

# Handbook of Research on Diverse Teaching Strategies for the Technology–Rich Classroom

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Lawrence A. Tomei  
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## MISSION

Education has undergone, and continues to undergo, immense changes in the way it is enacted and distributed to both child and adult learners. In modern education, the traditional classroom learning experience has evolved to include technological resources and to provide online classroom opportunities to students of all ages regardless of their geographical locations. From distance education, Massive-Open-Online-Courses (MOOCs), and electronic tablets in the classroom, technology is now an integral part of learning and is also affecting the way educators communicate information to students.

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*Yu Zhonggen, Hohai University, China*

English for Library Science is an essential course for students to command comprehensive scope of library knowledge. This chapter aims to compare the learning outcomes, gender differences, and affective factors in the environments of blended and traditional learning. Around 1000 participants from one university were randomly selected to answer questions in questionnaires. It was found that (1) the pass rates under blended learning increased compared with traditional multimedia learning and the dropout rates under blended learning decreased compared with multimedia learning; (2) males and females did not show any significant differences in learning outcomes; (3) affective factors under blended learning were significantly more favorable than those under multimedia learning; and (4) under the blended learning model, male motivation was significantly higher than female; male attitude was significantly more favorable than female; males held higher self-esteem than females. However, male anxiety was significantly less than female. Reasons for the findings, as well as future research directions, were also explored.

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The chapter presents the results of a longitudinal study (years 2013-2018) in which pre-service teachers' actual and perceived competence in computers were examined, together with factors that were hypothesized to affect both. Participants were 1070 senior students, studying at the Department of Primary School Education, University of the Aegean, Greece, and an online questionnaire was used for recording their views. Results analysis, using multiple linear regression, indicated that pre-service teachers do not actually know a lot about computers, while at the same time, they view themselves as average users. Moreover, ICT courses' impact on actual knowledge and skills in computers was minimal; more significant was the impact of additional ICT training and ownership of both a PC and a laptop. On the other hand, participants

based their perceived competence in computers almost exclusively on how competent they thought they were in basic computer use. On the basis of the results, recommendations are made in order pre-service teachers to be more adequately prepared to meet the challenges of using ICT as in-service teachers.

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During the last four years, information systems graduates participated in a practicum project during their last study year and took part in various professional activities in the industry in accordance with their professional aspirations and their desired specialty. The main purpose of this project was to reduce the gap between the graduates' acquired academic knowledge and the industry expectations. The aim of this chapter was to reveal the graduates' perceived contributions of the project. For that matter, semi-structured questionnaires and interviews with graduates who participated in the project in the last four years were conducted. The graduates experienced real workplace environments, acquired extended knowledge and skills, built social infrastructure to assist them with future job seeking, and above all gained real-world experience that helps them to build their professional image, and gain confidence in their traits and abilities. In addition, the practicum-based approach was compared with other common approaches used to bridge the gap, and its relative advantages and disadvantages were discussed.

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The notion of synchronous office hours in an asynchronous course seems counterintuitive. After all, one of the tenets of asynchronous education is to not require students to be online and participating at any time during the course. Having taught higher education online asynchronous courses for 20 years, the researcher experimented with online synchronous office hours as a means of making a connection with her online doctoral students. This chapter outlines the challenges, benefits, and best practices of incorporating a synchronous element into an otherwise purely asynchronous environment. Additionally, it offers strategies to enhance communication between students and the professor, as well as developing a community of learners in the asynchronous classroom.

### Chapter 5

Technology Adoption for Teaching: The Ethical Considerations..... 70  
*Airen Adetimirin, University of Ibadan, Nigeria*

Lecturers use technology for teaching to make learning more interactive and meet the different learning needs of students to promote their learning outcomes. The use of technology by lecturers will achieve the global trend of student-centered learning, where the course curriculum, pedagogy and type of technology should be focused on the needs of the students. To achieve meeting the needs of the students in a class, lecturers adopt technology such as interactive boards, learning management systems, videos, webcam to deliver their course content. However, the appropriate technology must be adopted for the topics in each course and used based on the rules and regulation referred to as ethics. Lecturers must use technology appropriately to avoid unethical acts such as copyright infringement and plagiarism in the retrieval of information resources from electronic sources such as the internet. Literature has revealed that lecturers

are involved in unethical acts and need to be educated on ethical use of technology. This chapter examines the use of technology by lecturers for teaching, ethical behavior and recommended that regular ethical education should be provided to the lecturers through information literacy programs for them to become knowledgeable in the ethics of using technology and avoid unethical acts.

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In the conundrum of what type of learning and teaching environments have a better impact on student learning and academic achievement or whether or not traditional learning and teaching setting surpass the emerging computer technology-rich education in today's digital era, scholars in the field of educational technology rather turn to history, focusing on what, how, and who as perceived change factors that tend to lead to long-lasting educational changes. With the emergence of the millennials, much of research conducted today ties to the importance of learning and teaching activities designed and delivered with appropriate media as vehicles for reaching positive learning outcomes. Current instructional practices are often tailored towards the specific learning needs of students that are diverse in many aspects (e.g., culturally, linguistically, technologically, etc.). Compared to learners back in the 1800s, it is undoubtable that today's local and distant learners need and prefer more different, progressive media tools for effective learning due to the exponentially changing demographics and social contexts, rapid growth in science, advances in information and communication technologies (ICTs), developing global economies, revision of educational policies, reassessment of media and technology tools, in addition to various instructional design principles and theories related to them, changing politics, and other subcomponents within this macro-system, all of which Moore and Kearsley view with a systems approach.

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The chapter contains the results of the research dedicated to the topic that has not been given much attention so far in the professional literature – discovering effective ways of developing students' programming abilities with the means of non-programming disciplines and activities. The authors argue that the process of forming capacities of students in programming becomes effective if students participate not only in programming lessons themselves but also dedicate a significant amount of time to other academic disciplines and extracurricular activities such as solving number-theoretic and chess endgame problems. The authors find that these disciplines and activities provide efficient means for developing programming capacities and therefore, their methods are the essential prerequisites for programming course. The significance of the obtained results is that they provide an effective alternative approach to organization of programming teaching process in those educational institutions where the traditional methodology does not bring the desired pedagogical effect.

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Role of Cloud Computing in School Education..... 98

*Vikas Kumar, Chaudhary Bansi Lal University, India*

*Aashish Bhardwaj, Guru Tegh Bahadur Institute of Technology, India*

Government and non-government organizations throughout the world are investing a lot in education because it is a primary tool to reduce poverty and crime in society. Still, the drop-out rates in primary as well as K12 education creates big worries for upcoming demands. This requires new strategies to make education motivating and improve student's commitment in learning. Student learning needs to be more flexible in time and place with interesting assignments and engagements. Technology can play a vital role in this and can enrich the student leaning in many ways. However, with the advent of new educational tools, their affordability and access has become a significant concern for the schools. The cost factor for adopting technology in education can be addressed by cloud computing technology. School education on cloud computing platform will facilitate the low-cost technology access with inherent features like flexibility, privacy, scalability, provisioning, reliability, and security. Cloud computing-based school education infrastructure will inculcate the participation and self-evaluation skills in the students. This chapter reviews the educational attainment and educational challenges in indifferent countries including the choice of subjects in K12 education for students as well as the technology options available for the students. It then outlines the school education improvement strategy with integration of cloud computing benefits in the school education system.

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The Integration of Information and Communication Technology in Pre-University Education in

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Educationists throughout the world are attesting to the capabilities of ICT for innovations in teaching and learning. There are evidences that integrating ICT into education enhances the learners' creativity and opens up new ways of knowledge acquisition and sharing. ICT is also credited with the improvement of teaching and learning of new skills needed to fully function in the 21st century knowledge society. This research was undertaken to evaluate the current state of ICT integration into the pre-university education and identify the barriers through principal components analysis and make the necessary recommendations. The research utilized both primary and secondary data. The primary data was collected through questionnaires and interviews while secondary data was obtained from reviews of government policy documents and reports. The study found an already existing ICT literacy education in the pre-university educational system in Ghana. There is also increasing access to and knowledge of ICT hardware and services. However, inadequate infrastructure, inadequate technology skills, lack of technical support, and inappropriate content are the challenges militating against effective integration of ICT in schools' curricula. Restructuring the curriculum of the various subjects, in-service training for teachers, integration of ICT into teacher training, and provision of internet connectivity infrastructure and services are recommended.

## Section 2 Applications of Diverse Teaching Strategies

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*Armand A. Buzzelli, Robert Morris University, USA*

*E. Gregory Holdan, Robert Morris University, USA*

*Daniel R. Rota, Robert Morris University, USA*

The challenge of engaging students beyond a typical class meeting session is a longstanding issue in educational research. This chapter outlines Twitter as a potential tool for enhancing student engagement while also enhancing concept learning. Twitter's efficient microblogging format allows instructors to share information quickly in real-time, while the hashtag feature enables a user to develop a list or repository of targeted tweets. These functions among others make the popular platform an educational tool that instructors should consider implementing carefully while modeling a good electronic footprint for their students.

### Chapter 11

Teaching Offensive Lab Skills: How to Make It Worth the Risk?..... 138

*Zouheir Trabelsi, UAE University, UAE*

*Margaret McCoy, La Salle University, USA*

*Yang Wang, La Salle University, USA*

This chapter identifies and discusses the learning outcomes to be achieved because of hands-on lab exercises using ethical hacking. It discusses the ethical implications associated with including such labs in the information security curriculum. The discussion is informed by analyses of log data on student malicious activities, and the results of student surveys. The examination of student behavior after acquiring hands-on offensive skills shows that there is potentially a high risk of using these skills in an inappropriate and illegal manner. While acknowledging the risk and the ethical problems associated with teaching ethical hacking, it strongly recommends that information security curricula should opt for a teaching approach that offers students both offensive hands-on lab exercises coupled with ethical practices related to the techniques. The authors propose steps to offer a comprehensive information security program while at the same time minimizing the risk of inappropriate student behavior and reducing institutional liability in that respect and increasing the ethical views and practices related to ethical hacking.

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*Neeta Baporikar, Namibia University of Science and Technology, Namibia & University of Pune, India*

Reflective practice supports critical thinking and assessment skills through analyzing one's own life experiences, and the role of reflection in learning is well reckoned. Reflective practice, the habit of looking back and analyzing one's own life experiences, is a process that supports learning and develops critical thinking skills. The role of reflection in learning has been recognized for decades and the reflective observation learning style may provide an important means of deepening student understanding and engagement especially with better technology integration. Many management educators recommend reflective practice for managerial and professional development as learning to reflect is a key element in

mastering the important management skill of self-awareness and developing management competencies. Adopting a mixed method qualitative approach, the aim of this chapter is to delve on the current scenario of the reflective practices and technology integration in management education.

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The authors present a framework for developing intercultural competence (IC) and use tridimensional digital virtual worlds (3DVW) as environments for developing IC. They developed an artifact, via design research, constituted by an educational method using the 3DVW Second Life® as the place for a virtual exchange program between 92 Brazilian and Portuguese master students. The results of the study indicate that the 3DVW can be used for the development of IC because it allows rich experiential and relational/conversational learning opportunities, especially due to the affordances of immersion/sense of presence, social interaction, content production, and knowledge sharing. The students involved in the virtual exchange inside Second Life® had to practice a set of attitudes and skills such as communication skills; culture-specific knowledge; understanding others' worldviews; skills to analyze, evaluate, and relate; skills to listen, observe, and interpret; respect, openness; tolerance for ambiguity, among other, that are all attributes of IC.

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Design-based research methodology was used to guide a line of research to develop, implement, revise, and evaluate the ESCOLAR online science curriculum for middle school students, including general education students, English language learners (ELs) primarily of Hispanic origin, and students with high-incidence learning disabilities (LD). The iterative research approach was carried out in three stages with multiple steps per stage: (1) Stage 1, or informed exploration, identified and described the problem under investigation; (2) Stage 2, or enactment, redesigned previously developed online science units, implemented each unit in case studies, and completed a feasibility evaluation; and (3) Stage 3, or evaluation of local impact, documented the efficacy of the science curriculum with a randomized controlled trial. The present chapter focuses on the second and third stages, demonstrating the process by which the ESCOLAR curriculum was repeatedly refined with input from stakeholders, and then examined for feasibility of implementation, usefulness in helping teachers engage with students, and efficacy in deepening student science knowledge. Data were drawn from multiple sources, including teacher logs, student and teacher surveys, web analytics, student notebooks, content assessments, and focus groups. Results indicate that the ESCOLAR curriculum was feasible to implement, useful, and effective, and may now be adopted as an evidence-based intervention to enhance science learning among diverse students. The data-driven, design-based research methodology proved to be a practical framework, and



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*Yu Zhonggen, Beijing Language and Culture University, China*

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*Vikas Kumar, Chaudhary Bansi Lal University, India*

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Development of information technology has very much affected the way teachers teach and students learn. Digital devices have become a routine not only for playing games and communicating with classmates but also for the education and knowledge. This has provided opportunities for enriching the learning environment. The classroom today is a very challenging environment. The reason may be the changing focus of the environment which has shifted from the teachers to the learners. Many educators attempt to adopt new instructional approaches to encourage and motivate students to learn; social media can be one of the best approaches. The objective of this chapter is to understand the importance of social media as new teaching pedagogy in higher education institutes. A framework has been proposed to assimilate specific social media channels in teaching pedagogy in higher education. The framework will be useful in identifying how social media platforms can be integrated into teaching pedagogy for higher educational institutes so that the students may be benefited the most.

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*M. Noor Davids, University of South Africa, South Africa*

This chapter reports on an ongoing case study that focuses on the development of a computer-mediated communication technological solution intended to assess the teaching practicum (TP). The context of this chapter is the TP module at an open distance e-learning (ODeL) university in South Africa. This university is faced with the demanding task of arranging mandatory supervisory visits for purposes of assessment, for more than 40,000 student teachers located both inside and outside of the country. The TP module forms a major part of a teaching qualification as it provides the pedagogical space for students to apply, integrate, and acquire various forms of knowledge. While the traditional “manual model” is still

the dominant mode of assessment, at ODeL institutions, it holds grave limitations, leaving thousands of students unassessed which undermines the value of the qualification. Given that, we currently find ourselves in the midst of the Fourth Industrial Revolution, an information communication technology (ICT)-based response to this predicament arguably offers the most appropriate solution. Such a solution would however require innovative design, critical thinking, research, and funding. This chapter reports on the development of an ICT-based project on the verge of being piloted at the ODeL institution concerned, as well as contact institutions. Informed by a theoretical framework that draws on technological pedagogical content knowledge (TPCK), critical connectivity, and open source software (OSS), this chapter responds to the questions: “Why” would an ICT-based instrument offer an optimal solution to TP assessment? and “How” would an ICT-based application offer an optimal solution to the assessment of the TP module? After the first pilot cycle with the prototype application, improvements and refinements will be made before a second pilot run. The objective of this project is to produce a TP application to be used in both contact as well as in distant, remote, and real-time/delayed assessment.

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Programming techniques is a difficult subject for the majority of students at vocational high schools in Indonesia. One of the problems is that the teaching-learning process still uses textual learning media with no interaction with students. Visual learning media offers some advantages to attract the attention of users, interact with users, involve users, and multimodal for users. Because of this, it is necessary to develop visual learning media to utilize visual programming to make it easier for students to understand programming techniques. The aims of this chapter are to determine the learning media feasibility utilizing visual programming to find the students’ responses to utilizing visual learning media and to applying fuzzy rating for the feasibility and students’ responses toward media learning based on visual programming. The research results showed that fuzzy preference can be applied to assess the learning media feasibility and students’ responses to the use of visual learning media utilizing visual programming.

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*Funmi Adebesin, University of Pretoria, South Africa*

*Rendani Kruger, University of Pretoria, South Africa*

As the use of information and communication technology (ICT) solutions become more embedded in our everyday lives, ICT graduates are required to design and develop solutions that are not only easy to use, but evoke overall positive user experiences. The incorporation of human-computer interaction (HCI) principles, such as user-centered design (UCD), usability, and user experience (UX) into the design of ICT solutions can positively influence the success of deployed solutions. However, developers of ICT solutions, especially those from developing countries, have been slow to apply these principles in their development practices. Some of the reasons for this slow pace include lack of experienced practitioners due to limited number of universities offering HCI courses, especially in African countries, lack of consensus on the measures of UCD effectiveness, and little appreciation of the benefits of incorporating

these design principles into development processes. This challenge is compounded by ineffective teaching strategies, in situations where HCI courses are taught. The application of an experiential learning strategy can go a long way in addressing the gap between the concepts of HCI, UX, and UCD that is taught in the classroom and their application by ICT graduates in the work environment. In this chapter, the authors describe how they incorporate eye tracking technology in an HCI course that forms part of a postgraduate informatics degree. The focus is on an eye tracking assignment that involves student groups performing usability evaluation studies for real-world clients. They posit that eye tracking is a powerful technology to convince students of the importance of user centered design. They conducted a survey amongst HCI students and analyzed student course evaluation results over a period of 3 years. The findings confirm that students regard the eye tracking assignment as a mind-altering experience and that it is potentially an effective technology for convincing future ICT professionals of the importance of usability, UX, and UCD.

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*Janet M. Ferguson, Canisius College, USA*

Handheld digital devices, especially iPads, have become increasingly popular in educational institutions surrounded by debates between advocates and skeptics. This chapter examines the perceptions of middle school teachers on the use of iPads in the classroom. A review of the existing literature on the digital devices and on iPads use in the classroom was conducted. The participants, 53 teachers, responded to a Likert scale type online survey asking them questions about how they felt about the 1:1 iPad initiative at their school. Data analysis included open and axial coding for identification of themes and patterns. The findings showed mixed findings, although the majority of teachers believed that the iPads played a significant role in the teaching-learning process to engage students in the classroom. Some participants, however, responded with concerns that iPads caused student distraction and allowed off-task behaviors in the classroom. The findings also suggest that teachers need targeted professional development training on pedagogical and practical use of iPad to be able to successfully integrate the iPad into their practice. Implications for educators, app designers, and for future research are discussed.

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*Taralynn Hartsell, Valdosta State University, USA*

*Sirui Wang, Colorado State University, USA*

E-textbooks make digital learning content portable, transferrable, and searchable, increase students' engagement, and enable highly interactive learning opportunities. However, adopting e-textbooks in higher education is far from its confirmation stage. This chapter examines the relationship between the perceived attributes of using e-textbooks by instructors and their actual use of e-textbooks in higher education settings. Further, the study explores factors that prevent instructors from fully adopting e-textbooks in teaching and explains how to circumvent such challenges. Challenges of adopting e-textbooks for instructors in higher education have been revealed by the survey. The findings suggest that instructors, institutions, and e-textbook publishers should work collaboratively to enhance the adoption of e-textbooks in higher education.

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## Chapter 5

# Technology Adoption for Teaching: The Ethical Considerations

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### ABSTRACT

*Lecturers use technology for teaching to make learning more interactive and meet the different learning needs of students to promote their learning outcomes. The use of technology by lecturers will achieve the global trend of student-centered learning, where the course curriculum, pedagogy and type of technology should be focused on the needs of the students. To achieve meeting the needs of the students in a class, lecturers adopt technology such as interactive boards, learning management systems, videos, webcam to deliver their course content. However, the appropriate technology must be adopted for the topics in each course and used based on the rules and regulation referred to as ethics. Lecturers must use technology appropriately to avoid unethical acts such as copyright infringement and plagiarism in the retrieval of information resources from electronic sources such as the internet. Literature has revealed that lecturers are involved in unethical acts and need to be educated on ethical use of technology. This chapter examines the use of technology by lecturers for teaching, ethical behavior and recommended that regular ethical education should be provided to the lecturers through information literacy programs for them to become knowledgeable in the ethics of using technology and avoid unethical acts.*

### INTRODUCTION

Teaching globally is user centred and technology has been adopted by lecturers for teaching to meet the diverse learning abilities of students and make them lifelong learners. For students to become lifelong learners, lecturers must engage them in the classrooms, promote learning and satisfy their information which can be made feasible through the use of technology. Technology can also improve education, providing innovative ways for instructors to teach and creative ways for students to learn.

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Technological tool like the Internet can provide access to simulations and virtual tours that allow educators to expose their students to places and resources otherwise unavailable to many classrooms (Evans, Martin & Poatsy, 2014). Course management software provides a rich online environment that includes tools like assignment submission, test/quiz taking, and discussion board forums. Computer laboratories enable instructor-led training and hands-on exercises for students. Smart boards can promote collaboration and enhance instruction, while handheld clickers and in class polling encourage student engagement (Bain & Przybyla, 2009).

O'Flaherty and Phillips (2015) concluded that technology is needed to enhance learning and the students expect to be taught using technology as they use technology for their daily activities especially those referred to as the millennials (born after 1980s). The authors concluded that technology in teaching will promote lifelong learning and prepare graduates for their future in their work places. Lecturers need technology to search for materials to prepare, update and deliver lectures to students. However, the type of technology used must be relevant and appropriate for the topic with utmost consideration for the Information and Communication Technology (ICT) skills possessed by the students. Some forms of technology adopted by lecturers include: videos, cameras, camcorder, computers and learning management systems (LMS).

Technology is being used in different countries by lecturers to enhance teaching through content delivery to increase the learning capabilities of students (Akinde & Adetimirin, 2017a; Ke, Sun & Yang, 2012). In USA, links to access and use web-based videos are provided to students to facilitate online education (Snelson, 2008). Almekhlafi and Almeqdadi (2010) investigated the use of video technology by teachers in the school classroom of the United Arab Emirates and the findings revealed that video technology is an important tool for teaching in the classroom. The use of technology by accounting lecturers in Australia is low in a study carried out on accounting lecturers using an interview and the findings revealed that 93% of the lecturers attributed this to their resistance to its adoption and use (Watty, McKay & Ngo, 2016)

In Nigeria, Akinde and Adetimirin (2017a) reported that technology is used by Library and Information Science lecturers in Nigerian universities, but the level is low. Use of technology for teaching and learning must be done appropriately by both lecturers and students, indicating that there is good and bad use of technology. The good use of technology involves abiding to rules and regulations guiding technology use. The wrong use of technology by lecturers may manifest in unethical acts like copyright infringement and plagiarism.

The wrong use of technology by students includes cheating, academic dishonesty, plagiarism and copyright violation. This wrong use of technology has negative consequences on the lecturers as they have to spend time verifying assignments or other task related documents submitted by students to determine if they adhered to ethics and if they violated the ethical use of technology, they are reported to the appropriate authority for punishment. This time spent on such activity reduces the time the lecturer would have used to search and retrieve relevant information sources for his or her course and plan the appropriate technology to use for content delivery (Bain, 2015).

Lecturers must be aware and knowledgeable in the ethical use of technology so as not to engage in violations themselves and also impart good ethical behavior to the students. This they can achieve by maintaining a specific academic integrity policy and discussing this information with the students (Lang, 2013).

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### **USE OF TECHNOLOGY BY LECTURERS**

Lecturers use different technology for teaching. Mobile technology such as smart phones and videos are used by lecturers as reported by Biddixa, Chungb and Park (2016) who examined the use of mobile technology by 59 Korean and US lecturers. Technology such as computer, interactive boards, web casting and screen casting, podcasting and multimedia projectors can be used for teaching especially for course delivery (Yusuf & Balogun, 2011). This technology will allow for interaction between the lecturers and the students and consequently, learning is improved.

Biddixa, Chungb and Park (2016) investigated the use of mobile information and communication technology by 59 faculty (39 Korean and 20 US) and the findings revealed that the Korean faculty used smart phones for presentation, writing or support; searching and verify online information and resources online and content explanation and for team discussion. The US faculty used smart phones for chatting with students, setting-up student groups or schedule student meetings, use videos or recordings to teach units, demonstrate or show materials with a laptop and give assignments. The findings further revealed that US faculty engaged in course management activities, such as posting information, creating resources and grading assignments, at higher rates than Korean faculty and this was because a course management system had been deployed in the US institution (Biddixa et al., 2016). The perception of the faculty on use of technology by the Korean faculty was somewhat effective (42.6%), while it was very effective for the US faculty (31.6%).

Social media can also be used by lecturers for teaching. Sohair, Moustafa, Ghandforoush and Khan (2016) investigated the use of social media for teaching by faculty in eight public higher institutions offering tourism and hotel management programs in Egypt using a questionnaire and reported that social media was a teaching and learning tool but its use was at minimal level. Lecturers could also use web cam for carrying out their responsibilities. Webcam based proctoring was used by faculty to monitor an online examination using an experimental group and a control group and reported that it deterred deception and dishonest during the online examination (Hylton, Levy & Dringus, 2016)

Onwuagboke and Singh (2016) reported that the use of technology by lecturers for instructional purposes in five universities in Imo State, Nigeria was generally low ( $X = 2.19$ ). This result was presented from a study conducted among 300 lecturers in colleges/schools with the aid of a questionnaire. However, the use of technology for searching and retrieving information and resources on the Internet ( $\bar{X} = 3.268$ ); developing teaching materials ( $\bar{X} = 3.169$ ); and typing test and examination papers ( $\bar{X} = 2.971$ ) was average. The authors attributed the low use of technology to low level of availability of ICT resources which hinders the use of technology by faculties for teaching. This is confirmed by Mdebeku and Azu (2014); Onwuagboke, Singh and Onwuagboke (2014).

Technology adoption in classroom by lecturers is necessitated by their attitude, perception and institutional support (Akinde & Adetimirin, 2017b). The authors in their study on 211 Library and Information Science lecturers' use of educational support systems in 27 universities in Nigeria reported that computers, printers, mobile and hand held electronic devices, scanners, electronic whiteboards or interactive boards were moderately to highly used (>48%). Videos, camcorders and webcam were never used (>49%). More than two thirds of the respondents indicated that the use of technology was made easy especially to regularly update course content (75.0%) and store and secure lecture notes (68.1%). The implication of these results is that lecturers will use technology because it is perceived as easy to use. Technology

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integration into teaching is globally accepted by lecturers, although its use entails rules and regulations that lecturers should be aware of to avoid its violation. This is referred to as ethics.

## **Ethics**

Teaching is a profession and it entails behavior which is specified by teaching associations to guide the lecturers on good behavior and anyone that behaves contrary to such rules is disciplined. The appropriate behavior as a lecturer based on adherence to rules and regulations is referred to as ethics. Adebayo and Mabawonku (2017) explained ethics as the moral assessment or guidelines that specifies or judge what is right or wrong in a profession. Ethics involves taking decisions by individuals based on the identification of good or bad behavior which may not be appropriate legally.

Lecturers are expected to perform the role of teaching within ethical guidelines that is they must not contravene any of the ethical rules of their profession. This is emphasized by Dahl-Michelsen and Groven (2017) who reiterated that “all professionals should practice their profession in an ethical way” (pg 67). Maphosa, Bhebhe and Dziva (2015) averred that “ethics involve the idea of knowing what is right and wrong in your professional life and involves taking correct action and still following what you believe” (pg. 267). This was affirmed from a review of literature from many studies by Mehta (2015) that ethical issues are challenges to individuals because it is difficult identifying good or bad.

The Internet has allowed easy access to electronic information resources and as such care must be taken in order to use them appropriately to avoid contravention of the ethics of using them through copyright infringement and plagiarism. Igudia and Hamzat (2016) stated that the “Internet has led to the upsurge of plagiarism and copyright infringement of electronic contents. This has transformed into a serious problem in all countries of the world” (pg. 106). The authors defined copyright infringement as the illegal or unauthorised use of copyrighted material in a way that violates the copyright owner’s exclusive rights. Plagiarism is an unethical act and is the art of using the ideas or works of an author without acknowledgment (Yadav *et al.*, 2016). These unethical acts should be avoided by lecturers in their use of technology for teaching.

## **Relevance of Ethics for Lecturers**

Lecturers are involved in teaching students, but they are also expected to be role models for the students in order for the students to imbibe moral uprightness and become good citizens in the society. Therefore, lecturers should be good examples to these students in terms of character and this involves abiding by rules and regulations guiding their responsibilities in higher education institutions (HEIs). This is affirmed by Maphosa *et. al.* (2015) who reflected on the importance of lecturers to be honest, act honourably and behave according to rules guiding their duties as they are role models for learners. The way lecturers should behave at work to ensure quality learning takes place is highlighted is provided in the ethical guidelines (Maphosa *et. al.*, 2015).

Lecturers download materials from the Internet, online databases, and electronic resources such as open educational resources (OERs), videos, power point slides, pictures, images, books, journal articles and others for various purposes such as preparing their lectures, research and self-development. The use of these materials is guided by ethics and this requires the appropriate use to avoid violation of any ethical rules. However, the integration of technology comes with appropriate rules and regulations guiding its use, Therefore, lecturers must be aware of such ethical guidelines.



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Munoli, Niveditha and Deepthi (2017) reported that medical ethics is being included in the curriculum of medical schools in many countries for health professionals to acquire ethical education required when they begin to practice. This became necessary because it was discovered that the health professionals encounter ethical issues when carrying out their duties and this becomes challenging to them due to lack of knowledge about the ethics of their profession, which the traditional medical training did not cater for.

Lecturers deploying technology for teaching expect students to submit their assignments, access the learning management systems, use the interactive boards and multimedia projector and recorded videos and other course materials to improve their learning. Lecturers must be knowledgeable in ethics to know how to source, retrieve and use materials for teaching without violating any ethical law such as copyright infringement and plagiarism.

There are many information materials available electronically and is open access, which allows users including lecturers to have access without any restriction. Lecturers who find materials under open access may use them without considering the copyright on such materials and may infringe on the copyright of such materials. Copyright infringement can occur in different forms, such as duplication of work, rewrite a copyrighted work, perform a written work or any other form of unauthorised uses of a copyrighted work without due permission. Igudia and Hamzat (2016) reported that copyright infringement include attitude such as “replacing words without citing being the highest followed by copying and pasting, photocopying of downloaded internet content, using the exact words of someone else without quotations and without citing the source, submitting another person’s work and downloading and using pictures” (pg. 204).

Plagiarism is defined as “copying a text, a paragraph, or some sentences without quotation marks, to explain and interpret ideas from a source without citation or with the inaccurate citation” (Soltany, Abdekhoda, & Habibi, 2018, pg. 407-408). It can also be explained as the “unauthorized appropriation of author’s work, ideas, methods, results, or words without acknowledging the source and original author” (Titus, Wells & Rhoades, 2008). Plagiarism has been adjudged to be the most common unethical conduct among lecturers as it is a theft of intellectual property of an author’s work (Kumari, Langer, Singh, Gupta, Sharma & Gupta, 2018). The authors attributed one major reason for the increasing trend of plagiarism to the use of technology which allows for easy access and retrieval of information resources (downloading) from electronic sources such as the Internet, thereby facilitating copy and paste.

The acts of plagiarism when using technology include: “loading from sources with free access, copying articles from web-based electronic databases, copying articles from local databases, and cutting and pasting content from different sources. Failure to insert quotation marks when quoting is the case of forging documents” (Soltany et al., 2018, p. 407). Lecturer’s attitude towards plagiarism will determine if they will engage in the unethical act. Lecturers that have negative attitude towards plagiarism will not commit such act when searching for electronic information materials for teaching, whereas lecturers with positive attitude towards plagiarism will not find it difficult to plagiarise. Kumari et al. (2018) investigated the attitude towards plagiarism of 93 lecturers and 67 senior residents in Government Medical College, Jammu, India which is the only public medical school with the aid of a questionnaire. Their findings revealed the mean scores for the positive domain, negative domain, and subjective norms of the attitude to plagiarism (ATP) scale were  $30.54 \pm 6.7$ ,  $24.34 \pm 2.9$ , and  $28.72 \pm 6.6$ , respectively, indicating a positive attitude towards plagiarism by the lecturers and senior residents.

## ***Technology Adoption for Teaching***

### **Theoretical Framework**

The theory adopted for this article is the deontological theory of ethics which emphasised the importance to behave and uphold moral values. “The deontological class of ethical theories states that people should adhere to their obligations and duties when engaged in decision making when ethics are in play. This means that a person will follow his or her obligations to another individual or society because upholding one’s duty is what is considered ethically correct” (Hanson, 2015 p.78). The deontological theory states that the morality of an act lies in something other than, or in addition to its outcomes. It may involve acting according to what one judges as one’s moral duty, or according to principles or rights that are binding on one’s behaviour, such as telling the truth (Hanson, 2015).

Lecturers will uphold the ethics in the use of technology for teaching when they are aware, informed and knowledgeable about the relevance and consequences of good ethical behavior to themselves, the university and the society. They will therefore, not be involved in acts of copyright infringement and plagiarism because they have ethical knowledge and so avoid such unethical behavior.

### **Educating Lecturers on Ethical Issues**

Lecturers need to be enlightened on using technology ethically as they are expected to be role models for the students they teach. However, it should not be assumed by the institution that because they are lecturers, they are aware of the ethics of using technology. Munoli et. al., (2017) in a study on 50 lecturers in ESIC medical colleges in Bangalore to investigate their knowledge, attitude and practice of research ethics using a validated questionnaire reported that majority (76%) had no training in research ethics and 96% felt it was not wrong to fabricate data and more than 90% of the respondents were favourable towards research ethics training. The authors therefore, advanced that medical ethics should be taught as a compulsory postgraduate module to equip the lecturers with the knowledge of research ethics.

A university has a role in educating the lecturers first by having a policy on ethics and ethical behavior and making the lectures aware of this policy. Lang (2013) stated that a university should have an academic integrity policy to educate both lecturers and students on good ethical values so that they do not engage in such unethical practices. The academic integrity policy should also include the use of anti-plagiarism software which the University is expected to provide and lecturers should be aware and educated on its use to avoid unethical behavior when searching, retrieving and using electronic information resources from the Internet and other sources.

The education of lecturers can be achieved through information literacy programmes that will educate lecturers both newly employed and others on appropriate behavior when using technology for teaching. This literacy programmes can be coordinated by the library and its goal is to periodically inform lecturers about good ethical behavior in the use of technology for teaching. The library can also do this through the production of short videos on academic integrity, what it entails and why it is important and how to upload it. The use of short videos is supported by the International Center for Academic Integrity as a means of educating lecturers and students on academic dishonesty (ICAI, 2014). The library should also educate lecturers and students on the acquired anti plagiarism software by the university and how it can be used to show the originality of an individual’s work. The students can acquire ethical education from their lecturers who discuss ethics within each course and when given assignments and this constant reminder will reinforce good ethical values to the students.

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The acquisition of ethical education is important for lecturers to enable them to behave appropriately when using technology. This is reiterated by Maphosa et. al. (2015) who averred the need for good professional conduct and concluded that courses and modules on professional ethics should be taught to prospective lecturers in universities before graduation. The authors reported that continuous professional development such as the provision of courses or modules should also be given to lecturers regularly to remind them of good ethical behavior and lecturers with good ethical behaviour should be commended, while those with bad ethical behavior should be punished. This will instill good ethical behavior in lecturers.

## **CONCLUSION**

Technology integration into teaching is presently a common feature in universities in many countries due to its enormous benefits to both lecturers and students. Lecturers use electronic information resources from the Internet and other sources to enrich their course and content delivery. However, the appropriate technology must be used to meet the diverse learning needs of the students. The use of technology is guided by ethics and lecturers should be aware of ethical issues such as plagiarism, copyright adherence to avoid violating them. Lecturers should therefore, be educated on ethical issues on the use of technology for teaching through the knowledge of ethical policies of the university and regular information literacy programmes by the library. This will equip the lecturers with ethical education and they will portray good ethical behavior and subsequently imbibe such to the students they teach.

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