Institutional Provision of ICT Infrastructure and Services- A Linchpin for Learner Participation in Distance Learning Programmes; The Case of Distance Learning Students Undertaking Diploma Course in Selected Distance Training Centers of the College of Education, University of Rwanda

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Abstract

Purpose: The purpose of the study was to investigate provision of ICT infrastructure and services on learner participation in distance learning programmes in the College of Education, University of Rwanda which were evaluated in light of five research questions that aimed to establish the extent to which provision of Video conferencing facilities, digital video and CD-ROMs influence learner participation in distance learning; assess the extent to which provision of internet connection points influence learner participation in distance learning; establish the extent to which the availability of electronic mail accounts and availability of computers for teaching and learning influence learner participation in distance learning; and to assess the extent to which access to electronic library influence learner participation in distance learning programmes.

Methodology: The study used both qualitative and quantitative approaches to collect data and embraced by a cross- sectional survey study. A sample study comprised of 315 students out of 1,474 that formed the target population.

Findings: The findings showed that ICT infrastructure and services positively and significantly influenced learner participation in distance learning in the College of Education with, $\beta=374.272$, t= 7.261, p=0.000<0.05. Thus, the null hypothesis H_o was rejected and the alternative H_1 accepted that provision of ICT infrastructure and services has a significant influence on learner participation in distance learning. Overall, the results from analysis of data showed that distance learners disagreed that ICT infrastructure and services were adequately provided with (M= 1.68, St. = 0.43). This meant that ICT infrastructure and services are not adequately provided to learners in the programme. This may hinder full participation of learners in the programme since learners usually depend on ICT infrastructures for their studies. The coefficient of determination for the influence in the provision of ICT infrastructure and services on learner participation was $R^2=0.058$. This meant that 5.8% of the variance in learner participation was explained by provision of ICT infrastructure and services.

Unique Contribution to Theory Practice and Policy: The theory in this study was validated and drew conclusion that measurable forms of ICT infrastructure and services such as internet connectivity, audio and video conferences, e-library services and other facilities were not statistically significant. Therefore, the unique contribution to this study calls for the policy makers to lay down funding mechanisms to support functionality of the university of Rwanda in order to be able to provide the necessary support services to learners and harness digital technologies in education delivery. In practice, the university of Rwanda in its strategic directions should ensure that it introduces degree programmes not only for in-service teachers but also in other disciplines in order to attract more people to participate in the distance learning programmes. The study will also open up new room for academic discussions in the pedagogic perspectives on what works well for learners in terms of interactions, discussions and communication between instructors and themselves.

Key terms: *Provision of ICT, Infrastructure Services, Learner Participation, Distance Learning, Influence*

INTRODUCTION

In Rwanda, the policy of ICT in Education was established in 2016 with the aim to improve preparation of the current generation of students for a workplace where ICT tools such as computers, Internet and other related technologies have been adopted in teaching and learning process. According to UNESCO Education sector (2019) provision of ICT devices such as desk top computers, laptops, projectors local wireless and school servers covered 66% in both secondary and higher education institutions. This means that the practice of provision of ICT infrastructure leads to effective service in any education delivery by enabling learners to become more engaged in their studies as it provides them the platform for exchanging ideas through interaction and discussions using ICT facilities.

According to Laurence and Tar (2018), the adoption and integration of ICT into the teaching and learning offers good opportunities for learners and teachers to work better in a globalized digital age. In addition, the 2020 academic interruptions due to the COVID-19 pandemic, distance learning relies on resources of the digital fields as well as the management of ICT and the development of digital skills among learners and instructors. These prompted teachers and students to relearn new ways of accessing, transmitting knowledge and interacting in cyberspace (De Vincenzi, 2020)

The research sought to establish the level of influence in the provision of ICT infrastructure and services to in-service teachers undertaking a Diploma course through distance mode of learning. Substantive literature on institutional management practices reveal that there is still much debate concerning the low participation in Distance Learning programmes and the hurdles faced by distance learners related to lack of technical support services such as computers in teaching and learning and the media used in course delivery. However, as highlighted in the study conducted by the world Bank (2017), low participation in distance and e-learning programmes are the basis of little progress in access to tertiary education. What is known about learner participation in distance education is largely based on mixed results which show both positive and negative effects on distance learning programmes.

While emphasizing on the relevancy and need for distance learning programme, Andrade (2016) demonstrate insightful benefits of distance learning as the achievement of social equity, increasing access to education for historically marginalized populations and giving a second chance for high school graduates who missed an opportunity to join tertiary institutions.

For higher learning institutions, distance and e-learning is the second best alternative to conventional learning which also overcomes the problem of the scarce human resources, financial and infrastructural resources as well as income generation for sustainability in education delivery (O'Lawrence,2006; Claudiu Coman etal.2020). For employees, distance learning saves a lot of funds and viable forms of education as they continue to work while learning; regarded as a co-investment in time and money (UNESCO, 2015; Mhalangu V, P, 2018).

In lieu of governments, distance learning is profitable because it provides educational services to many people who can earn while they are learning thus, it presence returns and lift up the literacy rates (Panday, 2016; Angina, 2018). Taking into account of the above enormous benefits of

distance education, Mary Burns (2019) noted that upgrading untrained teachers are increasingly becoming multimodal avenue for teacher education and Clarà (2015) reiterated that governments should embark on teacher training through distance and e-learning to accommodate all categories of people. This resonates with Perraton (2010) who stated that ''when the open and distance learning for teachers in Palestine was established in 1963, this mode of study for teachers led to a reduction of the untrained teachers from 90 percent to 9 percent in 1968''. In addition, teacher training programme in Sub –Saharan Africa (TESSA) was widely reinforced in a bid to address the problems related to poor learning which were felt by unqualified educators in many schools. (Strauss et. Al., 2017).

According to the NISR report (2015) there were over forty-five thousand students who qualified to join the only public university in 2014, but due to shortage of infrastructure and resources to cater for regular or traditional classes, only ten thousand students are enrolled to higher education every year. This situation places new emphasis of Distance Learning programme to supplement education delivery across all Colleges or campuses that form university of Rwanda, the only public institution of higher learning.

Problem Statement

In Rwanda, distance learning started in 2001 at Kigali Institute of Education as an in-service training programme which aimed to address the shortage of secondary school teachers and upgraded them to a Diploma level in terms of numbers and quality. Distance learning programme was run in tandem with the pre-service programme, considered as a dual mode of education delivery in the College of Education, University of Rwanda. However, an indication of low participation in distance learning programmes in Rwanda is that since 2001 when distance learning was established at the Kigali Institute of Education, only 5,919 students have graduated in the programme (MINEDUC report ,2018).

Some of the features that characterize learner support activities include but not limited to Face-to-face tutorial sessions during secondary school holidays, tutors give weekend tutorials throughout the term, gives assignments and scores and ensures that attendance during the tutorial sessions are observed. In addition, some learners who enrolled for distance education for a two-year Diploma course take three years or more to complete their studies. This is an indication that there are underlying factors that affect the delivery of distance learning programmes and that learner support services provided by the college of Education might not be sufficient to motivate them to accomplish their studies.

Moreover, current learners seem to be faced with so many hurdles such as inadequate learner support services by tutors, limited access to facilities such as video conference, computers for learning and teaching, internet connectivity across the ten distance learning centers and e- library services. This resonates with Oumbi and Nkuyuubwatsi (2019) who reiterated that the crucial challenge being faced by distance learners around the globe is inadequate learner support services for the growing number of student's enrollments in ODeL programmes.

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Purpose of the Study

The main objective of the research study was to determine the influence of the provision of information, communication and Technology infrastructure and services and learner participation in distance learning programmes.

This study sought to achieve the following objectives:

1. To establish the extent to which provision of Video conferencing facilities and digital video and CD-ROMs influence learner participation in distance learning programmes

2. To establish the extent to which provision of internet connection points influence learner participation in distance learning programmes

3. To assess the extent to which the availability of electronic mail accounts influence learner participation in distance learning programmes

4. To establish the extent to which availability of computers for learning and teaching influences learner participation in distance learning programmes

5. To assess the extent to which   access to electronic library influence learner participation in distance 2and e-learning programmes.

Theoretical framework for the study and Literature review

The theoretical framework in this study is informed by constructivism and systems theories. Constructivism and systems theories are related to the current study because both theories help to engage learners involved in distance learning to become self- directed and to seek for information on their own initiatives. Constructivism theory according to Berger (2000) is a learning model based on the nature of knowledge and interaction via learners' explanations, collaborations, critical evaluation, comments and information sharing. In this aspect, knowledge is constructed through critical, analytical and rational decisions and improvement in selecting course enrolment and training programs.

 Drawing on the work of oxygotsky, Stephen Asuuk (2008), constructivists focuses on knowledge construction in collaboration with others through making pairs and group work activities. This enables learners to have exposure on many view points on topic under discussion. In regard to group work, much emphasis is put on open interaction using different multi- media materials, such as tutorial meeting sessions, audio and video conferencing, email accounts or chat rooms. In this aspect, group interactions influences theories that dwell on the socio-emotional and cognitive benefits of working in a group. The interaction and exchange of information, ideas, attitudes and perception on different viewpoints raised in group work builds learner's self-esteem; learning how to accommodate each other's viewpoints and enhancement of capacities in listening and communication skills that enable learners to solve tasks which are designed to promote learning.   As defined by Woudstra (2009), a systems theory is a set of mutually dependent parts that work together as a whole towards achieving certain goals in which performance is better than those individual parts of the system. According to Lai et al. (2017), a system's theory puts mechanisms in place to ensure practical changes in an organization. The organization in this context is reflected as supra system. Distance education institutions have

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many operational systems which includes; administration sub-systems which is responsible for policy implementation, course development, delivery and examination. However, it can be noted that each of the sub-systems mentioned above operate separately. In agreement with the sub-systems explained, Assey (2004) highlighted that anything affecting one system, affects the entire system. Distance learning therefore, play a vital role in management of programmes as services are brought near learners.

Learner Participation in Distance Learning

The term Learner participation, refer to the act of learning and engagement of learners in order to be able to develop communication networks, exchanging their feelings, opinions and viewpoints during discussions and interactions in their studies. Therefore, understanding learner participation is vital to any learning environment to boost teaching and learning using learning management systems (Hrastinski, 2009; Sama Haniya, Lic Pacquette, 2020). Hrastinski further noted that learning and participation are interrelated, implying that learning outcomes and experiences are satisfactory.

In the literature review, Davies (2005) and Nurbiha et. Al., (2015) measured the degree of learner participation employing digital tools in communication among themselves while in different study locations. The study findings revealed that students who failed some particular units were as a result of their passive participation in interactive discussions while others who often meet via communication networks perform well in examinations. Another study carried out by Cregan (2005) revealed that learners who meet frequently to discuss using online student portals passed all registered modules. This was further emphasized by Helena et. Al., (2011) who noted that voluntary participation in group discussions significantly contribute to the learner's success rate. In addition, learner participation is viewed by Sheilla et. al (2007; 2014) as a learning process which makes the learner to realize potentials of using different learning strategies. In addition, Jeongju LeE et.al. (2019), alludes that learner participation in distance and e-learning leads to positive learning outcomes, such as a high level of learning achievement and higher-order thinking abilities, as it permits leaners to vigorously engage in learning anytime and anywhere.

The reasons for learner participation in distance learning programmes are many but the top most benefit of distance learning is its flexibility. Learners can choose when, where, and how they learn by selecting the place, time and medium for their education. (Education.com, 2020).

For employees who want to upgrade their qualifications while on job, distance learning creates a relaxed schedule that works for them better. On one hand, many people intend to participate in distance and e- learning programmes because of the envisaged backing from their employers who pay school fees for them. On the other hand, obtaining diploma certificates in education, in-service teachers enjoy pay increases and promotions, thereby, conforming the view that employers support contribute to the transfer of knowledge acquisition from classrooms to work place.

In view of this, one can conclude that learners are motivated to participate in distance learning distance learners for flexibility, timeliness and dependability and less costs for students in the

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programme. In conformity, Vicki et. Al., (2018) noted that leaners become responsible for their learning because distance learning provides them with the occasion to decide what, how and when to learn.

According to Schneider (2013), most of aspirants in distance learning programmes on one hand participate in distance learning programmes because of their strong desire to advance their knowledge and skills. They on the other hand, they are motivated to learn because of the perception that their success will assist them to achieve recognition in academic excellence and work place promotion.

In another study, Nicholas et. Al., (2015) noted that distance learning discusses the priority needs of the learners throughout their learning process. Referring to a study conducted by Dumazedire (1967) in France on reasons that motivates learners to learn through distance learning and cited by Ngoma (2009) and Wenting (2017) considerably agreed that people take in distance learning activities because they want to improve their performance and be recognized for their valuable contributions toward the success of the companies they work for. In regard to have access to library services, Proudfoot and Kebritchi (2017) reiterated that the dire role of the library is to improve and increase e-learning education and to offer information resources for users.

Provision of ICT Infrastructure and Services and Learner Participation in Distance Learning Programmes

The delivery of ICT infrastructure and services by Distance Education institutions has necessitated learners to undertake courses while in their homes and place of work. Through ICT infrastructure and services, learning can occur anytime and anywhere because on-line resources can be accessible 24 hours a day. Teleconferencing lecture Halls allow both learner and the instructor to interact simultaneously with ease and convenience. Based on ICT, learning and teaching no longer depend exclusively on printed materials. Multiple resources are abundant on the Internet, and knowledge can be acquired through video clips, audio sounds, visual presentation and so on. (Jo Shan Fu, 2013)

Further research studies in the past decades found out the practice of ICT in education delivery has basically changed the way people communicate and organize business. In agreement, Wambugu (2008), noted that in today's world of work, economies and experts need computer skills just like reading, writing and arithmetic skill because they are fundamental in people's lives. In support of these views, Ngare (2014) appreciate that Kenya has tried to catch – up with other countries that use digital technology in education delivery. Different authors such as Karan (2007), Essel et al (2019) have also noted that industrialized countries have embraced the ICT use in education delivery. Therefore, assistive technologies in the contemporary sphere of influence has played a key part in the speeding up of distance learning opportunities.

Fuinhas et al., (2019) highlighted three assumptions of communication technology services pointing out that communication can assist educators to plan, design, select and develop quality distance education programmes. In addition, the use of multimedia technologies has inspired instructors in the application of quality instructional materials in teaching and learning processes. It was also stipulated that transmission of the instructional materials is based on the assumptions that the roles of media are in tandem with communication characteristics such as storage,

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transmission and delivery using text based content and one or two-way communication. In view of O'Lauarence (2007), and Datha et al. (2010)) learner support services have been embraced by the use of ICT infrastructure and services to serve the learner better.

ICT has actually emerged as overriding mechanisms of system support. According to Saba (2011), ICT concerns are derived from different factors; First, the ICT in teaching and learning is recognized for its potency to meet learner's needs and for its effectiveness in service delivery. Thus, ICT has emerged as an overriding mechanisms of systems support (Thompson, 2005). The services provided include but not limited to; the on-line registration, publication of examination results, automation in finance and handling of learners' complaints (Floyd & Powell, 2004). Secondly, ICT enhances collaboration via telephone, internet and video conferencing (Makhanya, 2016). This enables distance education institutions to reach their third generation that use e-learning as a mode of delivery (Sumner, 2000; Gil,2014).

Mahajanet al., (2019) explained about the role of internet in learning and teaching processes. For instance, Massive Open and on-line Courses (MOOCs) internet enhances collaborative learning towards students' satisfaction. The enforcement for the use of emerging ICT services in teaching is also a dictation to educational systems that help learners to be familiar with ICT, thus producing people who can use these ICTs in workplaces for effectiveness and productivity (Aslant al.2016).

It is in this perspective Ashfaq et al (2016) emphasized the enhancement of ICT infrastructure and services to support teaching – learning paradigms, thus contributing to student's enjoyment, creativity and motivation for professional development.

In addition, ICTs use has enabled institutions to be felt, in a way that distance learning institutions have adopted technological innovations to serve the learners better (Sumner, 2000); Saba, 2011); (Ndayambaje & Ngendahayo, 2014). Nevertheless, the present study resonates with the strategic directions other distance education institutions have taken by establishing the extent to which provision of ICT infrastructure and services could influence learner participation in Distance learning programmes

In a particular way, Kathrine and Liz (2016) explains that communication networks enhance dialogue and structure in the teaching and learning. Thus, ICT infrastructure and services should be employed during the learning phase, thereby increasing focus on student's intellectual, physical and emotional needs. In this respect, course content should be flexible enough as dialogue between learners and tutors reflects on the course objectives, content and teaching strategies. As explained by Demetrio's et.al (2017), video conferencing is also considered to be the best interactive method that simplifies the work of professionals when interacting with learners. They categorized video conferencing into four interactive styles stating that video conferencing help to establish mutual trust and prevents misunderstandings; video portals reduce communication costs on the part of the institution and allows people in remote areas to succeed.

In regard to emails, White, (2003) explained that use of emails improves writing skills and video conferencing improves listening and speaking skills. In the same spirit, Rahman (2014) explains the use of ICT infrastructures, indicating that electronic correspondences are one of the most recent practical development in the field of distance and e- learning using computer mediated

communication. Therefore, ICT creates an enabling environment in which students and instructors use their personal computers and modems to connect to a central host computer that runs conferencing software programme and that the proliferation of the internet, the worldwide web is capable of facilitating social interactions between peers, collaborative group work, instructor-learner interaction and discussion and on-line resources and feedback.

Conceptual Framework for the Study

The current study on the extent to which institutional provision of ICT infrastructure and services influence learner participation in distance learning programmes is based on the conceptual framework being guided by one independent variable, considered as the provision of ICT infrastructures and services and its measurable indicators of: provision of Video conferencing facilities, Provision of Internet connections points, Electronic mail accounts, provision of computer for learning and provision of digital video and CD –ROMS, access to e-libraries. These ICT infrastructure and services have direct relationship with learner participation in distance learning programmes because distance learning largely use assistive technologies for learners to be able to register for the course that meet their schedule and learning styles. It can be noted that independent variable (ICT Services) have direct relationship with learner participation because it is a social responsibility of the university managers to provide the necessary support services so that learners can be attracted to participate and enjoy learning that takes place in different study centers.

Conceptual frame work showing influence of Support facilities for learner Participation
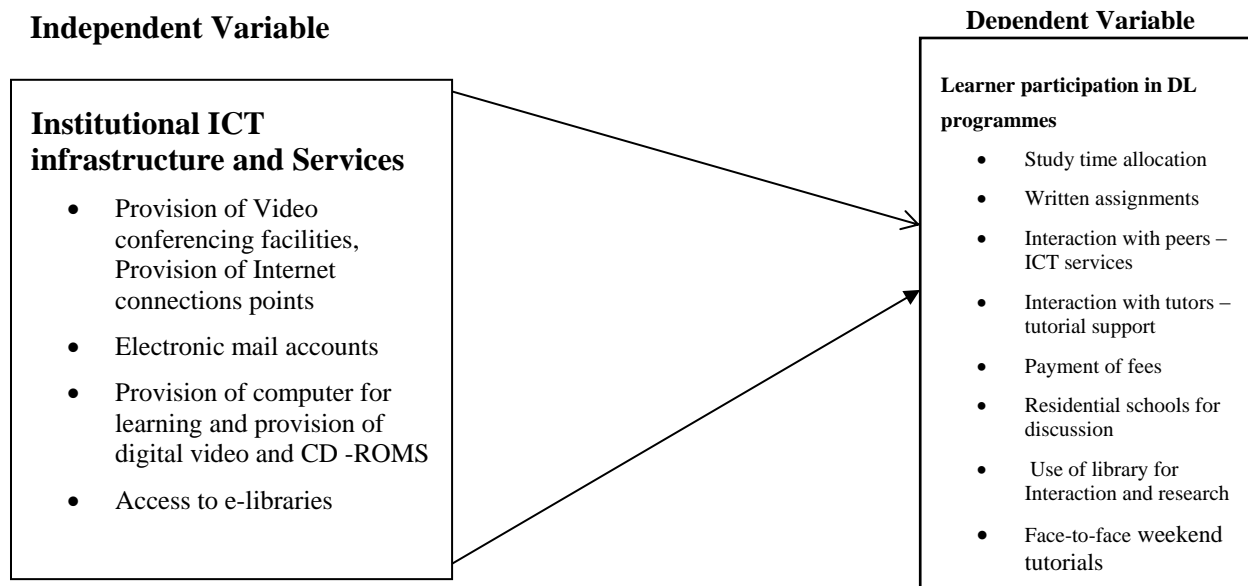

Figure 1: Conceptual framework

METHODOLOGY

The study objectives were to establish the influence of the provision of information, communication and Technology infrastructure and services on learner participation in distance learning programmes. The primary data were collected using self-administered questionnaire from sampled in-service teachers undertaking a Diploma course in education and used interview guide questions to 45 participants comprised of the administrators, course coordinators, provincial heads of distance training centers and some instructors who were randomly selected for the key informant interviews and focus group discussions. On the part of quantitative approach, a sample study comprised of 315 students out of 1, 474 that formed the target population, thus, totaling to 360 participants in the study. The study was embraced by a cross-sectional design which was employed to collect data from the six selected Distance learning centers in the College of Education.

Learner participation was deliberately evaluated in light of five research questions that aimed to assess the extent to which provision of ICT and infrastructure and services such as Provision of Video conferencing facilities, Provision of Internet connections points, electronic mail accounts, provision of computer for learning and provision of digital video and CD –ROMS as well as Access to e-libraries influence learners to participate in distance learning programmes. All statistical analysis for quantitative data results was computed with the help of SPSS software version 22.0. to condense the data into a form that is good enough for determining whether there were relationships between independent and dependent while qualitative information was thematically analyzed.

Study Findings, Conclusion and Recommendations

Description of Learner Participation (Dependent Variable) in the Learning Process

In regard to learner participation in distance learning programme, two hundred and seven (207) (72.6%) of the learners revealed that they took more than one day to register using online means and only thirty (30) (10.5%) spent one day using online means. Another 25 (8.8%) took five hours to register using online means while twenty-three (23) which account for eight point one percent (8.1%) took one hour on registration. Seventy-two point six percent (72.6%) of the respondents were dissatisfied with the registration process.

The study also enquired about learners' attendance of tutorials during face-to- face sessions. The majority of respondents ninety-eight point two percent (98.2%) indicated that they attended 40 hours of the weekend tutorials during face-to-face last semester and only five 5 (1.8%) respondents indicated having attended above 40 hours in face-to- face sessions in the preceding semester.

In addition, the study enquired about number of hours spent in the weekend tutorial support services. Two hundred and eighty of the respondents (280) account for ninety-eight point two percent (98.2%) reported attending more than 40 hours of the weekend tutorials during face-to-face in that semester while only five (5) accounts for one point eight percent (1.8%) reported no attendance.

On the number of tutorial hours missed during face-to-face learning sessions, two hundred and forty-six (86.3%) reported that they missed 10-15 hours in that semester. The reasons given The reasons given for two hundred and forty-six percent (86.3%) who missed lectures were lack of transport to the study center while eleven point six percent (11.6%) reported lack of time due to family responsibilities. Another zero point four percent of the respondents (0.4%) reported health related problems as the cause for missing lectures during the semester.

Concerning registration for courses in the semester, two hundred and eighty-two (98.9%) of the respondents had registered for six course units while only three percent (1.1%) had registered for three (3) course units. Students who registered for few modules had special cases related to either repeating the failed modules or inability to pay for six course units.

Regarding the number of assignments submitted per course unit in the semester, two hundred and eighty-two (98.2% of the respondents reported submitting two assignments per course unit. The reason for submitting all the assignments is that it is a prerequisite for writing examinations at the University of Rwanda.

Three account for eleven point one percent (1.1%) of the respondents reported submitting one assignment. The reason for submitting one assignment was that the assignment they had submitted earlier had been misplaced.

Regarding tuition fee payments, all respondents 285 (100%) reported paying ten thousand Rwandan francs per course unit, an equivalent of 12 USD (United states dollars). This constituted one percent of the total fee, the rest of which is subsidized by the government of Rwanda.

Concerning time spent on home study, two hundred and sixty-nine, ninety-four point four percent (94.4%) of the respondents reported spending two hours while 11 (3.9%) devoted only one hour and only 5 (1.8%) spent three hours per day. Regarding frequency of meetings to discuss academic issues, one hundred and sixty-nine, fifty-nine point three percent (59.3%) of the respondents reported meeting with two colleagues while one hundred and twelve (112) account for thirty-nine point three percent (39.3) indicated meeting with three colleagues per day and only four (4) account for one point four percent (1.4%) reported meeting with three colleagues in one day.

Enquiry was also made about frequency of visits by learners to read in the library in a week. One hundred and seventy-eight (62.5%) of the respondents reported that they did not go to a physical library to read due to limited time available at the secondary schools where they teach. Another ninety-nine (34.7%) of the respondents reported that they visited a physical library to read once a week during their pedagogical day off and only eight (8) (2.8%) indicated visiting the library to read in a week.

Regarding the frequency of using e-learning resources in a week, one hundred and forty-two (49.8%) of the respondents indicated that they did not read e-learning resources because of lack of internet connectivity in their respective schools. Another one hundred and nineteen (41.8%) reported using e-learning resources once a week to read while 10 (3.5%) reported using internet

resources twice a week and one (0.4%) indicated using it twice a week while another one responded using it once a week.

Students also were asked to state other sources of their learning materials. Two hundred and eighteen (76.5%) of the respondents indicated that they only read modules provided by the College of Education. Another sixty-seven (23.5%) of the respondents reported that they were buying internet bundles for their telephones to access –learning materials. On the frequency of meetings by peers for interaction and discussions, two hundred and twenty-six (79.3%) of the respondents indicated that they met once a week while fifty-nine (20.7%) met twice a week.

Provision of Institutional Information Communication and Technology Infrastructure Services on Learner Participation in Distance Learning

The objective of the study was formulated to assess the influence of information, communication and technology infrastructure and services (ICT) on learner participation. The following indicators were considered and analyzed: video conferencing facilities, computers for learning at study centers, email accounts to students for interaction; internet connection points; access to e-libraries; digital video, DVD- CD Roms and printed materials. Respondents were asked to give their opinions about provision of institutional ICT infrastructure and services by responding to statements on Likert scale. This section therefore, presents the analysis and interpretation of each of these indicators as shown in the Table 1 which summarizes the responses.

Table 1: Provision of ICT Infrastructure and Services as captured from Likert Scale Data

Statements	1	2	3	4	5	Mean	SD
Provision of Video conferences facilities	89.8	10.2				1.1	0.30
Provision of computers for teaching and learning	18.6	61.8	19.6			2.0	0.61
Provision of electronic mail accounts for students	30.9	50.9	18.2			1.8	0.69
Availability of Internet connection points in DL centers	87.4	11.6		0.7	0.4	1.1	0.46
Provision of Digital video- CD - ROM	93.3	6.0	0.4	0.4		1.0	0.31
Print materials	0.4	0.4		0.4	98.9	4.9	0.30
Composite mean and St. D						1.68	0.43

Findings in Table 1 showed that 98.9% of the respondents strongly agreed that they are provided with printed course materials (M= 4.9, SD= 0.30) while 50.9% of them did not agree (disagreed) with the statement that email accounts are provided to students for communication purposes (M=1.8, SD= 0.69)

In regard to video conference meetings, 89.9% strongly disagreed that video conference meetings are organized for students (M= 1.1, SD= 0.30). On provision of computers for teaching and learning, 61.8% of the respondents disagreed that computers for teaching and learning are provided at their learning centers (M= 2.0, SD= 0.61). Concerning availability of internet connection points in distance learning centers, 87.4% of the respondents strongly disagreed that

internet connection points are provided at their study centers. (M =1.1, S D= 0.46) while 1.1 percent strongly agreed that internet connection points were available for communication purposes between tutors, administrators and students (M=1.11, S=0.46). Regarding provision of Digital-CD Rom facilities 93.3 percent strongly disagreed that the College of Education provides digital video-CD Roms (M= 1.0, SD= 0.31).

Overall, distance learners disagreed that Information communication and technology infrastructure was adequately provided at the College of Education. (M= 3.82, SD =0.63). The findings for this variable indicate that provision of ICT infrastructure such as Video-conferencing and discussions portals among peers, provision of computers for teaching and learning, provision of e-mail accounts for communication between learners and instructors, availability of internet connections in all the study centers, provision of audio cassette, CDs-CD-ROMs, distribution of study materials (modules) are not adequately provided to learners in the programme. This may hinder full participation of learners in the programme since learners usually depend on ICT infrastructure for their studies.

Description for the Provision of ICT infrastructure and Services as taken from Visual Analogue Scale Data

Participants in the study rated the adequacy of ICT infrastructure services provided by the College of Education by means of applying scales from (1-10), where 1 denoted least adequate and 10 represented most adequate. Study findings are as shown in the following Table 2.

Table 2: Provision of ICT Infrastructure and Services from Visual Analogue Scale

Score	Frequency	Percent
8	195	68.4
7	2	0.7
5	74	26.0
4	13	4.6
3	1	0.4
Total	285	100

As shown in Table 2, sixty-eight point four percent (68.4%) of the participants gave a rating of 8 for inadequacy of provision of ICT infrastructure while twenty-six percent (26%) gave a rating of 5 followed by four point six percent (4.6%) who gave a rating of 4, 0.7% who rated it 7 and 0.4% who rated it 3. Thus, though two-thirds of learners gave above average ratings for provision of ICT infrastructure and services, another one-third thought that they are average and below.

Correlation Analysis of the use of ICT Infrastructures on Learner Participation in Distance Learning Programme

Correlation coefficients was analyzed to determine relationship between provision of ICT Infrastructure services and learner participation in distance learning programme. Study findings are illustrated in the following Table 3.

Table 3: Correlation Coefficients for the use of ICT infrastructure and Learner Participation in Distance Learning Programme

		Learner participation	ICT infrastructure
Learner Participation	Pearson Correlation	1	0.396
	Sig. (2-tailed)		0.000
	N	285	285
Provision of ICT infrastructure services	Pearson Correlation	0.396	1
	Sig. (2-tailed)	0.000	
	N	285	285

Results in Table 3 showed that there is positive and significant association between provision of ICT Infrastructure services and learner participation in distance learning programmes in the College of Education, with r = 0.396, p<0.000 <0.05. This suggests that provision of Information, communication and Technology in teaching and learning by the College of Education could have an influence on learner participation in distance learning programme.

Simple linear regression was analyzed to determine how provision of ICT infrastructure influences learner participation in distance learning programme. The hypotheses tested stated that:

H_o: Information, communication and technology infrastructure and services do not have significant influence on learner participation in distance learning programme

H_1 Information, communication and technology infrastructure services have significant influence on learner participation.

Summary model for the influence of ICT infrastructure services on learner participation in distance learning programme is illustrated in the following Table 4

Table 4: Model Summary for the provision of ICT infrastructure

Model	R^2	R^2	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.240a	0.058	0.044	579.5248	2.109

In determining coefficient of determination (R^2), findings indicated differences in dependent variable that can be explained by the predictor variable (Bryma, 2012). Therefore, coefficient of determination for the provision of ICT infrastructure services and learner participation in distance learning programme was R^2=0.058. This shows that 5.8% of the variance in influencing learner participation in distance learning programme is explained by provision of ICT infrastructure services to learners.

Analysis of variance was further pursued to assess the goodness of fit for the regression model. Findings are shown in the following Table below

Table 5: Analysis of Variance (ANOVA) for the regression model.

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	15671214.552	1	15671214.552	44.66	.000
1	Residual	84125624.164	283	297263.690		
	Total	99796838.716	284			

Analysis of variance (ANOVA) was further pursued to test whether the regression model is a good fit for the data analyzed. The Results in Table 5 above show that the F-calculated (F=44.66) was greater than F-critical (4.02), with p=0.00< 0.05. The results indicate that the model is a good fit for the data analyzed. Thus, it may be used in predicting that the learner can participate in programmes by e-learning using availability of ICT user devices.

Further analysis of coefficients of regression for the influence of provision of ICT infrastructure and services on learner participation was done. Table 6 shows coefficients of regression.

Table 6: Coefficients of regression of availability in provision of ICT infrastructure on learner participation in distance learning programmes

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		β	Std. Error	β		
1	(Constant)	71440.35	199.596		357.925	0.000
	Provision of ICT Infrastructure services	374.272	51.547	0.396	7.261	0.000

The results indicated that provision of ICT infrastructure and services positively and significantly influence learner participation in distance learning programme in the College of Education, β=374.272, t= 7.261, p=0.000<0.05. Thus, the null hypothesis H_o was rejected and the alternative H_1 accepted that provision of ICT infrastructure and services has a significant influence on learner participation in distance learning.

In distance education, provision of ICT infrastructure is very important in influencing learner participation as it gives learners material support in the learning progress. The findings also showed that 63.9% of the students do not have personal computers and 87.4% indicated inadequate provision of internet connection in regional study centers. These findings agree with Guan et al (2016) who noted that the ultimate challenges of learner support technically and administratively in distance education stem from the institutional inability to respond to learners needs. That is to say that there is lack of coordinated support units in executing roles and responsibilities.

Furthermore, 92.3% of the respondents reported inadequate provision of electronic books in the libraries, unavailability of digital video disks, DVD and CD ROMs, in the study centers. These findings resonate with O' Laurence (2007) and Datha et al (2010) who asserted that system

support services should enhance the provision of Information, Communication and Technology infrastructure to serve learners in their educational journey.

In addition, Saba (2011) and Thompson (2005) expressed concern that learner support services through ICT infrastructures should be embraced by distance education institutions because they are recognized for their potency for accomplishing and increasing quality and effectiveness in service delivery.

Similarly, Makhanya (2016) and Gil (2014) emphasized that provision of ICT infrastructures enhances collaboration between e-learning officers, instructors and students through telephone, internet and video conferencing, noting that leveraging ICT infrastructure services would enable distance education institutions to reach its third generation that use e-learning as a mode of delivery.

The study findings also showed that internet services are crucial in the day-to day activities and this is in agreement with Mahaja net al. (2019) who encouraged distance education institutions to use massive, open and online courses (MOOCs) which enhances collaborative learning. The enhancement of integrating Information, Communication Technologies in education is also a requirement for instructors, students and administrators for capacity development to produce students, and educators who can use the technology with ease. The use of ICT is increasingly becoming a requirement for workers to effectiveness perform better and increase productivity (Aslan t al.2016).

It is in this respect that Ashfaq et al (2016) recommended the enhancement of ICT to support teaching and learning paradigms in order to sharpen student's enjoyment, creativity and professional development. The findings also resonate with those by Kibuuka (2010), Wills (1993) and Krishnan (2012) who indicated that shortage of learning resources constituted an enormous hindering factor to students' learning process.

The third aspect that emerged during interviews was the lack of supplementary resources for teaching such as computers for use in the study centers. This finding is similar to that of Guloba, Wokadala & Bategeka (2010) who noted that inadequacy of learning resources such as library, computers for teaching and learning, availability of internet connections in study centers and others, affected the quality of educational provisions. This is also linked to Donkor (2010) who noted that the absence of adequate learning resources, impedes practical oriented and entire fulfillment of the learner's needs.

In response to what motivates them in pursuit of rendering services to learners in their educational journeys, one informant (P1) made a response which captured the theme of responses that:

Information, Communication and Technology infrastructures and services ought to facilitate an effective interaction/communication between students and lecturers at their convenient time and place. This makes me feel good because distance learning communication tools provide opportunities for learners to express themselves without any negative feelings such as shyness, fear and feeling discriminated against them because of their gender, race or nationality.''

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Another participant (P2) in the FGDs alludes to the dialogue that takes place between tutors and learners using technology;

The dialogues that takes place during discussions is more democratic because every learner participates freely and his or her opinion is considered without prejudice, but the idea remains open for discussions for mutual understanding among learners.

It was also noted that libraries in the distance training study centers are not connected to the internet to be able to have access to on-line resources. In spite of these challenges, regional distance training centers have small libraries each with few text books and printed modules. The theme was captured by participant (P3) stating that:

‶*It was only Kigali Regional Centre which had a standard library equipped with computer facilities. Butare, Rwamagana and Nyundo Regional centers have a television (TV) set each, although without digital decoders because the country moved from the use of analogue to digital transmission which requires the University of Rwanda's management to update the devices so that learners can have access to the resources''.*

It was also reported that the College of Education does not seem to have a framework to solve the problems faced by students especially in the use of ICT infrastructures that are considered as part and parcel of the technical support services rendered to learners. This theme was captured by two quotes from two participants (P4 and P5) who stated that: *''In the wake of industrial revolution and technologies, there should be collaborative efforts between learners, university managers and instructors on the use of ICT infrastructure because technologies enable different teaching methodologies. The use of ICT infrastructure also allows instructors to teach a large number of learners located in different places at the same time…but the main challenge is the lack of learning resources and functionality of the existing tools that make the programme paralyzed.*

The same theme was reinforced by another participant (P6) who imagined that: ‵*'Suppose a mathematics instructor is talking to students and at the same time recording the whole session, he or she then upload it to the web and adds daily supplementary videos, notes, comments and feedback from students over a period of time, that would become an insightful for learners through attracting their attention.*

On the same theme, participant (p7) had two trainings in 2018, on massive open online courses referred to as MOOCs whereby instructors would record their lectures and upload on the platform for learners at any time, but the challenge was that the College required high speed internet connectivity for the delivery platforms or a relevant learning management system. This is in agreement with Saba (2011); Ndayambaje & Ngendahayo (2014) who also noted that provision of ICT infrastructure and services enables learners to get timely and satisfactory assistance thus facilitating engagement. Moreover, information, communication and technology infrastructure and services empower institutions to operate remotely, an aspect that distinctively brings radical difference in distance learning institutions depending on their capacity to adopt technological innovations.

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Conclusion and Recommendations

Overall results from analysis of data showed that distance learners disagreed that information, communication and Technology infrastructure and services were adequately provided with (M= 1.68, St. D = 0.43). This meant that ICT infrastructures such as Video-conferencing and discussions portals among peers, computers for teaching and learning, e-mail accounts for communication between learners and instructors, internet connections in all the study centers, audio cassette, CDs-CD Roms, study materials (modules) are not adequately provided to learners in the programme. This may hinder full participation of learners in the programme since learners usually depend on ICT infrastructures for their studies. The study findings also showed that internet services are crucial in the day-to day activities and this is in agreement with Mahajanet al. (2019) who encouraged distance education institutions to use Massive Open Online Courses (MOOCs) which enhances collaborative learning, leading to students' satisfaction. It was however, realized that nearly all distance training centers of the College of education are poorly equipped with ICT services. Hence, ICT infrastructure and services are necessary for learner participation in distance learning programmes. It is imperative therefore, that the university of Rwanda's management should make available all the necessary ICT infrastructures to attract the attention of learners to participate in distance learning programmes. This would include provision of: provision of Video conferencing facilities, Provision of Internet connections points, Electronic mail accounts, provision of computers, digital video and CD-ROMS for learning and access to electronic libraries.

References

Andrade M., (2016). Issues in distance learning. Springer, vol. 2016, issue 173:1-113

Apuke OD, (2017). Quantitative research methods: A synopsis approach. *Kuwait Chapter of Arabian Journal of Business and Management Review*, *33*(5471), 1-8.

Clarà, Marc & Kelly, Nick & Mauri, Teresa & Danaher, Patrick, (2015); Can massive communities of teachers facilitate collaborative reflection? Fractal design as a possible answer. Asia-Pacific Journal of Teacher Education. 1-13. 10.1080/1359866X.2015.1095280.

Datha Damron-Martinez, Adrien Presley, Lin Zhang. (2013); A Study of Undergraduate Student Intent to Minor in Business: A Test of the Theory of Planned Behavior. *Journal of Education for Business* 88:2, pages 109-116.

Davies, Jo & Graff, Martin, (2005). Performance in e-Learning: Online Participation and Student Grades. British Journal of Educational Technology. 36. 657 - 663. 10.1111/j.1467-8535.2005.00542.

De Vincenzi, A (2020). Del aula presencial al Virtual universitaria en context de pandemia de COVID-19 Avances de una experiencia universitaria en catteras presesencciales adaptadas a la modalidad Virtual. DebateUniversitario,8(16)

Demetrios & Giannakos, Kostaris, Christophoros & Sergis, Stylianos &Sampson, Michail & Pelliccione, Lina, (2017); Investigating the Potential of the Flipped Classroom Model in

K-12 ICT Teaching and Learning: An Action Research Study. Educational Technology & Society. 20. 261-273.

Dillon and Blachard (1990). Success factors among community college students. https://books.google.rw/books?isbn=1581121067. Retrieved on 4th August 2017.

Dumazedire (1967); Areview of factors which influence learner participation in Distance Education*Education:* DE vol. 29, No. 3 Nov 2 Floyd, Deborah & Casey-Powell, Deborah. (2004); New roles for student support services in distance learning. New Directions for Community Colleges. 2004. 55 - 64. 10.1002/cc.175.

Fuinhas, José & Marques, António & Lopes, Cátia. (2019). The Impact of Financial Development and Globalisation on Economic Growth: Evidence from a Macro Panel of Ten Countries. Asian Economic and Financial Review. 9. 366-388. 10.18488/journal.aefr.2019.93.366.388

Gibbs, Paul. (2001); Marketing of Higher and Further Education. Taylor Francis

Gil de Zúñiga, Homero & Molyneux, Logan & Zheng, Pei. (2014); Social Media, Political Expression, and Political Participation: Panel Analysis of Lagged and Concurrent Relationships. Journal of Communication. 64. 612-634. 10.1111/jcom.12103

Howell, Williams and Lindsay (2008), Thirty-two Trends Affecting Distance Education; An informed Hranstinski Trends and issues as reflected in traditional Education. www.researchgate.net/.../35703209_Trends_and_issues_as_reflected_in_tra. Retrieved on 5th September 2017.

Hrastinski, (2009); A theory of online learning as online participation. Computer and education 52(1): Jeongju Lee, Hae-Deok et al. (2019), Exploring Factors and Indicators for Measuring Student's Sustainable Engagement in e-Learning

Jo Shan Fu, (2013); International Journal of Education and Development using Information and Communication Technology Vol. 9, Issue 1

Kathrine Jensen & Liz Bennett (2016); Enhancing teaching and learning through dialogue: a student and staff partnership model, International Journal for Academic Development, 21:1, 41-53, DOI: 10.1080/1360144X.2015.1113537

Ministry of Education, (2018); Education sector strategic plan 2018/19 to 2023/24. Republic of Rwanda

Ngare, Everline & Nyamongo, Morekwa & Misati, Roseline. (2014); Stock market development and economic growth in Africa. Journal of Economics and Business. 74. 10.1016/j.jeconbus.2014.03.002.

Nicholas C., Alice D. & Marcus G, (2010); Overcoming Isolation in Distance Learning: Building a Learning Community through Time and Space. Journal for Education in the Built Environment, 5:1, 27-64, DOI: 10.11120/jebe.2010.05010027

NISR, (2015). Statistical yearbook 2015, education in higher education. National Institute of Statistics (NISR). Kigali, Rwanda.

O'Lawrence, Henry. (2006). The influences of distance learning on adult learners. Techniques. 81. 47 Perraton H., (2010). Teacher Education: The Role of Open and Distance Learning. Commonwealth of Learning 1055 West Hastings, Suite 1200 Vancouver, British Columbia Canada V6E 2E9.-49.

Panday, (2016). Women's empowerment in south Asia: NGO interventions and Agency building in Bangladesh. Abingdon, Oxon; New York, Routledge.

Perraton H., (2010). Teacher Education: The Role of Open and Distance Learning. Commonwealth of Learning 1055 West Hastings, Suite 1200 Vancouver, British Columbia Cana Sangra A, Gonzalez- Sanmamed, (2016). The role of information and communication technologies in improving teaching and learning processes in primary and secondary schools. Journal of research in learning technology. Vol. 18, (3): 207-220

Proudfoot, D.E. and Kebritchi, M. (2017), "*Scenario-based E-learning and STEM education: a qualitative study exploring the perspectives of educators*", International Journal of Cognitive Research in Science, Engineering and Education (IJCRSEE), Vol. 5 No. 1, pp. 7-18, doi: 10.5937/ijcrsee1701007.

Saba, Irum. (2011). Measuring the Job Satisfaction Level of the Academic Staff in Bahawalpur Colleges. International Journal of Academic Research in Business and Social Sciences.

Schneider (2013), learning from MOOCs: A qualitative case study from the Learners' Perspective. Journal of Educational Media International. Volume 532 Issue 2

Sedgwick, Monique & Spiers, Jude. (2009); The Use of Videoconferencing as a Medium for the Qualitative Interview. International Journal of Qualitative Methods. 8. 1-11. 10.1177/160940690900800101.

Sheilla Han-augstein (2007). Learning Conversations: A person-centered approach to self-organized learning. British Journal of Guidance and Counselling, Volume 7, 1979- Issue 1.

Strauss, Valerie. (2017); Why It is a Big Problem That So Many Teachers Quit—and What to Do About It," Washington Post, November 27, 2017

Thomas, J & Harden, A (2007). Methods for the thematic synthesis of qualitative research in systematic reviews, London: ESRC.

UNESCO Education sector (2019); Improving quality and relevance of Education through Mobile Learning in Rwanda: A promise to deliver. World Education News (2019) +Reviews of October 15, 2019 Education in Rwanda

Vimbi Peetrus Mahlangu (2020), The Good, the Bad, and the Ugly of Distance Learning in Higher Education

Wambugu, Patriciah & Changeiywo, & Johnson. (2008). Effects of Mastery Learning Approach on Secondary School Students' Physics Achievement. Eurasia Journal of Mathematics, Science and Technology Education. 4. 10.12973/ejmste/75352.

Wenting Jiang, (2017). Interdependence of roles, role rotation, and sense of community in an online course. *Distance Education* 38:1, pages 84-105.