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The Perceived Impact of Massive Open Online Courses in the Development of ICT Skills among University Students

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Abstract:
Background*: Nowadays, traditional universities and colleges are currently confronting a number of issues, including increased student enrollment, limited physical infrastructure, admissions delays, rising educational costs, and so on. While different schools are addressing these challenges in different ways, Massive Open Online Courses (MOOCs), a relatively new technology, is increasingly being examined as a way to give higher education to a large number of individuals at potentially cheaper rates.MOOCs play a critical role in the development of skills and abilities in a variety of study fields.The extent to which these skills and competencies are acquired is determined by the learner's effective interactions with the knowledge found within the system.This is, however, tied to connectivism, the theory of the digital era, also reviewed in this study.This study, therefore, ascertained the perceived impact of MOOCs in the development of ICT skills among University students*
Materials and Methods*:A descriptive survey research design was adopted. The instrument for data collection was a self-designed questionnaire that was administered to a random sample of 370 university respondents.*
Results*:The finding showed that MOOCs can improve students processing skills and competencies in Microsoft Word and Excel, internet surfing for study materials, forum discussions on social media, emailing, and downloading/ uploading files online. It is also found that MOOCs have less impact in facilitating students' skills in Web design and development, use of digital cameras, MATLAB, GIS applications, statistical and qualitative data analysis software, graphics, textual or image processing software, etc.*
Conclusion:*MOOCs are recommended as a pedagogical tool for people of all ages, especially the busy and working-class, because of its capacity to expose learners to digital literacy skills and lifelong learning opportunities.*
Key Word*:**Massive Open Online Courses, Connectivism Theory, ICT Skills, University Students*

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I. INTRODUCTION

The three broad learning theories that are frequently used in the construction of educational environments are behaviorism, cognitivism, and constructivism [1]. These theories, on the other hand, were created during a time when technology had little impact on learning. Technology has reorganized how we live, communicate, and learn during the previous two decades. As a result, learning requirements and theories that define learning principles and processes must take into account the social contexts in which we find ourselves.

Because of the exponential growth of knowledge, the underlying ideas that underpin early theories of learning, such as behaviorism, cognitivism, and constructivism, have been revised. The life of knowledge is today measured in months and years in many domains of research. [2] coined the phrase "half-life of knowledge" to describe the time span between when knowledge is acquired and when it becomes obsolete.

The Connectivism idea, which is founded on the premise that knowledge exists inside systems and is gained by persons who interact collaboratively within activities linked to that knowledge [3], was designed to fight the diminishing half-life of knowledge. This theory, perhaps, supports the emergence of new methods of deploying instruction and learning. Formal education is no longer only conducted in traditional classrooms, but also in a number of ways employing information and communication technology resources, such as communities of practice, online courses, and personal networks, resulting in a growth in online studies.

Massive Open Online Courses, or MOOCs, have lately emerged as a result of the increased focus on information acquisition through online study. A MOOC is an open online course that can be accessed through the internet and allows for limitless participation. A Massive Open Online Course (MOOC), according to [4], is

a model for delivering learning content online to anyone who needs it, with no limit on attendance. MOOCs use both classic and modern learning materials, such as videos, readings, projects, and assignments, among other things. Aside from that, students, lecturers, teachers, and other users can join in interactive forums to help establish a community of students, lecturers, and instructors.

MOOCs have evolved into an open platform for students to make decisions about their education, resulting in a proliferation of online courses and programs of all types. To offer content to students, MOOCs requires computers, headsets, speakers, microphones, video gadgets, and an internet connection, among other digital devices. The utilization of these devices demonstrates that technology (ICT) abilities are essential for comprehending and participating in massive open online courses successfully.

The MOOC system of education, like traditional education, has a number of prerequisites, the fulfillment of which is the duty of the students participating. Specific requirements of MOOC according to [4] include effective mastery of the digital learning tools by the learners, reasonable time management, and continuous self-motivation. These requirements sometimes are not fulfilled by all students who ultimately avail themselves in online studies. Many will not even have any prior ICT skills. The skills gap in most cases puts them in a continuous struggle for successful completion of their course of study.

Fortunately, some students may have taken advantage of the web-based content delivery opportunities associated with MOOCs to gain ICT skills on their own. They may even have excellent technical abilities in ICT, as a result of their struggle to complete online programs successfully. This fact inspired the researcher's decision to look into whether Massive Open Online Courses allow students to learn ICT skills on their own and to what extent this is possible.

PURPOSE OF THE STUDY

The primary purpose of this study was to ascertain whether or not learners through online study can acquire ICT skills. Specifically, the study seeks to;

i. ascertain whether MOOCs present ICT skills to be acquired by university students.
ii. identify ICT devices and programs that can be learned through MOOCs.
iii. ascertain ICT skills that can be developed through MOOCs by university students.
iv. examine the extent to which ICT skills can be acquired through MOOCs.

SIGNIFICANCE OF THE STUDY

Many stakeholders will benefit from this research; students, in particular, will be exposed to a variety of ICT devices, applications, and skills available on the platform. Another group of people that may benefit from this study is MOOC operators, as the findings may be used to entice many more people to join MOOC programs, leading to economic expansion as the number of participants increases. Findings on available technologies, how learning is achieved through them, and to what extent will serve as indicators for curriculum designers and education stakeholders to evaluate learners' experiences for the creation of a reachable and sustainable curriculum for online courses.

CONCEPTUAL/THEORETICAL FRAMEWORK

Massive open online courses (MOOCs)

[5]perceives Massive Open Online Courses (MOOCs) as learning platforms designed for large numbers of participants, that can be accessed by anyone anywhere as long as they have an internet connection, which offers a complete learning experience free of charge. [6]perceivesMOOC as an open online course model which delivers learning content to every distant learner across the globe with no geographical, social, or economic restrictions, and attendance limits.

Massive Open Online Courses started predominantly in 2001 when the Massachusetts Institute of Technology (MIT) launched its Open Course Ware (OCW), with the aim of publishing materials from all its courses permanently on the open Web [7]. Since then many other Universities have joined the movement. Massive Open Online Courses have their roots in the free online versions of existing courses taught by several well-known Universities.

The term MOOC was coined in 2008 by Dave Cormier of the University of Prince Edward Island in response to the course, Connectivism and Connective Knowledge. This course was first offered in 2008 at the University of Manitoba by Stephen Downes and George Siemens [7], and it drew a large number of adults and informal learners who used a variety of technological tools suggested by the facilitators, such as chat, mailing lists, discussion forums, Wikis, Web conferencing systems, personal blogs, and a variety of other tools.

In 2011, Stanford introduced another course in this subject, Introduction to Artificial Intelligence [8]. This noncredit online course was open to everyone and had an initial enrolment of 10,000 students, but ended up with 1,600,000 students. Lectures, homework, and exams were all part of the course.While many students did not complete the course, some did, much like those who took traditional campus-based classes. These

milestones have annoyed the curiosity of many scholars, who see MOOCs as having the ability to give education on a global scale.

CHARACTERISTICS OF MOOC

Several scholars have examined the characteristics of MOOCs. For example, [9, 4, 10], and [11] listed the following:

A large number of participants: In contrast to traditional distance learning courses, MOOCs address an unlimited number of participants.

Open accessibility: The most obvious feature of MOOC-based courses is their open availability to everyone with Internet access. With this, individuals are free to join and participate according to their learning needs.

Digitization: Courses are exclusively conducted via the Internet and thus are not location-dependent. Digitization comprises the learning material, the teaching process, the social interaction of participants, as well as their examination. Forums, live chats or hangouts, and blogs are used to support collaborative learning.

Pedagogical concepts: The learning content is structured according to a pedagogical concept. The teaching process and the development of knowledge follow predefined learning objectives.

Role of faculty: As with traditional classroom-based instruction, faculty members often design and lead the courses for students who are enrolled, and therefore serve as coaches or mentors in addition to their role as guides.

BENEFITS OF MOOC

Several researchers have identified various benefits of Massive Open Online Courses. For instance, [12, 9, 4, 13], and [11] revealed the following benefits:

Reduce Educational Cost:MOOCs have actively contributed to reduce education expenses by eliminating physical infrastructure through the systematic use of social interaction and learning methods.

Global Audience:MOOCs are open to anybody with an internet connection, making free courses and higher education available to people from all walks of life all over the world. Learners have the opportunity to gain learning experiences from some of the world's greatest universities.

Support Lifelong Learning: Enable Lifelong Learning: MOOC systems are designed to support lifelong learning for all types of students, including teenagers, adults, and retirees.

CHALLENGES FOR MOOC

A fundamental challenge in open online courses is that learners must take personal responsibility for learning tools (computers and internet connection), time management, effective mastery of digital learning tools, and self-motivation. Other problems with MOOCs have been uncovered as a result of research, including the following:

High dropout rate: When compared to traditional learning environments, MOOCs have a high dropout rate. The bulk of MOOCs have completion rates of less than 10% [13]. MOOC dropouts can be caused by a variety of circumstances, including personal interest or motivation [11]. Another cause is the lack of a registration process that permits students to enroll regardless of their educational background. This makes establishing whether a learner's educational background satisfies the course's requirements challenging [4].

Ineffective assessments: Conducting effective assessments in a MOOC is a big challenge as diverse technology for exam cheating is available. Another means of cheating in online tests include contributory efforts from the actual student's alliance during an online test.

Recognition: Another point of contention is the recognition of MOOCs and their accreditation. Many institutions, organizations, and individuals continue to have reservations about and discriminate against certificates gained through online learning.

Hardware and internet facility: Because many of the contents are given in video format via the internet, MOOCs require both hard and software components of a computer to be completed successfully. Learners will need a broadband connection to see a high-quality video. Not every learner, however, has access to a high-speed internet connection. Many students reside in underdeveloped nations with inadequate internet connection.

THE THEORY OF CONNECTIVISM

Connectivism is a digital-age learning theory. According to the notion, knowledge emerges from systems and is gained by individuals who collaborate in actions that are connected to that knowledge [1, 3]. This notion is supported by two main proponents; George Siemens created the first in 2004 and Stephen Downes created the second in 2005. The theory alongside network learning first appeared in the 1970s when Ivan Illich presented an idea on "deschooling" education and encouraged a movement towards student-centered and socialized learning opportunities.

Deschooling in itself is a learning society where the educational system comprised three main purposes [14]:

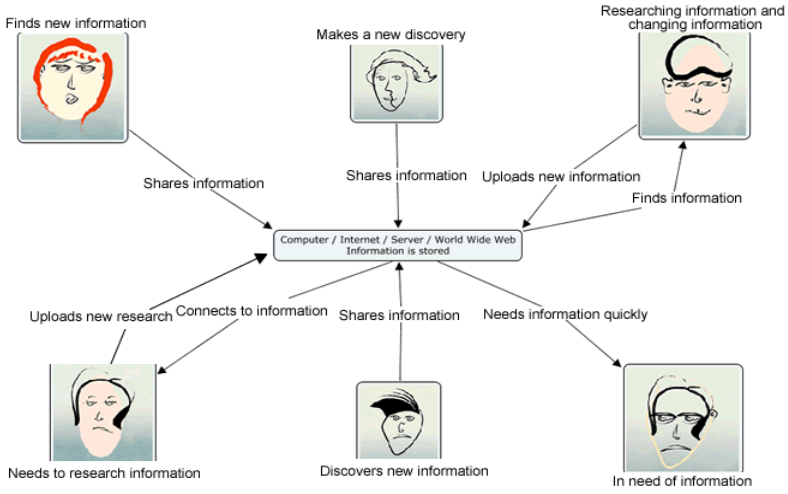
i. Provide all who want to learn with access to available resources at any time in their lives.
ii. Empower all who want to share what they know to find those who want to learn it from them.
iii. Furnish all who want to present an issue to the public with the opportunity to make their challenge known.

However, Illich could not back His assertion with any formal theory or instructional model until 2004 when George Siemens coined the term to depict a learning paradigm of the 21st century. Connectivism, according to George Siemens, is a learning model that recognizes seismic upheavals in society, where learning is no longer an internal and autonomous activity, but rather a process based on a variety of constantly altering elements. He claimed that learning begins with a person feeding information into a network, which then feeds information back to individuals, who then feed information back into the network in a cycle [1].

This theory takes into account the way and how learning is influenced by the new technologies. The rationale is those previous theories of learning such as behaviorism, cognitivism, or constructivism were created when learning was happening in different technological contexts. This resulted in some specific limitations including:

a. intrapersonal view of learning.
b. failure to address the learning that is located within technology and organizations, and
c. lack of contribution to the value judgments that need to be made in knowledge-rich environments.

Learning paradigms that served earlier generations are being phased out in favor of ones that are more relevant to today's demands and realities, such as using technology and connecting as learning activities. Learning takes place when a learner joins a learning community, contributes information, and receives feedback. A community, on the other hand, is a diverse learning network of individuals who are full learning networks of themselves [1]. These people can be compared to nodes, which are connective elements that allow fresh information to be routed, or they can simply allow connections between ideas and concepts that were previously unconnected. Individuals, groups, systems, fields, ideas, resources, and communities are examples of nodes, as shown in Figure 1.1.



Because of the constant changes in the technology landscape, the connectivism idea has a significant impact on current teaching. This may be seen in the location of open and accessible resources on the internet. There's also the quick advancement of technology, as well as the exponential expansion in the usage of the internet and mobile apps for educational material delivery. As a result, learners, rather than the instructor or the institution, have become the focal point of the learning process. Learners are now in charge of determining learning content, as well as the nature and amounts of communication and who can participate.

Massive Open Online Courses (MOOCs) are a direct result of connectivism, a connectedness learning approach that allows students to move away from a tutor-controlled learning environment and into one where they direct their own learning, find information, and create knowledge by engaging in networks outside of the formal setting. This provides students with opportunities to collaborate in activities that are connected to the knowledge and experiences they want to gain.

EMPIRICAL STUDIES

Several scholars have examined the benefits and impact of Massive Open Online Courses (MOOCs) around the world (MOOCs). For example, in Kano State, Nigeria, [16] assessed the amount of awareness, perceived benefits, and barriers of MOOC uptake among university students. A structured questionnaire was provided to 300 randomly selected respondents as part of the descriptive survey study. The findings found a gap in awareness between IT and non-IT students, as well as user unfriendliness, limited internet access, power instability, and enrolment costs as factors impacting slow uptake. The construction of hubs, the supply of a globally acceptable curriculum, and a discounted cost of registration were all suggested as ways to increase awareness and adoption.

In a separate study [17], researchers looked into the use of Massive Open Online Courses (MOOCS) and other e-learning platforms by Nigerian university students to see how much they knew about them and how often they used them. With 126 responders, the study area was Federal University, Lafia, Nasarawa State, Nigeria. The respondents were chosen using a multi-staged random approach. The first stage entailed a deliberate selection of all of the university's faculty. In the second stage, three departments from each faculty were chosen at random. The final stage involved selecting students at random from each department. In order to analyze the data, descriptive statistics such as frequency counts and basic percentages were used, as well as inferential statistics such as a Liker-type scale and analysis of variance.

[16] and Temilade and [17] studies have a common approach. First, both were concerned with the level of awareness of MOOCs among university students. They were equally similar in their use of survey and inferential statistics for data analysis. In comparison, the present study ascertained whether MOOCs present ICT skills to be acquired by university students and to what extent, using mean and standard deviation for data analysis.

[18] claimed in another study on digital literacy skills and MOOC participation that university students and instructors, particularly in underdeveloped countries, could benefit from the skills acquisition opportunities afforded by MOOCs. A survey of 110 instructors from business and social science departments at a private institution in Nigeria was conducted. Data was collected using a self-created questionnaire. Simple percentages, mean scores, and logistic regression were used to analyze the data. Lecturers were found to have advanced digital literacy abilities ($x = 3.60$), with MOOC enrolment at 15%. Furthermore, 20% of those enrolled indicated active engagement, with no statistically significant impact of lecturers' digital literacy abilities on enrollment ($x2 = 2.35$, $p > 0.05$). The study suggested that university administrators implement strategies for maintaining and improving the digital skills of lecturers and encouraging them to participate in lifelong learning activities

By way of comparison, the present study is totally at variance with that of [18]. While [18] assessed the level of digital literacy among university lecturers who engage in MOOCs, the present study focused on whether MOOCs present ICT skills to be acquired by university students and identifies ICT devices and programs that can be learned during MOOC.

In a study, [19] came to the opposite conclusion as [18], who claimed that digital literacy abilities have no bearing on MOOC participation. They suggest that there is an alarming gap between the digital competence that can be acquired after taking a MOOC and the digital competence that can be acquired after taking a traditional study. [19] investigated the instructional effectiveness of MOOC-format courses for learners' training in the safe and responsible use of ICT by analyzing three courses using three methods: a questionnaire to assess participants' perceptions, pre- and post-tests to assess knowledge gained, and LORI (Learning Object Review Instrument) to assess the quality of digital educational resources. The findings revealed that online courses are an excellent tool to teach learners how to use ICT safely and responsibly, and that these courses can aid in the development of ICT skills.

According to the review's authors, Massive Open Online Courses (MOOCs) encourage open access to digital learning and e-material availability, giving learning possibilities for both professional growth and lifelong learning. Intuitively, the existing literature's main goal was to identify the benefits of Massive Open Online Courses and promote awareness about them. However, no research has been done on the ICT skills that may be acquired through MOOCs. This created a void, which the current research attempts to fill.

II. MATERIAL AND METHODS

Research design

This study adopted a descriptive survey design. This is aimed at collecting data on and describing systematically the characteristics, features, or facts about a given population [20, 21]. This method was appropriate because the opinions of university students were collected from a poll, considered to be representative of the entire population using a questionnaire. The study was conducted at the National Open University of Nigeria (NOUN), Benue State study center. NOUN Benue State is one of the 75 [22] centers established across the country for distance learning and is located in the North Central geopolitical region of Nigeria.

Population of the study

At the time of the study, the National Open University of Nigeria had a student enrollment population of 400,000 across the country [23, 24]. Out of this population, Makurdi, the area of study, had an enrollment of seven thousand and ninety-four (7094) distributed across four levels of study (100, 200, 300, and 400 levels). For this study, 379 undergraduate students, comprising males and females, across the four levels of the study, were sampled for the study.

Sample and sampling

A sample size of 379 undergraduate students from the National Open University (NOUN), Makurdi study center, was drawn for the study. The sample size was established using the Yaro Yamane formula for determining sample size. A varying random sampling approach was used to obtain the population at each level of the study. Under this approach, 37%, 27%, 18.5%, and 17.5% were allotted to the 100, 200, 300, and 400 levels, respectively. These proportions were each level's percentage contribution toward total enrollment. This resulted in obtaining 140, 102, 70, and 67 students, respectively, from 100, 200, 300, and 400 levels, amounting to a 379 sample size believed to be reasonable enough for the study.

Instrument for data collection

The instrument used for data collection was a questionnaire, developed by the researcher and made up of two sections: A and B. Section "A" contends the demographic information of the respondents, while Section "B" comprises Likert-type questions with a range of options. A sub-part in section "B" was particularly designed to assess the extent of ICT skills acquisition by university students. A research assistant was employed alongside the researcher who helped in administering nine (9) practical questions to randomly selected 20% (78) of the study population. Each participant was graded by the research assistant based on performance using ratings of "very high extent," "high extent," "low extent," and "very low extent". Following that, the collected data were entered into SPSS for mean and standard deviation analysis.

III. RESULT

Table 1: Gender of the Respondents

Sex		Frequency	Percent	Valid Percent
Valid	Female	168	45.4	45.4
	Male	202	54.6	54.6
	Total	370	100.0	100.0

Source: Field Survey, 2022

Table 1 indicates the proportion of male and female undergraduate students that participated in the study. The result showed that out of 379 administered questionnaires, 370 (97.6%) were completed and returned, of which 168 were female and 202 were male. This resulted in 9 (2.4%) lost questionnaires.

Table 2: Age of the Respondents

Age Group		Frequency	Percent	Valid Percent
Valid	18-22	52	14.1	14.1
	23-27	162	43.8	43.8
	28-32	101	27.3	27.3
	33 Above	55	14.9	14.9
	Total	370	100.0	100.0

Table 2 presents the age distribution of the respondents. The result indicated that 14.1% of the respondents were between the ages of 18 and 22, 43.8% were between 23 and 27, 27.3% were between 28 and 32, and 14.9% of the respondents were aged 33 and above. This signified that the majority of the respondents were between the ages of 23 and above.

Table 3: ICT Skills to be Acquired by University Students through MOOCs

		Frequency					
S/N	**Items Description**	**SA 4**	**A 3**	**D 2**	**SD 1**	**Mean**	**Std Deviation**
1	MOOCs have enhanced my processing skills in MS Word	234	55	27	54	3.27	1.11
2	MOOCs have enhanced my skills of MS Excel	278	53	37	02	3.64	0.68
3	MOOC have improved my skills in MS PowerPoint	65	99	181	25	2.55	0.86
4	MOOCs have improved my skills for internet surfing	284	27	42	17	3.56	0.87
5	Improved skills of Web design and development using HTML	02	03	282	83	1.79	0. 46
6	MOOC has exposed and enhanced my skills for online forums; WhatsApp, Facebook, LinkedIn etc.	285	80	03	02	3.75	0.49
7	MOOCs have perfected my skills of converting text from word to PDF format.	240	98	28	04	3.55	0.68
8	Skill of sending and receiving e-mail	265	102	03	0	3.71	0.47
9	Skills to Download, upload and browse study material online	285	80	03	02	3.75	0.49

Source: Field Survey, 2022

Table 3 shows ICT skills to be acquired by university students through Massive Open Online Courses. Items 1, 2, 4, 6, 7, 8, and 9 of the table had mean scores of 3.0 and above. This signifies that MOOCs have the enablement to enhance participants' processing skills in Microsoft Word and Excel. The results also show that MOOC participants have an advantage in improving their skills in internet surfing, forum discussions using WhatsApp, Facebook, LinkedIn, and other similar platforms, text conversion from Word to PDF format, sending and receiving e-mail, and downloading, uploading, and browsing study material online.Similarly, items 3 and 5 had mean scores of less than 3.0. This shows that MOOCs facilitate less students' understanding or acquisition of skills in Microsoft PowerPoint and Web design and development using hypertext mark-up language (HTML).

Table 4:ICT Devices and Programs that are Learned during MOOC

		Frequency					
S/N	**Items Description**	**SA 4**	**A 3**	**D 2**	**SD 1**	**Mean**	**Std Deviation**
10	Desk top and Lap top computers	300	70	0	0	3.81	0.39
11	Smart phones	251	81	29	09	3.55	0.74
12	Audio and Videotapes devices	243	78	39	10	3.50	0.79
13	Lecture notes on CD-ROM	229	81	49	11	3.45	0.83
14	Projectors and printers	276	74	18	02	3.69	0.59
15	Tablet devices (e.g. iPad) and Digital Cameras	80	75	202	13	2.60	0.86
16	MATLAB and GIS applications	61	50	230	29	2.39	0.85
17	Data analysis software; SPSS, SATA, EXCEL, MINITAB, SAS etc	44	97	208	21	2.44	0.77
18	Graphics, textual or image processing software such Corel Draw	52	0	186	132	1.92	0.96
19	Office applications programs; MS Word, MS Excel and MS PowerPoint	281	89	0	0	3.76	0.43
20	Database applications (e.g) Mysql, Access, etc	23	41	172	134	1.87	0.84
21	Search engines (Fire fox, Google chrome, opera mini, explorer, etc)	169	138	40	23	3.22	0.88
22	Web design and development applications (Note Pad, Dreamweaver, Sublim, Net beans, Eclipse etc	37	32	168	133	1.93	0.92

Source: Field Survey, 2022

Table 4 indicates the ICT devices and programs that can be learned during the MOOC. Variables such as 10, 11, 12, 13, 14, 19, and 21 had mean scores of 3.0 and above. This largely implies that Massive Open

Online Courses can expose learners to the use of ICT devices and programs such as desktop and laptop computers, smartphones, audio and videotape devices, CD-ROMs, projectors, and printers. Students can also leverage MOOCs to acquire skills in office application programs such as MS Word, MS Excel, and MS PowerPoint. The result further revealed that MOOCs can expose students to the use of search engines such as Firefox, Google Chrome, Opera Mini, Explorer, etc.

On the contrary, items 15, 16, 17, 18, 20, 21, and 22 each had mean scores of less than 3.0. This category includes devices and programs that are less common in MOOCs. The implication is that Massive Open Online Courses have limited availability of devices and programs such as MATLAB, GIS applications, and statistical and qualitative data analysis software such as SPSS, SATA, EXCEL, MINITAB, SAS, etc. Detailed results also indicated that graphics, textual, or image processing software such as Corel Draw, web design and development applications (Note Pad, Dreamweaver, Sublim, NetBeans, Eclipse, etc.) are also limited in use or sometimes not available at all.

Table 5: Specific ICT Skills that can be Acquired by University Students through MOOC

		Frequency					
S/N	**Items Description**	**SA 4**	**A 3**	**D 2**	**SD 1**	**Mean**	**Std Deviation**
23	Skills to produce text using Word processing, Spreadsheet and PowerPoint programmes	222	87	40	21	3.38	0.89
24	Skills to edit digital photographs or other images	80	75	141	74	2.44	1.04
25	Skills to edit online text containing Internet links and images	80	99	100	91	2.45	1.08
26	Skill to create and use a database	19	94	96	161	1.92	0.94
27	Skill to send/receive file through e-mail	230	96	24	20	3.45	0.84
28	Skill of participating in discussion forum on the Internet (social media)	263	89	18	0	3.66	0.57
29	Skills to create and maintain blogs or web site page	0	26	209	135	1.71	0.59
30	Skills of installing software application packages	272	82	08	08	3.67	0.63
31	Skills to download, upload and browse material from website or portals	210	96	20	44	3.28	01.01

Source: Field Survey, 2022

Table 6 reveals specific ICT skills that can be acquired by university students through MOOCs. The detail investigation affirmed that questionnaire items 23, 27, 28, 30, and 31 had mean scores of 3.0 and above, respectively, signifying majority acceptance. This demonstrated that through MOOCs, respondents could learn how to create text using word processing, spreadsheet, and PowerPoint programs.Respondents can also acquire the skills of sending and receiving files through e-mail, participating in discussion forums on social media, installing software application packages, downloading and uploading files online, and browsing the internet for study material. Results also showed that items 24, 25, 26, and 29 had mean scores of less than 3.0. These indicate the level of skills that are given less attention during MOOCs. The majority of the respondents believed that MOOCs give little or no attention to skills such as editing digital photographs or other images, creating online text containing internet links and images, using a database, and maintaining blogs or website pages.

Table 7: Extent of ICT Skills Acquisition by University Students through MOOC

S/N	**Items Description**	**VHE 4**	**HE 3**	**LE 2**	**VLE 1**	**Mean**	**Std Deviation**
32	Skills to produce text using a word processing, spreadsheet and PowerPoint programme	223	87	45	15	3.40	0.85
33	Skills to edit digital photographs or other images	80	75	242	74	2.44	1.04
34	Skills to edit online text containing Internet links and images	90	97	90	93	2.50	1.12
35	Skills to create and use a database	10	25	100	235	1.49	0.74
36	Skills to send/receive file through e-mail	230	96	24	20	3.45	0.84
37	Skills to participate in discussion forum using Instant Messenger, Facebook, LinkedIn, WhatsApp, Twitter, Blogging, Google+ etc.	275	83	05	07	3.69	0.5
38	Skills to create and maintain blogs or web site page	0	25	210	135	1.70	0.59
39	Skills of installing software application packages	276	82	02	10	3.69	0.62

40	Skills to Download, upload and browse study material from website or portals	215	98	18	39	3.32	0.98

Source: Field Survey, 2022

The extent to which ICT skills can be acquired by university students through MOOCs was assessed and presented in table 7. The result showed that questionnaire items 32, 36, 37, 39, and 40 have mean scores of 3.0 and above. This signifies that MOOCs can expose university students to text processing in Word, Spreadsheet, and PowerPoint, file exchange through e-mail, discussion forums through Instant Messengers (Facebook, LinkedIn, WhatsApp, Twitter, Blogging, Google+, etc.), installation of software application packages, and browsing of study material to a very high or high extent.

Ultimately, there are some ICT skills that are needed by university students but are given less attention by MOOC operators. For instance, questionnaire items 33, 34, 35, and 38 with mean scores of less than 3.0 indicate that skills on them are acquired to a low or very low extent. These items include digital photograph editing, creating and using a database, and skills to create and maintain blogs or web site pages.

IV. DISCUSSION OF THE FINDINGS

Findings of this study revealed generally that Massive Open Online Courses have the enablement to enhance university students' text processing skills in Microsoft Word and Excel. Skills for internet surfing, forum discussions using WhatsApp, Facebook, LinkedIn, etc., can also be acquired. Participants of MOOCs also have a chance to acquire skills for sending and receiving e-mail and for browsing study materials online to a greater extent.

Further findings showed that MOOCs present ICT devices and programs such as desk/laptop computers, smartphones, audio and videotape devices, CD-ROM, projectors, printers, and office application programs such as MS Word, MS Excel, and MS PowerPoint at the students' disposal. Other skills include the use of search engines such as Firefox, Google Chrome, Opera Mini, Explorer, etc.

On the contrary, findings indicated that MOOCs facilitate fewer skills acquisition for Microsoft PowerPoint presentations and Web design and development using Hyper Text Mark-Up Language (HTML). Devices and programs including digital cameras, MATLAB, GIS applications, statistical and qualitative data analysis software such as SPSS, SATA, EXCEL, MINITAB, and SAS, etc were limited in use, hence low skill acquisition. The results further indicated that graphics, textual or image processing software (Corel Draw), web design, and development applications (Note Pad, Dreamweaver, Sublim, Net Beans, Eclipse, etc.) were not commonly made available to students.

The findings of this study were consistent with that of [17], who found that the majority of students of MOOCs have access to ICT devices and programs such as mobile phones, tablets, and desktop/laptop computers. The findings also aligned with those of [18], who noted that MOOCs expose university students to digital literacy skills for accessing online study materials, participating in online discussion forums, and providing learning opportunities for professional development and lifelong learning. [19] is yet another study whose findings match the present work. [19] concluded that online courses are an effective way to train people in the safe and responsible use of ICT, as it enables the development of digital competence in the area of content creation.

V. CONCLUSION

This study aimed to ascertain the perceived impact of Massive Open Online Courses (MOOCs) on the development of ICT skills among university students. A descriptive survey design was adopted. A random sampling technique was employed to obtain 370 undergraduate students from the National Open University, Makurdi study center, Benue State, Nigeria. A self-developed questionnaire was administered to the population to obtain opinions, which were analyzed using mean and standard deviation.

It was concluded that Massive Open Online Courses were very instrumental in the acquisition of ICT skills and competencies by university students to perform efficiently in the present ICT-driven society. Consequently, in addition to exposing students to devices such as desk/laptop computers, smartphones, audio and videotape devices, CD-ROM, projectors, and printers. It was observed that MOOCs have the ability to improve students' skills in Microsoft Word and Excel, internet surfing, forum discussions using WhatsApp, Facebook, LinkedIn, etc.; sending and receiving e-mail, downloading/uploading files online, browsing study material online, use of search engines such as Firefox, Google Chrome, opera mini, explorer, etc. It is also concluded that MOOCs have less of an impact on facilitating students' acquisition of skills in Microsoft PowerPoint presentations, web design, and development using hypertext mark-up language (HTML). Other areas where students are exposed less during MOOCs include the use of digital cameras, MATLAB, GIS applications, statistical and qualitative data analysis software such as SPSS, SATA, EXCEL, MINITAB, and SAS, etc., graphics processing software (Corel Draw), web design and development applications such as Notepad, Dreamweaver, Sublim, NetBeans, Eclipse, etc.

VI. RECOMMENDATIONS

Based on the findings, the following recommendations were made:

i. People of all ages, especially the busy and working class, should embrace MOOCs as a pedagogical method because of their ability to expose learners to digital literacy skills and provide learning opportunities for professional development and lifelong learning.

ii. MOOC operators should always ensure that digital learning gadgets are provided to learners during registration to mitigate the huge costs that are accrued in the struggle to take personal responsibility for learning requirements.

iii. Improved security checks should be put in place to guard against cheating in tests and examinations. Surveillance cameras and biometrics authentication should be used for actual learners' identification before one is allowed to take any examination.

iv. MOOC operators should ensure that ICT devices and programs such as digital cameras, MATLAB, GIS applications, statistical and qualitative data analysis software such as SPSS, SATA, EXCEL, MINITAB, and SAS, etc., along with graphics processing software (Corel Draw), are made available for MOOC learners. Professional programs such as database software, web design, and development tools (Notepad, Dreamweaver, Sublim, Net Beans, Eclipse, etc.) should also be made available for students' use.

v. MOOC operators should encourage their students to own personal ICT devices, gadgets, and programs to enhance academic performance. Through all these, students may gain additional ICT skills, independent of their fields of study.

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