (TRA) by Ajzen and Fishbein (1980). The TAM argues that when users are presented with new technology, a number of motivating factors influence their decisions about how and when they will implement and/or use the technology, primarily perceived usefulness (PU) and perceived ease of use (PEU) (Davis, 1989). The Perceived usefulness refers to the degree to which user believes that using a particular technology or ICT facility would enhance his or her job performance and output efficiency. The perceived ease of use refers to the degree to which user believes that using a particular technology/ICT will be free of effort (Davis, 1989). The perceived ease of use and perceived usefulness are triggered by external variables which can be Individual differences and facilitating conditions. Both perceived use and perceived ease of use influence actual use of the technology by the users.

In application of the TAM to the use of ICT in teaching, the model suggests that instructors' use of ICT in teaching may be predicted by their perceived ease of use and perceived usefulness of ICT facilities. Instructors' perceived ease of use (e.g. confidence, positive attitude toward the technology) and perceived usefulness (e.g. increased attention by the students; students becoming more engaged in learning) of ICT facilities may be influenced by their individual differences (age, sex, teaching experience, education level (rank), technology self-efficacy); facilitating conditions i.e. availability and accessibility of ICT facilities like computers, projectors, internet access etc., time to prepare necessary materials, administrative support like regular trainings, provision of funds. Both perceived use and perceived ease of use influence actual use of the ICT facilities by the instructors in teaching and learning process.
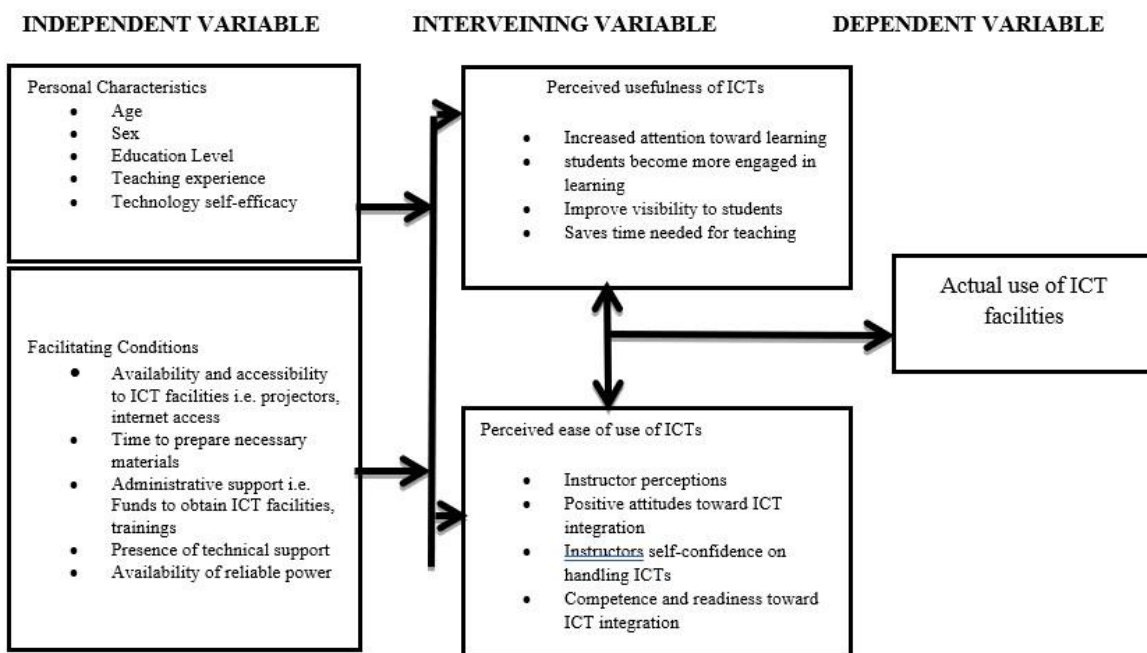

Figure 1: Theoretical Framework (Adapted from Venkatesh and Davis (2000)

METHODOLOGY

This study adopted a descriptive survey research design. The study was conducted at Sokoine University of Agriculture (SUA) located in Morogoro Municipality, Tanzania. The University is best known in the country for offering various degree programmes in agricultural and allied sciences. The University has five campuses in different regions and seven academic units (SUACSP, 2021). This study was conducted at Edward Moringe Campus within the College of Agriculture (CoA) in Morogoro region involving four departments namely; Department of Agricultural Extension and Community Development; Department of

Crop Science and Horticulture; Department of Soil Science and Geological Sciences; and, Department of Animal, Aquaculture and Range Sciences.

The population of this study comprised of 65 instructors from the College of Agriculture, with a minimum of ten or more years in teaching at the university, the Head of ICT services at the university and 4 heads of department. Both instructors and key informants were purposively selected and a list of instructors with a minimum of ten or more years in teaching from the CoA was used as a sampling frame. The instruments involved in this study were questionnaires, and interview schedule. Data from instructors were collected using self-administered semi structured questionnaires. A total of 65 questionnaires were administered to agricultural science instructors with 53 questionnaires recovered and used for the analysis. This indicates that the response rate was 81.54%. Data from the heads of departments and the head of ICT services were collected using semi structured interview schedule. The instruments were validated by experts from the Sokoine University of Agriculture Laboratory for Interdisciplinary Statistical Analysis (SUALISA). To establish the reliability of instrument, drafts of the questionnaires were purposively given to agricultural science instructors from the department of Human Nutrition and Consumer Studies for pre-testing. Cronbach's Alpha statistical technique was used to determine the internal consistency of the instrument, and it yielded a coefficient of 0.83. This indicated that the instrument was reliable and capable of yielding the desired results for the study.

Qualitative data were analyzed using content analysis. Quantitative data were analysed using Statistical Package for Social Science (version 20) software whereby descriptive statistics such as frequency, percentages, mean and standard deviation were used to make analysis. Since the questionnaire was prepared having five-point Likert scale range from Strongly Agree (=5) to Strongly Disagree (=1), three trisecting scores were used to make the analysis clear as suggested by Creswell and Creswell (2018). These scores were 2.49, 3.49 and 4.49. The remark was reached upon the mean value, whereby a mean value from ≤1.49 was strongly disagree, 1.5 to 2.49 was disagree, from 2.5 to 3.49 was neutral, from 3.50 to 4.49 was agree, and from 4.50 to 5.00 was strongly agree. A binary logistic regression model was used to determine factors influencing utilization of ICT facilities by instructors at the university. The binary logistic model and its interpretation are shown below

$$\log \frac{p}{1-p} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \cdots \ldots \ldots \ldots \ldots + \beta_n X_n + \varepsilon \ldots \ldots \ldots \ldots \text{(i)}$$

Whereby, P is the probability of an instructor always use ICT facilities, P-1 is the probability that an instructor uses ICT facilities otherwise, $\beta_0 =$ Y-intercept, $\beta =$ Regression coefficient, $\varepsilon =$ Error term, $X_1 \ldots X_n =$ Independent variables ($X_1 =$ availability of ICTs, $X_2 =$ accessibility of ICTs, $X_3 =$ reliable power, $X_4 =$ time to plan for teaching materials, $X_5 =$ number of students, $X_6 =$ technical support, $X_7 =$ provision of funds, $X_8 =$ instructor attitude, $X_9 =$ Instructors self $-$ confidence, $X_{10} =$ competence and readiness, $X_{11} =$ Instructor's teaching style, $X_{12} =$ Sex, $X_{13} =$ age, $X_{14} =$ teaching experience

Table 1: Description of the variables

Variable	Descriptions
Dependent variable	
Utilization of ICT facilities	1 if an instructor always uses ICTs, 0- otherwise
Independent variables	
Availability of ICT facility	1 if ICTs are available, 0-otherwise
Accessibility of ICT facilities.	1 if ICTs are accessible, 0-otherwise
Availability of reliable power	1 if power is available, 0-otherwise

Enough time to plan for teaching materials	1 if time is available, 0-otherwise
Large number of students	1 if the number is large, 0-otherwise
Provision of funds	1 if funds are available, 0-otherwise
Technical support	1 if technical support is provided, 0-otherwise
Instructor's attitude	1 if an instructor has positive attitude, 0-otherwise
Instructors' self-confidence	1 if an instructor has self-confidence, 0-otherwise
Competence and readiness	1 if an instructor is competent, 0-otherwise
Instructor's teaching style	1 if an instructor uses student-centred, 0-otherwise
Sex of Respondents	1 if an instructor is male, 0-otherwise
Age of Respondents	1 if an instructor is aged, 0-otherwise
Teaching Experience	1 if an instructor has 10 years of teaching, 0-otherwise

FINDINGS AND DISCUSSION

Demographic Information of participants

Table 2 provides information on the demographic characteristics of participants in a study. In terms of gender, the majority of respondents 67.9% were male and nearly 81% were aged between 40 and50 years. Regarding the teaching experience, majority of the respondents 66% had 10-20 years of teaching at the university. When considering academic rank, majority of the respondents 62% were lecturers (i.e., Ph.D. holders).

Table 2: Demographic Information of participants

Category	Items	Frequency	Percent %
	Male	36	67.9
Sex of Respondents	Female	17	32.1
	30-39	10	18.9
Age of Respondents	40-49	22	41.5
	50 and above	21	39.6
	10-15	24	45.3
	15-20	11	20.8
Teaching Experience(years)	20-25	6	11.3
	More than 25	12	22.6
	Assistant Lecturer	6	11.3
	Lecturer	22	41.5
Academic Rank	Senior Lecturer	11	20.8
	Associate Professor	5	9.4
	Professor	9	17.0
	Total	**53**	**100.0**

Source: Field survey, (2023)

Research Question One: What are the factors that influence instructors to use of ICT facilities in teaching and learning of agricultural sciences?

Table 3: Responses on the factors that influence the use of ICT facilities in teaching and learning of agricultural sciences at the university

Variables	B	S.E.	Wald	df	Sig.	Exp (B)
Institutional factors						
Availability of ICT facility	1.327	1.151	1.329	1	0.049**	3.769
Accessibility of ICT facilities.	1.712	1.473	1.351	1	0.014**	5.540
Availability of reliable power	-0.343	0.801	0.183	1	0.669	0.710
Enough time to plan for teaching materials	-1.471	0.841	3.059	1	0.080	0.230
Large number of students	4.785	2.545	3.534	1	0.060	1.197
Provision of funds	-1.327	1.151	1.329	1	0.249	0.265
Technical support	5.026	2.606	3.721	1	0.050**	1.523
Personal factors						
Instructor's attitude	3.624	1.825	3.943	1	0.047**	3.748
Instructor perceptions	2.026	2.524	0.644	1	0.422	7.586
Instructors' self-confidence and knowledge	-5.019	2.757	3.314	1	0.069	0.007
Competence and readiness	2.563	2.465	1.082	1	0.298	1.297
Instructor's teaching style	4.785	2.545	3.534	1	0.060	1.197
Sex	4.551	2.290	3.950	1	0.047**	9.472
Age	-5.325	2.571	4.290	1	0.038**	0.005
Teaching Experience	5.106	1.938	6.940	1	0.008***	1.659
Constant	5.700	11.631	2.869	1	0.021	2.988

Summary of the model fit: Nagelkerke R2=0.739, Cox & Snell R2=0.549, -2 Log likelihood=29.782[a]

Table 3 presents the results of a statistical analysis on the factors influencing instructors toward utilizing ICT facilities. Each variable in the table represents a specific factor, and the associated statistics provide information about the strength and significance of the relationship between each factor and the utilization of ICTs. The factors are categorized into institutional and personal factors. All the factors confirm with the Technology Acceptance Model (TAM) developed by Davis in 1978, as a framework to explain and predict how people adopt and use technology, particularly ICT. Starting with institutional factors, availability of ICTs had a positive coefficient (1.327) and statistically significant (0.049) with the odds ratio of 3.769. This indicates that, an increase in the availability of ICT facilities is associated with a 3.769 times higher likelihood of utilizing ICTs. This implies that, instructors are more likely to utilize ICT facilities if the facilities are readily available. These findings are consistent with the findings of Gikundi (2016) and Al-Mamary (2020) who reported that, availability of ICT facilities significantly influences utilization of ICTs since instructors can only utilize ICT facilities if the ICTs are available. However, these findings are in contrast to the findings of Kiboss and Kosewe, (2017); and Okorieocha et al., (2019) who found that availability of ICT facilities does not guarantee instructors' effective use of ICT.

Accessibility of ICT facilities was also statistically significant (0.014) with a positive coefficient (1.712) and

the odds ratio above 1(5.540). This implies that; an increase in the accessibility of ICT facilities is associated with a 5.540 times higher likelihood of utilizing ICTs. Therefore, the more ICTs are accessible to the instructors underpinned by instructors' ability to use these facilities, the more instructors utilize ICTs in teaching and learning process. These findings are consistent with the findings of Al-Mamary (2020) and Buabeng-Andoh (2012) who reported that accessibility of ICT facilities to instructors enhances chances of utilization. Moreover, technical support was found to have a significance of 0.05 and a positive coefficient of 5.026 suggesting that the availability of technical support is associated with a higher likelihood of utilizing ICTs. This indicates that, presence of technical support/ ICT systems personnel/experts influence instructors towards utilizing ICT facilities. The findings are in line with the findings of Al-Mamary (2020); Gikundi (2016); Singh and Muniandi (2012) and Aidoo et al., (2022) who reported that if technical support is available and accessible, then the likelihood of utilizing ICT is high.

On the other hand, personal factors such as instructor's positive attitude toward ICTs was found to have a positive coefficient (3.624) and the odds ratio above 1(3.748). This implies that, the instructor's attitude has a positive and significant impact on the utilization of ICTs. This indicates that if an instructor has a positive attitude on a particular ICT facility, then the chances of incorporating such facility in teaching and learning process is higher. The finding is similar to the studies done by Agbo (2015); Alabi (2016) and Scott (2016) who found instructor's positive attitude toward technology influences utilization of various ICTs. In addition to that, the coefficient for instructors' sex was positive (4.551) and statistically significant (0.047) with odds ratio of (9.472) respectively. This connotes that, instructors who are male are more likely to utilize ICTs more than female instructors. This is mainly because, looking at the population of instructors at the university, male instructors had higher population compared to the female instructors. That is, male instructors appeared to utilize ICT facilities more often than female instructors not only because their population at the university being higher compared to that of female instructors but also male instructors had more opportunities for attending UTLIP seminars and courses (SUAUTLIP, 2017). These findings are in line with the findings of Alabi (2016); Mahdi and Al-Dera (2013) and Murphey et al. (2012) who reported male instructors were likely to use ICTs than female instructors since male instructors were found to have knowledge and skills to operate various ICTs than female instructors. Similarly, these findings are inconsistence with the findings of Yashau and Nanim (2020) and Olafare et al., (2018) that showed that there is no difference in the level of ICT utilization based on the gender of instructors.

Age of respondents was found to have a negative coefficient (-5.325) and statistically significant (0.038) with odds ratio of 0.005. The negative sign indicates that, as one grows in terms of age the likelihood of utilizing ICTs decreases. This means that, instructors who are at youth age are more likely to utilize ICTs in teaching process compared to elderly instructors. This finding is consistent with the findings reported by Alabi (2016) who reported that, as instructors become older in age they could maintain technologies that they are accustomed too many years ago thereby negatively influencing adoption of contemporary ICTs. These findings are also similar to Rogers (2003) who reported that the younger people are technologically-enthusiast individuals; therefore, they are more positively disposed to the use of various ICTs. However, this result is inconsistent with the findings of Yashau and Nanim (2020) who reported that lecturers who are older in age had higher mean ratings on level of utilization of ICT facilities.

Finally, teaching experience had a positive coefficient (5.106) and statistically significant (0.008) with the odds ratio of 1.659 respectively. This indicates that, the more experienced an instructor is the more likely he/she utilizes ICTs. This may be due to the fact that, as an instructor gains experience in teaching the more exposure to different ICT facilities. This is because the more experience an instructor has in teaching, the more he/she has access to various ICT resources/facilities. These findings are consistent with the findings of Olafare et al., (2018); Alabi (2016); Yashau and Nanim (2020) who also reported that, ICT resources were more frequently used in the classroom by individuals with more years of teaching experience than by those with fewer years in teaching. However, these results are in contrast with the study of Mahdi and Al-Dera

(2013) who reported that, there is no significant difference on ICT use based on years of teaching. The findings are also in contrast with the findings of Tezci, (2009) who reported that instructors with fewer years in teaching utilized ICTs more than those with more years of teaching experience.

Research Question Two: What are the challenges facing instructors from effectively utilizing ICT facilities in teaching and learning of agricultural sciences?

Table 4: Responses on the challenges that deter instructors from effectively utilizing ICT facilities in teaching and learning of agricultural sciences. (N=53)

Challenges/Constraints towards ICT utilization	Mean	SD	Remark
Lack of interest/ negative attitude of instructors toward using ICT during classroom instruction delivery	2.09	1.148	D
Insufficient time to master new software or integrate ICT during a classroom instruction delivery	2.75	1.207	N
Lack of instructor's collaboration and instructional support on how to use ICTs, as well as a lack of experience among cooperating instructors	2.83	1.205	N
Lack of specific knowledge and skills about new technologies and how to combine it with the existing instructional content/ knowledge to support student learning	3.13	1.161	N
Lack of in-service training on the use of ICT facilities	3.79	1.246	A
Problems of handling large classes and large number of students to accommodate the existing technologies	3.70	1.449	A
Lack of self-confidence in using ICTs for teaching	1.96	1.224	D
Instructor's resistance to change, hence unable to effectively use ICTs during teaching and learning process	1.98	1.217	D
Inadequacy of ICT facilities and infrastructures projectors, laptops etc. to support the full application of ICT in teaching and learning process	4.36	1.021	A
Slow internet connectivity	4.26	.880	A
Inadequacy of ICT manpower/ technical support at the college	3.75	1.054	A
Unreliable power supply at the University	4.38	.860	A
Most of the available ICT facilities are nonfunctional	3.70	1.219	D
Lack of reward or incentive for using ICT in teaching and learning	1.96	1.224	D
Lack of appropriate administrative support for the effective use of ICT	3.81	.962	A

Note: A-Agree, N-Neutral, D-Disagree   Source: Field survey, (2023)

Table 4 indicates responses on the challenges faced by agricultural science instructors towards utilizing ICT facilities in teaching and learning of agricultural sciences at the university. Such constraints include inadequacy of ICT facilities and infrastructures (4.36), slow internet connectivity (4.26), unreliable power supply (4.38), lack of in-service training (3.79), problems of handling large classes (3.70), inadequacy of ICT manpower/ technical support (3.75), and lack administrative support i.e. provision of funds (3.8).

Inadequacy of ICT facilities and infrastructure (Mean=4.36) signifies that there is shortage of necessary ICT facilities and ICT infrastructure at the university. ICT facilities such as desktop computers, laptops, projectors, and other related equipment, are insufficient to meet the demands of agricultural science instructors present at their respective departments in the CoA (Makundi *et al.,* 2023). Similarly, insufficient computer labs, multimedia classrooms, or other necessary infrastructure may impede instructors' ability to

incorporate ICT effectively into their teaching practices. This was supported by one of the key informants who revealed that:

"Some of the laptops we are using during teaching and learning sessions are old and outdated since some instructors still use the same laptops that they used years ago when they were undertaking their degree programmes/ studying. These laptops are slow and sometimes may even get stuck on the middle of teaching process hence making teaching and learning difficult. Given this scenario, some instructors have opted for conventional teaching methods like lecture and use of overhead projectors (One of the Head of Department, 14th April 2023)."

These findings are supported by Aldheleai, *et al.,* (2019) who conducted a study on what hinders the use of ICT among academic staff in Yemen's public universities, and Obiri-Yeboah, *et al.,* (2013) at Kwame Nkrumah University, Ghana who revealed that lack of appropriate ICT resources/facilities and infrastructure can be barriers to integration of ICT in teaching and learning.

Slow internet connectivity (Mean=4.26), implies that the internet speed experienced by agricultural science instructors is not sufficient for conducting effectively their teaching activities. Slow internet connectivity can hinder their ability to access online resources, communicate with students, or utilize web-based tools effectively. These results are in line with Emmanuel's (2020) study which revealed that instructors had difficulties in integrating ICT into teaching and learning process because of low internet speed. This is also consistent to the findings by Kunda *et al.,* (2018) that lack of adequate Internet bandwidth is among the major barrier for assimilating ICTs in teaching and learning among Zambian university lecturers.

Unreliable power supply (Mean=4.38), including issues related with the consistency and stability of electricity supply at the university implies that there is frequent power outage or disruptions that hinder the use of ICT tools in teaching and learning process. Unreliable power supply at SUA is a critical problem experienced in both even and odd semesters necessitating the use of generators which are not readily accessible in all classrooms. Interview with the key informants also revealed that:

"Most of the ICT facilities require electricity to operate, however problems with frequent power outages hinder us of from utilizing the facilities efficiently as a result we are forced to use the traditional methods of teaching (One of the Head of Department, 12th April 2023)."

The findings are in line with Apagu and Wakili (2015); Aldheleai *et al.,*(2019) and Haliso (2011) who revealed that unreliable power supply is one of the challenges that hinders instructors from using ICTs.

Lack of in-service training (Mean=3.79) suggests that there is a notable deficiency in the provision of in-service training among the instructors at the university. With the rapid growth of technology, the university has been providing trainings through the UTLIP workshops. However, instructors still lack some necessary skills or competencies on how to operate contemporary teaching technologies. Interview with key informants also revealed that;

"Technology in teaching and learning keeps on changing day by day depending on advances in science and technology. For instance, we now are experiencing emergence of zoom and Moodle platforms as new teaching technologies and instructors are required to upload their teaching notes via these platforms. However, most of the instructors do not possess the necessary skills and knowledge to operate these technologies since the university does not conduct regular trainings on how to operate and manage these facilities (Head of ICT services, 14th April 2023)."

These findings are supported by Emmanuel (2020); Mtega *et al.,* (2012) and Mtebe and Raisamo (2014) who revealed that lack of training among lecturers is one of the factors/challenge hindering ICT integration

in higher education institutions in Tanzania.

Problems of handling large classes (Mean=3.70) is one of the major challenges that deters instructors from incorporating ICTs into their teaching activities. This is mainly because over the years, SUA has been experiencing an increased undergraduate and graduate students' enrollment in keeping with its strategic plan. For instance, the number of students' enrollment has grown from about 500 in 1988, 7,299 in 2016 to 14,581 students in 2021 (SUACSP, 2021). This trend has made agricultural science instructors at SUA to struggle with managing large class sizes of over 200 students. Large classes are indeed challenging and have been found to be a bottleneck when it comes to providing individualized attention to students and in particular those with special needs. . These findings are in line with Ojo and Adu (2018) who reported that, the size of classroom and ability of instructors to manage larger student population can affect instructor's use of ICTs during teaching and learning process. Interview schedule with key informants further supports these findings as one of the key informants reported that;

"One of the major challenges that we as instructors face nowadays is the presence of very large number of students in the lecture rooms compared to the type of ICT facilities we have. For instance, with the new venues and especially the multipurpose laboratories it is difficult for all the students to see what is projected in front of the lecture room by the instructor when using the LCD projector with one screen. Under these circumstances large enrollments have been found to promote student disengagement and feelings of alienation, which may in the process erode students' sense of responsibility and lead to behaviors that both reflect and promote lack of engagement. It is no secret that a number of times some students during teaching sessions are found busy surfing on their cellular phones and completely detached from the session. The situation is indeed alarming and in a way is comprising the quality of education being offered. It needs to be arrested by the University authorities. (One of the Heads of Department, 13th April 2023)."

Inadequacy of ICT manpower/technical support (Mean=3.75), implies that there is a shortage of personnel at SUA with ICT expertise and experience who could provide the necessary technical support to agricultural science instructors when and where need arises. As such, instructors face difficulties in troubleshooting technical issues when problems arise using ICTs during teaching sessions leaving instructors and students being frustrated. This is similar to the studies done by Al-Mamary (2020) in Yemen and Emmanuel (2020) in Tanzania who reported that lack of technical support/ insufficient ICT systems personnel can affect instructor's effective use of ICT facilities.

Lack of administrative support and in particular financial assistance (Mean=3.80), suggests that lack of financial support from the university administration to address the ICT-related needs of agricultural science instructors which deters them from using ICT facilities. It was reported that instructors at SUA face challenges in acquiring necessary ICT resources, upgrading existing infrastructure, or accessing training opportunities due to limited funding or shrinking university budget. For instance, one of the key informants revealed that;

"Some of the white boards in the lecture rooms are blur/dirty/dilapidated and there are no accessories such as alcohol-based sanitizers and clean microfiber cloth. Additionally, there are no marker pens to use on these boards as a result; instructors do not use these boards during teaching and learning process. This appears to be an inherent problem that calls for immediate attention. (One of the Head of Department, 14th April 2023)."

These findings appear to be in line with the study conducted by Kunda *et al.,* (2018) in Zambia; and Bett (2014) in Kenya who reported that poor support and limited financial resources were the barriers toward utilizing ICT facilities.

CONCLUSION AND RECOMMENDATIONS

The study concludes that there are various factors that influence ICT utilization in teaching and learning of agricultural sciences at SUA. These factors are hovered around institutional and personal factors as alluded to earlier. The findings of this study revealed institutional factors such as availability and accessibility of ICT facilities, and availability of technical support together with personal factors such as positive instructor attitudes, sex, age and teaching experience play significant roles in influencing ICT utilization at the university. The results of this study also show that inadequacy of ICT facilities and infrastructures, slow internet connectivity, unreliable power supply, lack of in-service training, problems of handling large classes, inadequacy of ICT manpower/ technical support, and lack administrative support i.e. financial assistance are the barriers toward integrating ICT facilities in teaching and learning of agricultural sciences at the university. Given the existence of a myriad of factors that deter instructors from utilizing ICTs in teaching and learning process, it appears the University has not put in place a coherent strategy for addressing both the institutional and personal factors. Therefore, the university in keeping with its current strategic plan and ICT policy should develop a sound long term strategy that seeks to address these challenges while seeing to it that, it's properly financed and executed. In the short term, it is recommended that the university should strive to implement the following strategies as proposed by various instructors. These strategies as reported by respondents are presented as follows:

1. The university, if it is to live up to its vision, should take an affirmative action and ensure that use of ICT in teaching and learning is at the centre stage in keeping with its strategic plan. This is essential given the university and Government's desire for increased student enrollments in line with the Tanzania Development Vision 2025 and the evidence of youth bulge in Tanzania.
2. The university administration should use part of the internally-generated revenue for purchasing ICT tools/facilities so as to overcome the challenge of inadequate ICT facilities in respective departments. For instance, the university should purchase and provide instructors with new updated modern laptops since the ones they have are personal and outdated.
3. Alternative source of power such as generators and solar panels should be installed across different departments to ensure reliable power supply at the university.
4. In-service training to instructors and students on how to use various ICTs should be provided especially on zoom and Moodle platforms so that instructors can be aware on how to upload their teaching notes on these platforms so that students can easily access them wherever and whenever they need them.
5. The university should ensure that, sufficient ICT systems personnel/expertise are available at different departments to provide technical support to instructors on all ICT related problems. These experts should ensure obsolete /damaged ICT equipment are timely and properly repaired and/or replaced with new ones.

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