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Teaching information literacy in Nigerian universities using advanced technologies

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Abstract

Rationale of Study – The study examined the use of advanced technologies in teaching information literacy in Nigerian universities. The specific objectives of the study were to identify the old methods of teaching information literacy in the Nigerian universities; identity the old contents and the new ones to be added; determine the advanced technologies that are used or that will be used to teach information literacy; identify the challenges associated with using new methods introduced due to the advancement in technology or the emergence of the fourth industrial era; and determine the way forward to teaching information literacy in the future.

Methodology – The study adopted a qualitative approach. Five universities in Nigeria were purposively sampled for the study. Observations, document analysis, and a review of the literature were conducted. The curriculum for information literacy courses and library instructions in Nigerian universities were reviewed. This was to determine the old contents and methods used to teach them and the new ones through a review of recent literature on the most recent technological advancement currently influencing the information literacy teaching methods in universities.

Findings – The findings revealed that the traditional face-to-face teaching method is the most common method used by most universities in Nigeria to teach information literacy instruction. It is currently complemented by technological tools such as tablets and Google classroom. Power failure, inadequate access to laptops, tablets, and Android phones, and inadequate funding are challenges associated with using advanced technology to teach information literacy.

Implications – The findings of this study can be used to improve the impact of information literacy programmes in academic libraries in Nigeria, the sub-Saharan Africa and beyond using advanced technologies.

Originality – This is an original study which explores modernised approaches to teaching information literacy in academic libraries in Nigeria.

Keywords

Advanced information technologies, information literacy, information literacy teaching, teaching methodologies, Nigerian universities

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1 Introduction

It is no longer news that information and communication technologies (ICTs) affect many aspects of human life, including politics, governance, business, and economics. Significant changes have been made to how instruction is delivered, notably how information literacy (IL) is taught to new university students (Harrison & Deans, 2021). Skyline College (2021) describes information literacy as the ability to find, assess, organise, use, and convey information in all forms, particularly in the circumstances demanding judgment, problem-solving, or knowledge acquisition. For this to be achieved, critical thinking, computer technology, and communication skills are required for practical information literacy.

Undergraduates need to be exposed to the new information literacy material, which includes 5G, the Internet of Things (IoT), artificial intelligence (AI), machine learning, virtual and augmented reality, cloud computing, blockchain, cybersecurity, and robotic technology. As emphasised by Harison and Deans (2021), the delivery of content to satisfy the skills needed by undergraduates to develop lifelong learning skills and competencies inclusive of the ability to select, access, evaluate, use and communicate information effectively is achievable. Therefore, to teach those identified resources successfully, the strategies that can be used to deliver IL should include but are not limited to online feedback questions, social media tools, and telecommunication applications such as Skype and zoom are mentioned as possible resources used by the librarians in instruction delivery. Similarly to this, Cardenas and Ramirez (2014) identified the methodologies used for the teaching of Information Literacy as reading, presentation, discussion, arguments, elaboration of concept maps, brochure design, posters; solving practical tasks, students as "Conference Teachers" for their classmates as well as individual and group activities using the social web; use of subject's sites, Google sites, initial diagnosis, teacher/students' presentations, reading analysis and elaboration of comparison charts, time points, summary, and research. Tshuma and Chigada (2018) added an in-class tutorial for students to develop hands-on skills, a hybrid method where students engage in practical development, in class, and via online tutorials.

The fundamental difficulty is that first-year students who are new entrants into the university must identify their information demands for them to identify the location to get the information, when and how to get them, understand digital data, and forecast changes with the aid of technology. The particular concerns that most developing

countries face, such as power interruptions, the expense of making new technologies available, and knowledge competence, will undoubtedly present some challenges with the new adjustments. Since these undergraduates will be participants in the smart city and intelligent economy, it is imperative to teach them information literacy as they are admitted into the university.

Employers have expressed concerns about the employability of today's information students, claiming that the skills they possess need to be more relevant to the talents in demand by employers (Kwanya et al., 2012; Ocholla, 2011). Because technological innovation is one of the elements causing changes in the abilities that employers are looking for, knowledge concerning those new technologies must be included in the information literacy curriculum. This will enable the information graduate to have a basic understanding of technology. The concept can be refined when they are employed and begin interacting with the technologies. Unfortunately, most Nigerian colleges' existing curricula do not offer coursework that reflects these new advanced technologies (Peet, 2015; Pham & Udoh, 2021). In light of this, it is crucial to examine what constitutes the new advanced technologies currently being used to teach information literacy, the approaches and techniques of teaching information literacy to new university enrolees, what new content should be added given the advancement in technology, what new methods of teaching IL should be introduced, and what benefits those to be introduced have over the current methods; what challenges there are; and so on. In light of this, the study looked at the challenges and future directions of teaching information literacy at universities in developing nations using novel methodologies and advanced technology.

The specific objectives of the study were to identify the old methods of teaching information literacy in the Nigerian universities; identity the old contents and the new ones to be added; determine the advanced technologies that are used or that would be used to teach information literacy; identify the challenges associated with using new methods introduced due to the advancement in technology or the emergence of the fourth industrial era; and determine the way forward to teaching information literacy in the future.

2 Literature Review

How information literacy is experienced in the world of work should influence how it is taught and experienced in professional education and professional development programmes (Abubakar & Isyaku, 2012). Many methods have been adopted in teaching

information literacy in Nigerian higher institutions, especially universities. Many information literacy models were designed, and some have been tested as the baseline for teaching and to serve as a mechanism for promoting information literacy skills in academic and other institutions that require well-refined and technical information for decision-making. Students today need the skills that will enable them to access and navigate the growing universe of information, select appropriately credible and reliable information, they needed to read critically and think independently as they produce their ideas, and then use that refine information for their academic courses (Middle States Commission on Higher Education 2003). Cognitive apprenticeship is one of the old methods revealed by Mcpherson and Nummes (2004) that scholars have considered for teaching information literacy. They look at it as a method that would help students' actual presentation and active participation in learning with a test in their intellectual information search and applications. Mcpherson (2004) argued that a paradigm shift in education and instruction demands intellectual reasoning ability with skills for accomplishing tasks rather than promoting acquiring and memorising facts and abstract concepts and theories. Information literacy instruction now means improving the abilities of self-regulation of learning, thinking, intelligence, and problem-solving.

Computer laboratories and workshops are used to demonstrate search strategies using specialised databases and web search engines and how to use discipline-specific research strategies and information technology. According to Detlor et al. (2012), active learning strategies is another old method of delivery of IL. The authors argue that the approaches currently in use need to be improved. Essentially, they advocated for using teaching strategies that encourage students to participate actively in the learning process for more successful learning outcomes. Additionally, the authors agreed that students being able to use higher-order thinking skills while being engaged in critical thinking activities (analysis, synthesis, reflection, evaluation) would help them to improve their critical thinking skills and to recognise their attitudes and values. Sanderson (2018) added learning styles as another method to deliver IL. The author explained that learning styles are adequate for the successful delivery of IL through diagnostic tests and encouragement to identify and tailor learning situations best suited for students.

In the old curriculum of information literacy, contents relating to the rudimentary skills in database searching and Internet searching, website analysis for their reliability, and basic competence in computer technology are considered indispensable to developing skills for success and bridging the digital divide. As Bruce (2003) mentioned, information

literacy is the ability to access, evaluate, organise and use information to learn, solve problems, and make decisions in formal and informal learning contexts, at work, home, and in educational settings. Hancock (1993) contends that information literacy is viewed as a resource-based approach to learning in the classroom, library media centre, and community. Teachers and school library media specialists collaborate to provide students with various resources to solve problems.

Thus, the old contents taught by information literacy instructors include clarification on what they teach, particularly when they place discipline and interdisciplinary connection in the foreground of discussion. This reinforces the metacognitive value of the information literacy process. For example, in introductory courses, the content includes the differences between professional and popular sources of information. In more advanced courses, students can understand the complex nature of the information within various disciplines (Middle States Commission on Higher Education 2003).

A new developing information technology innovation with relatively few users yet promises to provide a future, significant values are known as advanced technology. Although this phrase is distinct from advanced manufacturing and manufacturing technology, they are related. Advanced technology enhances both the procedure and the final output. Unit testing, version control, outlining, and managed code are among the tasks and necessities that can be made simpler and more efficient with the help of advanced technology (Austin, 2018). Similar to how it affects other industries, new technology impacts the software industry by transforming and improving crucial IT processes in many businesses, including information businesses.

There are technologies responsible for tagging this era as an advanced information technology era. The digital revolution, which started in the latter half of the 20th Century, is being built with the help of the most recent, cutting-edge technology (Corfe, 2018). Internet of Things (IoT), big data, robotics, artificial intelligence (AI), blockchain, addictive technology, nanomaterials, and cloud computing are some of the technologies mentioned. Synthetic biology, energy storage, neurotechnology, machine learning, virtual reality, and others (Tella, 2020). Many of these named technologies have found their way into libraries.

The ever-growing and increasing advancement in technology is, to no small measure affecting information literacy. There is now a relationship between information literacy and technology. Libraries have undergone significant change due to technological

advancements as service-based organisations. For instance, the storage medium for information storage has changed to a more complex and advanced storage medium like flash drives, CD ROMs, Hard-drives, and cloud storage. Undoubtedly, some libraries have managed to keep up with the pace of technological development. As correctly noted by Onuoha and Obialor (2015), the development of information and communication technology has made it possible for libraries to use various technologies to support their services. New technology developments impact how information is handled and processed daily in libraries and information centres. Satell (2018) pointed out that our world has been thoroughly changed by digital technology. To a person looking at an IBM mainframe in the 1960s, it would be challenging and nearly impossible to explain how similar machines would take the place of books and newspapers one day. We may also consider it impossible to offer us suggestions for where to eat, directions on how to get there, and even talk to us. However, these things are now commonplace practices.

More importantly, most of these advanced technologies have become indispensable tools for teaching, learning, and research in our institutions of higher learning. These technologies and their application are now used in most advanced nations to teach information literacy and or library instructions. Some instances of the use of technologies are presented and discussed here as case studies. Kane (2016) gives an example of ANTswers, a chatbot created by the University of California Irvine. Understanding chatbots in the capacity of instruction and reference is thoroughly examined in the project.

Assist in the learning of information literacy or library skills. Pepper, a humanoid robot from the United States, teaches coding at Roanoke County Public Libraries, as seen in Figure 2. One of the numerous libraries in the US is adopting cutting-edge technologies. The library envisions further uses of AI in the future, including more educational programmes and incorporating robots into the curriculum to discuss touchy subjects like drugs and death with youngsters (Queram, 2019). It means that if such is included in Nigerian libraries, they can be utilized to educate and inform the general public about rape, cultism, kidnapping, corruption, and other related topics. Libraries around the US are embracing AI as a tool for the community that facilitates access and educational opportunities for users who may need the advantage to experience it.

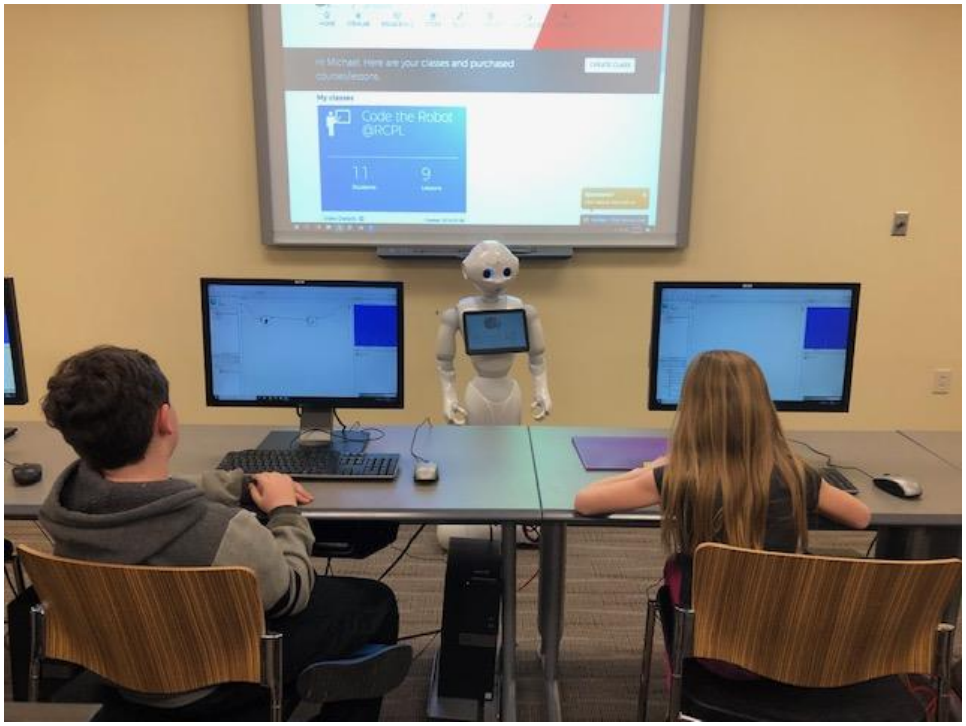

Figure 1: Robotic teaching library instruction

Source: Roanoke County Public Library

Literature has reported some challenges associated with teaching information literacy, particularly at the university level. For instance, Anunobi and Ukwoma (2016) emphasised that the underdevelopment of information literacy programmes in higher education institutions can be attributed to the attitude of critical stakeholders, including administrators, academics, students, and libraries. They identified a lack of essential management commitment, ignorance of the meaning of information literacy, the unwillingness of various departments to collaborate for the effective development of programmes, aversion to innovative curricula, and inadequate technological infrastructure, all of which hinder the growth of effective information literacy programmes. Tshuma and Chigada (2018) added that a lack of support from the administration and university management. This lack of support results in the unstructured teaching of information literacy as sessions that can be conducted on a one-on-one or group basis. Mention can also be made of the fact that university stakeholders need to be amenable to implementing information literacy programmes, which challenges the efforts of the librarians. The factor indicated causing the resistance by university stakeholders is the belief that information literacy is the library's responsibility. Julien et al.'s (2018) study highlighted many challenges to IL surrounding the common themes of lack of time and adequate staffing. The lack of time was related to insufficient time to

show up, prepare for class, and schedule and deliver all the instruction sessions. Challenges related to the lack of adequate staffing include poor student-staff ratio. The authors mentioned other challenges, which included balancing instruction with other job duties, lack of formal training, shortage of available instruction space and technology, lack of student motivation, limited to no cooperation from faculty, lack of support from administration, and no formal assessment. Many challenges surround the implementation and delivery of IL in institutions of higher education. The most prominent ones identified in the literature include lack of support from the administration, lack of faculty cooperation, lack of funding, students' motivation, and those related to lack of time and lack of adequate staffing (Inskip, 2017; Omeluzor et al., 2017; Abubakar & Isyaku, 2012).

Some available studies have revealed the use of advanced technologies in teaching information literacy and library instruction. For instance, Johnson (2012) found that the professional abilities needed for K–12 educators have changed as a result of developments in technology and access to information. Information literacy publications were extremely scarce before the introduction of technology into libraries, mainly through the automation of the card catalogue. Due to the abundance of publications on information literacy nowadays, this is no longer the case. Information literacy differs from information technology or computer literacy, and this distinction is made in the introduction to the Information Literacy Competency Standards for Higher Education. This distinction was made because, in 2000, the impact of technology on the idea of information literacy was significant enough to warrant it.

Information literacy is described as a distinct and broader area of competence that initiates, sustains, and extends lifelong learning through abilities which may use technologies but are ultimately independent of them (Akidi, 2018). However, the text also acknowledges that information literate individuals necessarily develop so. When specific performance indicators and learning objectives are considered, the relationship between information and technology literacy becomes even more apparent.

By offering a specific definition of AI literacy based on existing research, Long and Margako (2020) took a step toward realising the need for additional human-computer interaction (HCI) research investigating a) what competencies users need to interact with effectively and critically evaluated AI and b) how to design learner-centred AI technologies that foster increased user understanding of AI. The study synthesised a range of interdisciplinary literature to build a set of fundamental competencies for AI

literacy. It also makes numerous design recommendations to assist AI developers and educators in developing learner-centred AI. These design concerns and competencies are arranged in a conceptual framework that is thematically drawn from the literature. The contributions of this work can be utilised to initiate a discussion and direct future research on AI literacy within the HCI community.

Krylova-Greg (2020) investigated the problems with using information technology to study media literacy in answer to a call for input on a study of media and information literacy at the State University of Telecommunication (Kyiv, Ukraine). The course can be implemented successfully based on the author's original methodology, which actively incorporates a "media-creator" computer game, fact-checking techniques, and specialised software. The course on media and information literacy is seen as a series of steps, as shown in the paper. The results show that students become more knowledgeable, sensitive, and aware of the information they receive on the internet after taking various classes, learning theory, and completing practical tasks.

The related literature shows that there needs to be more research focusing on the impact of cutting-edge technology on the instruction of information literacy to first-year students entering universities. Based on this, the study examined information literacy teaching at universities in a developing country context. The study considered the advances in technology, looking at the new approaches, challenges, and advances in technology and new approaches and the way forward.

3 Methodology

The study adopted a review of documents and literature on information literacy courses at the university. Such documents were collected from five different universities in Nigeria. The curriculum for information literacy courses and library instructions in Nigerian universities were reviewed. This was to determine the old contents and methods used to teach them and the new ones through a review of recent literature on the most recent technological advancement currently influencing the information literacy teaching methods in universities. Five universities were purposively sampled, and the curriculum on information literacy course/library instructions was analysed and observed. These universities were chosen because they have the name of the course as 'Information Literacy' compared to others. The analysis was based on the study's objectives which were to identify the outdated approaches to teaching information literacy in Nigerian universities and determine the outdated materials that need to be added. The difficulties

of utilising the new techniques due to technological advancements or the advent of the fourth industrial revolution and suggestions were also featured for the future of information literacy education. The collected documents and reviewed literature were analysed. The analysis outcomes are presented thematically following the study's objectives.

4 Results and Discussion

The results are presented and discussed hereunder in accordance to the specific objectives of the study.

Objective 1: The old methods of teaching information literacy in the Nigerian universities

To achieve this objective, documents like the old curriculum and observations of the ways and methods used in most of the five universities sampled revealed that primarily face-to-face teaching had been employed to teach information literacy/library instruction courses. However, there has been a change recently due to the introduction and adoption of some new technologies by university libraries and universities. This change comes as a result of the integration of face-to-face methods with technology into the courses. This is summarised in Table 1:

Table 1: Summary of the mode of teaching IL

Universities	Mode of Teaching	Technology Platforms
University 1	Face-to-face	Moodle
University 2	Face-to-face	Microsoft Team/Google Classroom and Moodle
University 3	Face-to-face	Zoom
University 4	Face-to-face	N/A
University 5	Face-to-face	Zoom

The result here implies that face-to-face has the most common method used in most universities in Nigeria to teach information literacy instruction. This is currently complemented by technological tools and platforms such as Google Classroom, Microsoft team, Moodle, and Online forums like yahoo and Google forums, among others.

Objective 2: The old and the contents for addition to the information literacy curriculum

To achieve the second objective, an analysis of documents such as the information literacy curriculum and course materials used to teach the course in the selected universities was conducted. The findings revealed that most discussions include word processors, PowerPoint presentations, excel, and some minor applications on laptops or desktop computers. It also includes sending and receiving emails, troubleshooting computer problems, and composing content. Others use the mouse, or keyboard, connecting and commanding the computer peripherals to print, scan, or photocopy. The library instruction content found in the curriculum includes information about libraries, their meaning, the arrangement of the materials, how the materials can be accessed, and the general functions of the library. Similarly, the function of each unit in the library, such as circulation, readers services, serials, cataloguing, acquisition, collection development, documentation, reprography, binding, and the like, were also included. These contents are similar in all the universities studied.

The literature was searched to identify the new contents to be added in line with the trends in the global environment and universities in advanced nations. It was discovered that content that will make the current-day undergraduate students develop skills needed and demanded in the Fourth Industrial Revolution (4IR) should be included. Furthermore, this includes but is not limited to (World Economic Forum, 2018):

i) Extensive and accurate manual dexterity
ii) Memory, linguistic, auditory, and spatial skills are also included.
iii) Management of Material and Financial Resources
iv) Management of personnel
v) Technology installation and maintenance
vi) Quality control and safety awareness, technology use, monitoring, and control,
vii) Creativity, originality, initiative,
viii) Complex problem-solving and the meaning and concept of technology design, programming, and troubleshooting are only a few of the criteria.
ix) Social sway and leadership
x) Systems evaluation and analysis
xi) Analysis and critical thinking
xii) Emotional intelligence.

All of these are in line with the Fourth Industrial Revolution Skills recommendation by the World Economic Forum (2018). The European Council's (2018) recommended that digital competence or information literacy competence should involve the confident, critical, and responsible use of and engagement with digital technologies for learning. This should apply at work, and social participation aligns with the study's findings. Information and data literacy, communication and teamwork, media literacy, media production (including programming), safety (including digital well-being and cybersecurity competencies), problems about intellectual property, problem-solving, and critical thinking are all included.

Similarly, the Council of Europe (CoE) uses "digital citizenship" to describe thoughtful and positive engagement with digital technologies and data. It also involves (creating, publishing, working, sharing, socialising, examining, playing, communicating, and learning); actively and responsibly participating (values, skills, attitudes, knowledge, and critical understanding) in communities at all levels (local, national, and global) (political, economic, social, and cultural). These topics are anticipated to be included in the information literacy curriculum for first-year students at Nigerian colleges.

Objective 3: Advanced technologies that will be used to facilitate the teaching of information literacy further

This objective was achieved through data analysis and a review of the literature. Research has shown that some cutting-edge technologies, particularly those brought about by the Fourth Industrial Revolution, are now being used to teach information literacy in some, if not most, of the universities in advanced countries. These technologies include artificial intelligence, the Internet of Things, machine learning, virtual/augmented reality, and robotics. Other technologies include social media such as Facebook, YouTube, Telegram, and WhatsApp (Kwanya & Stilwell, 2015). The report by Kane (2016) and Queram (20019), which emphasised how some universities in the United States of America are using robots to teach information literacy, supports this finding.

Table 2: Advanced technology for teaching IL

Universities	Advanced Technology
University 1	Telegram and WhatsApp
University 2	WhatsApp
University 3	Telegram
University 4	WhatsApp

University 5	Telegram and WhatsApp

From Table 2, it is clear that universities need to start using advanced AI, robotics, or virtual/augmented reality technologies. This calls for their inclusion in the new information literacy/library instruction curriculum in the participating universities.

Objective 4: The challenges associated with using new methods introduced due to technological advancement or the emergence of the fourth industrial era

This objective was achieved through observation and analysis of the curriculum Table 3 summarised this.

Table 3: Challenges of teaching IL through Advanced Technology

Universities	Challenges
University 1	Power failure, inadequate access, the inability of some students to own personal devices like laptops, tablets, and android phones
University 2	Power failure and funding
University 3	The inability of some students to own personal devices like laptops, tablets, and android phones
University 4	Funding
University 5	Funding, inadequate lecture rooms

It was discovered that following the introduction of some technological tools and applications to the teaching of information literacy, problems such as postponement of classes due to power failure and inadequate access due to the inability of some students to own personal devices like laptops, tablets, and android phones. Similarly, due to inadequate funding, most universities could not provide some of the tools and applications that can go around the students for ease of teaching and learning of the course.

Objective 5: The way forward to teaching information literacy in the future

Based on the literature, some of the ways forward were identified. These include the need for universities in Nigeria to follow the global environment trend in teaching information literacy, where Artificial Intelligence, Machine Learning, and Robots are now being used to teach information literacy. It was discovered from the literature that this is familiar in Africa since we have a pioneer university in Africa where a robot (Libby) is

being used to facilitate library operations; also, the University of Lagos has just acquired a robot to facilitate library operations. Having done that, advanced technology will also be introduced to teach information literacy instruction in Nigerian universities. It is also essential that university libraries and university authorities should be thinking about how to acquire these technologies. To do this, they must make funds available to acquire these advanced technologies. This is because they will soon dominate most of our universities. Teach the students the development of new skills in line with the Fourth Industrial Revolution demands. Librarians in charge of information literacy and library instruction in most universities need re-skilling and up-skilling to teach the students the development of information literacy skills to enable them to become effective competitors in the 4IR global market.

5 Conclusion

The study looked at the difficulties and potential solutions for teaching information literacy at universities in developing countries using cutting-edge technology and novel methodologies. The findings have revealed that the Face-to-face method is the most common method used in most universities in Nigeria to teach information literacy instruction. This is currently complemented by technological tools and platforms such as tablets, Google classroom, Microsoft team, Moodle, and Online forums like yahoo and Google forums, among others. The subject of the content on discussion, such as the use of word processors, PowerPoint presentations, excel, and some minor applications on laptops or desktop computers, how to send and receive emails, troubleshooting computer problems, and the likes constitute the content. On the other hand, the library instruction contents found in the curriculum include information about libraries, in terms of it, meaning, the arrangement of the materials, how the materials can be accessed. More so, that content that will make the current-day undergraduate students develop skills needed and demanded in the Fourth Industrial Revolution (4IR) should be included. Information literacy is now being taught in developing countries using cutting-edge information technology, including artificial intelligence, the internet of things, machine learning, virtual/augmented reality, and robotics. Challenges such as power failure, inadequate access due to the inability of some students to own their equipment like laptops, tablets, and Android phones, and inadequate funding are identified. Universities should make funds available to acquire the advanced technologies used in information literacy teaching. Teaching the students new skills that correspond with the Fourth Industrial Revolution requires that librarians in charge of information literacy and library

instruction in most of our universities need to re-skill and up-skill to teach the students the development of these skills.

6 Implications and Recommendations

Arising on the findings of this study, the following are recommended. The old method of teaching, majorly face-to-face information literacy, should be changed as research revealed that students learn better through technology. Therefore, technology should be introduced to the teaching of IL. This will enable the new entrants to acquire all the necessary skills and competencies to be information literate.

The teaching of old contents in IL instruction should be discarded. Since things are changing, the old instruction may not be relevant in the new dispensation characterised by advanced technologies. In light of this, new knowledge that has to do with how advanced technologies work and how new entrants into the universities can annex and use them for their optimum advantage and become functional citizens in the four industrial eras should be the target. These should encompass, but not be limited to, complex problem-solving, technology design and programming, leadership and social impact, systems analysis and evaluation, critical thinking and analysis, and emotional intelligence.

Aside from the tools introduced based on the development of Web 2,0 technologies such as Facebook, Twitter, YouTube, Telegram, Whatsapp, and others; for institutions in Nigeria to implement technology like robotics, virtual/augmented reality, machine learning, and artificial intelligence to enhance the teaching of IL. Adequate funds should be made available to the universities to purchase these technologies.

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