

Practical Assessment of ICT in Teaching and Learning: Contextualizing an ICT Impact Assessment Model

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Abstract

Less than a decade after University of Ilorin, Nigeria launched the platform for teaching and learning with ICTs, it ranked first among Nigerian universities web popularity in 2009. Researchers took interest in this fact and decide to put an ICT impact assessment model for developing countries on ICT deployment in teaching and learning in context of the University. Using classroom observations, the 4-component model was used to assess the impacts ICTs have on lecturers' teaching and students' learning, the level of ICT integration, the incentives available to lecturers and students and the challenges that impede succesful integration of ICTs in teaching and learning. These observations were used to understand the phenomenon at the University of Ilorin and recommendations were made based on the findings. The observation procedure, the contextualization of the model in the setting and the deduction of outcome from the observation are presented in this case for reference purposes.

Keywords: Practical Assessment, ICT, Teaching and Learning, Impact Assessment Model

Organization Background

The University of Ilorin (UNILORIN) ranked first among Nigerian universities and tertiary institutions going by the assessment of the nation's international colleges and universities web popularity ranking in 2009 (ITU, 2009). It has since been vigorously pursuing its mission to provide a world-class environment for learning and research through the Computer services and Information Technology (COMSIT) Directorate. COMSIT oversees the deployment of ICT facilities in the university and coordinates the activities of the three units (Computer Training Unit, MIS Unit and Computer Network Unit) under it for effective ICT implementation across the university.

The computer centre is the training wing for the university's ICT implementation. It conducts information technology training for staff and students at a discounted rate and for the public at reasonable prices. The training conducted by this unit includes ICT curriculum integration training for faculty members and use of software in the sciences and social sciences. Its other functions include computer maintenance, data processing, information retrieval and management (Unilorin Comsit Directorate, 2015).

The MIS unit on the other hand handles staff and student information, the staff, undergraduate and postgraduate database and portals. The activities of this unit include online application, index of courses, student registration, course registration, assigning courses to lecturers and online payment. The campus network unit however maintains support services like email services, internal networks and ensure security, less loss of data, long term project durability and sustainability. Services provided in this unit also encourage students to check their timetable, curricula online and courseware (Unilorin Comsit Directorate, 2015)

The University is stopping at nothing to ensure that its community builds a sustainable ICT workforce. This is evident in the number of on-going ICT projects and future initiatives mapped for the university like the e-library and the digital literacy curriculum. Other activities that have received considerable attention by the university include: Cyber Security seminar, Video Conferencing, University Library Services Automation, On-line SMS and life-meeting facilities. For training and content enrichment; the Computer Appreciation Certificate for undergraduates, Microsoft IT Academy, and Learning Content Development Software (LCDS) are also put in place. To facilitate the revolution, the University is procuring additional hundreds of computers and enhanced capacity building of the University human resources (UNILORIN Bulletin, Feb., 2009).

ICT capacity building has been expanded tremendously in the University with the execution of a robust website, a seamless and sustainable Internet facility that is being extended from the campus area to the residential area. A provision in the form of helpdesk and technical staff in all faculties are also available. The officers assigned for these operations are the faculty officers, operators and emergency response team. They are in charge of academic publications, students' registration, Internet services, application software, undergraduate and postgraduate portals.

Courseware was also developed by the University for students' use and this facilitates interaction between students and lecturers. It is a faster way to post lesson notes, track students' participation, ask questions and provide feedback. Among other proposed ICT projects in the university include mobile learning, fibre optics backbone to transmit almost 100% of data, tele-

presence and videoconferencing (UNILORIN, 2008). Having acknowledged the endeavour of UNILORIN in putting a massive ICT structure in place, it became imperative to assess the impact the deployed ICT facilities have on students' learning and lecturers' teaching.

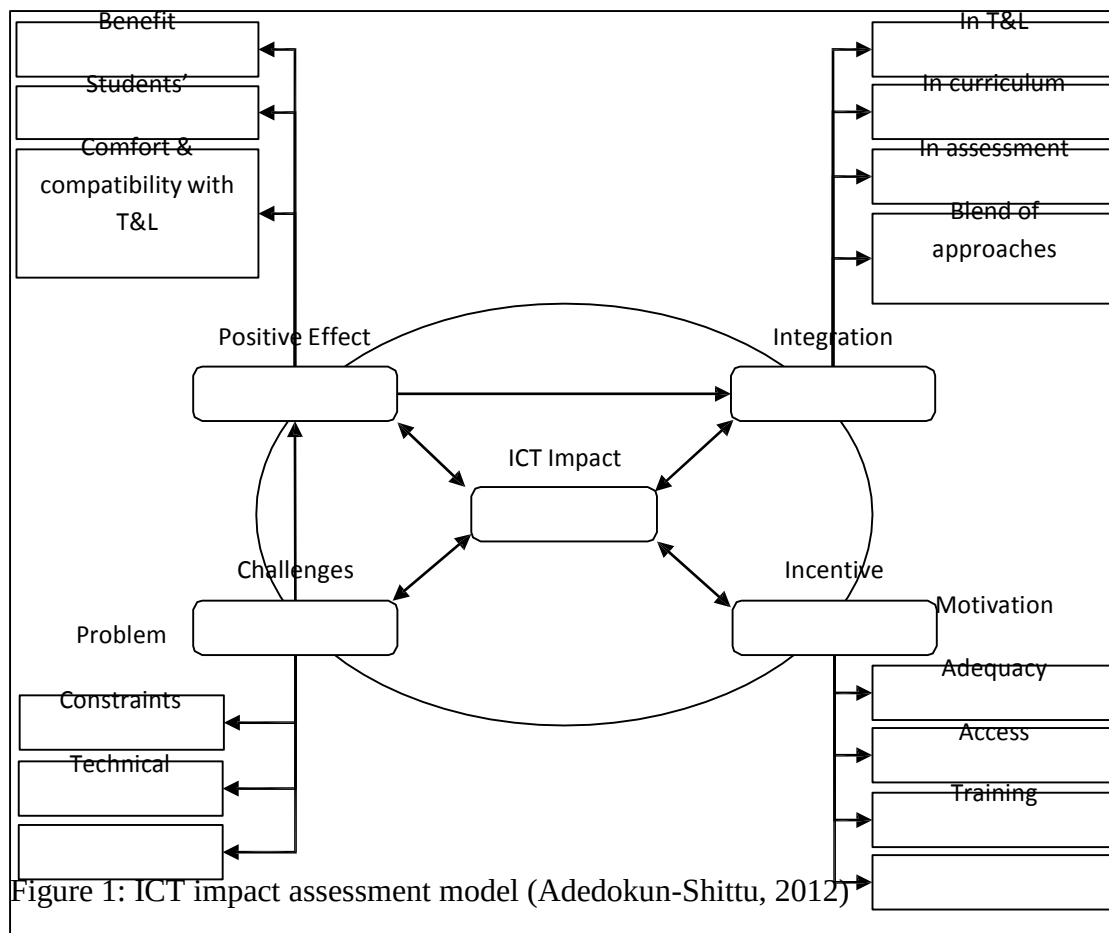
Preliminary investigations conducted by this researcher revealed that no impact study has been carried out on ICT use at UNILORIN since the deployment of the campus-wide ICT initiative. Likewise a review of the university's publications (Ilorin Journal of Education (IJE) and the UNILORIN Academic Staff Publication as at 27th July, 2009) shows no evidence of any study of this nature conducted at the institution. This is however limited to the researcher's knowledge based on search from the university's publication. Hence, assessing how ICT is deployed at this university and its impact on teaching and learning is crucial. It is also essential to determine its reach on the intended users (students and lecturers) and how it can be improved to meet educational goals.

Authors (Ololube, Ubogu & Ossai, 2007; Yusuf, 2010) have identified that Nigeria, being a developing country with an emerging thrust in technology and gradually deploying technology because of its prowess, has failed to consider evaluating the impact of technology on the system it is deployed for. Trucano (2012) also lamented about the situation in developing countries that the lack of evaluation tools and methodologies for the assessment of ICT impact on teaching and learning constitutes a limitation. In an attempt to respond to this limitation, this study thus assessed the impact of ICT in teaching and learning in UNILORIN by putting Adedokun-Shittu (2012)'s ICT impact assessment model to work.

Putting the Model in Context

The ICT impact assessment model (Adedokun-Shittu, 2012) is presented in a cyclic form to indicate the central strength all the elements in the model provide to ICT impact. Each of the elements has an individual and collective effect over the cause. They form four strong pillars for the foundation of the impact ICT will generate over teaching and learning in education. Its cyclic representation also depicts that assessment of ICT impact on teaching and learning can start from any of the four elements.

The positive effects derived from deploying ICT facilities into teaching and learning could be assessed earlier or the incentives provided in the form of training, mentoring and adequate facilities could follow. The level of usage and integration of ICT in the curriculum, assessment and pedagogy could also be measured before looking at the barriers and challenges to the limitation in the level of integration. This process could be reversed to suit the situation or the researchers' discretion. The layout of the model is illustrated in Figure 1.



Positive effects in this model comprise benefits, students' response and ICT compatibility/comfort in teaching and learning. The benefits include; ease in teaching and learning, access to information and up to date resources, online interaction between staff and students, establishing contact with the outside world through exchange of academic work and achieving more in less time are some of the contributions of ICT to teaching and learning. This model depicts students' response to the use of ICT as students' punctuality and regularity in class, attentiveness, high level of ICT appreciation, interactive class, students enjoy ICT-enabled classes, contribute greatly in class and prefer online assignment to offline exercises. The use of Internet to search for resources and use of softwares make students pleased with the product of their learning with ICT and assist their comfort level. Lecturers' proficiency in ICT skills also aid their comfort level and their ability to adapt it to their teaching needs (Adedokun-Shittu, Shittu & Adeyemo, 2013).

Another component of this model is incentives and it comprises four issues that include accessibility, adequacy, training and motivation (Adedokun-Shittu & Shittu, 2015). Wagner et

al. (2005) in their conceptual framework for IT listed equipment, software and network as infrastructure and they highlighted software use, equipment operation and instructional integration as required training. They also emphasized the need for professional, administrative and technical support for teachers and students which are all part of incentives in this model. It is thus implicit that these incentives need to generate some impact to be felt in the area of integration into teaching and learning before the deployment of ICT facilities in Higher Education Institutes could be deemed productive (Adedokun-Shittu & Shittu, 2014). Hence, the fourth part of this model is integration. Some of the areas where integration is required are; ICT integration in teaching and learning, ICT integration in curriculum, ICT-based assessment, and a blend of ICT-based teaching and learning methods with the traditional method (Adedokun-Shittu, 2012). Wagner, et al. (2005) recommends that any plan for monitoring and evaluating ICT should elaborate on how ICT is integrated into the curriculum, the pedagogy, and assessment.

Challenges in this model include problems, constraints and technical issues. Among the problems are plagiarism, absenteeism and over reliance on ICT. Constrains identified especially in the Nigerian context are: large students' population, inadequate facilities and limited access in terms of working hours, insufficient buildings for the conduct of computer based exam, insufficient technical staff, no viable policy on ICT in place and epileptic power supply. The technical issues revolve around hardware, software and Internet services. Challenges is a crucial part of this model, no matter how perfect an implementation is, it will definitely have some loopholes that need to be observed to achieve optimal benefit. Likewise the essence of assessment or evaluation (formative or summative) is to examine if an implementation is achieving its desired goals. Thus, to determine this, it is essential to foresee any immediate or future challenges to the successful implementation of the program.

Specifically since this model is on ICT impact assessment and ICT is an ever evolving subject; it is appropriate to assess from time to time, the challenges, the gaps and updates needed to meet up with the developing nature of ICT required in the education system (Adedokun-Shittu, 2012). A confirmation on this could be made through the concluding words of Wright et al. (2007) study which assessed how blended model improves teachers' delivery of education curriculum. Concluding on the problems encountered by both teachers and students in the blended model, they resolved through Murphy's Law dictum thus; "... 'Anything that can go wrong will!' certainly applies to technology.... These issues of access and connection speed continue to present challenges" (p. 59).

Methodology

Classroom observations were conducted across three classes from three faculties of the University of Ilorin to see how the deployed ICT facilities are utilized and integrated in teaching and learning. The ICT impact assessment model (Adedokun-Shittu, 2012) helped in the development of the observation protocol (Table 1) used to guide the classroom observation. It directed the researchers on what and how to observe the phenomena in the class to be able to properly assess the impact of ICT in teaching and learning in the university. The researcher-designed observation protocol used to guide the classroom observation was thoroughly developed after an elaborate review of researches that employed observation as a data gathering technique and careful preliminary investigation of the study site. The observation protocol checklist (Table 2) was validated by two experts on qualitative observation. The checklist contained items to look out for during the observation such as ICT facilities in the class, the ones utilized and the instructional strategy adopted by the lecturer. Others include students' reaction to the lecturers' teaching approach, student-lecturer interaction and technology interaction, their ICT proficiency and technical challenges. Field-notes and indexed video recording of the observation were made for validity purpose.

Three classes, one each from the faculties of Law, Communication and Information Sciences, and College of Medicine, were observed. All the classes were postgraduate classes because as at the time of collection of data, undergraduate students were in their exam preparation week and all their classes had been wrapped up for them to be set for the exams. Thus, postgraduate classes were chosen for observation. A Masters of Business Administration class under the Faculty of Communication and Information Sciences was first observed followed by a Masters of physiology class in the College of Medicine and lastly, a Masters class in the Faculty of Law, each with a duration of two hours. Descriptive interpretations of the class procedures are presented in sequence and the data gathered from the observation is situated under the corresponding components of the ICT impact assessment model for validity purposes.

Descriptive Interpretation of the First Lecture Room Observed.

This is a programme under the Faculty of Management Science taught by a lecturer in the Faculty of Communication and Information Sciences (CIS). The course is specifically designed for professional health workers under Masters of Business Administration (MBA) to help them adapt the information and communication technology into their work practices. This class was chosen to be observed because it is one of the classes taught by a resource lecturer in

CIS. The first 10 minutes of the 2 hours lecture between 12 pm and 2 pm on the 14th of July, 2010 was spent setting up the ICT facilities, connecting to the Internet and loading the softwares to be used. Among the facilities used included a laptop, projector, whiteboard used as the screen for projection and a flash drive sized Internet modem used for Internet connection. As the topic (Computer Application in Health Analysis) indicates, the lecturer demonstrates how budgeting can be made by utilizing the Excel spreadsheet 2007 to make simple calculations using household examples which is really appealing to the students who are majorly housewives and breadwinners. She explains that the beauty of Excel spreadsheet in calculation is that once the formula for the problem is defined, the outcome changes automatically whenever any value is changed.

She added that the same calculation table can be done in Microsoft Word but the accuracy is higher in excel since it has to be done manually in Microsoft Word. She explained how to save, manipulate data and manage a large volume of data on Excel spreadsheet. She spent 15 minutes on this exercise during which she allowed questions and contributions from students; the session was quite interactive. She explained and compared how EPI info version 6 and SPSS version 15.0 can be used to analyze data from excel spreadsheet. She explained that EPI info is a free software on the Internet and it can be used to summarize or do a detailed analysis of statistical data. She shows the process of how data can be uploaded from the data source to the Epi Info for analyses. The class subscribed to a yahoogroup account where assignments are uploaded, submitted, assessed and feedback given. She adopted a time management strategy during the course of the lecture knowing well that the Internet connection is slow. Thus, she has initiated the Internet connection and navigated back and forth to connect to Yahoo homepage and sign in to the university's email account and check whether it has fully loaded or not. She wrapped up the session at 1.55p.m.

Table 1: Observation Protocol

Issues	Sub-Issues	1st Lecture Room	2nd Lecture Room	3rd Lecture Room	Theme
Lecture Room Description	Faculty	CIS – Professional Health workers MBA	Medicine - Physiotherapy	Law	
Subject	Topic	Computer Application in Health Analysis	Gastrointestinal Secretion	Seminar Presentation	
	Content	Budgeting with Excel Spreadsheet 2007, EPI info version 6, SPSS version 15.0	Process and phases of gastrointestinal secretion, graphical representation of the pancreas	Arbitrators' Confidentiality in Nigeria	
Instructional aids	Types	Laptop, projector, software, whiteboard as projection screen, flashdrive sized internet modem	laptop, LCD, software, PowerPoint, whiteboard, wireless internet	Textbook, laptop, Whiteboard, wireless internet	Integration
	Usage	70% ICT usage, 10% Setting up, 20% Teacher explanation	80% ICT usage, 20% Teacher explanation	95% oral presentation, 5% ICT usage,	
Lecturer	Teaching strategy	Blends ICT with traditional teaching, Time management strategy, Emailing for assignment submission, assessment, feedback Yahoogroup: communication, material and info sharing	Blends ICT with traditional teaching, PPT presentation slides, Moodle for assignment submission, feedback and assessment. Web Search for supportive materials and references	Traditional aided by ICT	
	ICT skill	Good	Excellent	Good	Incentives
	Mastery of subject	Good	Good	Good	
Students	Attitude	Noisy but participatory	Attentive and participatory	Attentive, interactive & participatory	Positive Effects
	Attention	On the lecturer and the LCD as directed by the her	On the PPT presentation slide and back on lecturer during explanation	On presenters, reactors, and lecturer	
	Reaction	To lecturer: interactive To content: confused then understand after clarification To ICT: Normal to some, challenging to some, strange to some To question: responsive, Students ask questions	To lecturer: attentive, inquisitive To content: confused then understand after clarification To ICT: Normal, not strange To questions: responsive, challenging, interactive Students ask questions	To presenter: attentive To content: understand, reactive To ICT: not ascertained To question: responsive and challenging. Students and lecturer critique presentation	
Technical issues	Technical Problem	Yes – Initial setting up problem, slow internet connection	Yes – power failure	-	Challenges
	Technical Assistant	No	No	-	

Descriptive Interpretation of the Second Lecture Room Observed

Around 10 minutes before the class time (10am – 1pm) on the 15th July, 2010, some of the students in this class (male) went to the department office to collect the ICT facilities that has been booked for use in this class. They installed the LCD and displayed the projection screen before the lecturer entered. The lecturer's laptop was used for the lecture so he started it and opened the PowerPoint slide he has prepared for the day's lecture which is titled;

“Gastrointestinal Secretion”. The PowerPoint presentation contained both text and graphics enhanced with different colours to show some of the process occurring in the stomach and specifically the gastrointestinal. He also used graphical images to show the different phases of gastrointestinal secretion such as gastric phase intestinal phase and the cephalic phase. While the lecturer rolled the slide, he explained the graphics and the text prepared in the slide and asks questions intermittently and demands if students have questions to ask. However some students were preoccupied with some other activities like Internet surfing and mail checking but some others were attentive and making notes.

Descriptive Interpretation of the Third Lecture Room Observed

This class was not teacher-directed; it was a seminar presentation session. Prior to this day 15th July, 2010, the lecturer had assigned topics to individual students to prepare a printed copy for presentation during the seminar and a softcopy for submission to the lecturer. Three students were scheduled to present but just two of them could make it because the review and critique from the lecturer and students took longer than anticipated. The lecturer introduced the presenter and her topic and allotted 20 minutes for her to make her presentation. She highlighted some salient points on the issue and gave relevant examples. During her presentation, the lecturer sought some clarification on her reference to a particular point she raised and she pinpointed where the reference is in the printed copy of her presentation. There and then, the lecturer searched for the author and the link she quoted on the Internet and he confirmed the authenticity of her remark. This was the only point at which ICT facility (lecturer’s laptop connected to wireless Internet) was utilized in this session. It could be seen here that the lecturer was quite comfortable with ICT but it is difficult to ascertain the students’ proficiency and comfort since they did not make use of ICT in class but from the output of their work it could be inferred that they are somewhat comfortable with ICT use.

Inferences from the Observation

The first two classes observed were ICT-based while the third class was traditional complemented by ICT. Necessary ICT facilities like laptop, projector, LCD, whiteboard, projection screen, Internet were available for teaching in both classes (though they were not readily installed) except that the whiteboard was used as the projection screen in class one and the Internet is not wireless; it is a modem enabled Internet service. This presumably caused the slow Internet connection experienced in the class but this was not an issue in the second class because it has a wireless connection. Class two though experienced a little hitch when power went off but it took just few minutes to be restored.

Lecturers and students in both classes used ICT proficiently and comfortably in teaching and learning except for a few students in the first class who are not proficient in ICT use yet. Though ICT access in these classes gave room to students in class two who were preoccupied with other activities like Internet surfing and email-checking. Even with the use of ICT in these two classes, the sessions were still interactive and participatory. Class three was more of interactive and participatory because it is traditional in nature but an element of ICT was added when the lecturer searched the Internet to confirm a reference cited by one of the students. The ICT facilities available in the third class were the lecturer's and some of the students' laptop and wireless Internet. The lecturer was quite proficient in ICT use but it was difficult to ascertain the students' proficiency and comfortability since they did not make use of ICT in class. However, it could be inferred from the output of their work that they utilize ICT. Going by this analysis, it could be concluded that the Faculty of Communication and Information Sciences and the College of Medicine are ahead of the Faculty of Law in terms of ICT integration in teaching and learning. It could however be gleaned from the observation that the first two class sessions were teacher-centered despite the high level of ICT integration, while the last class session was observed to be student-centered even though it was more of traditional mode complemented with ICT.

To validate the observation of the teaching and learning process in the University, situating the outcome of the observation under the four components of the ICT impact assessment model - positive effects, challenges, incentives and integration is required. It was observed that both formal and informal students and lecturer interaction was present in the classes which is one of the positive effects identified. Slow Internet connection, power outage, inadequacy of facilities and distractions as a result of ICT access were some of the challenges encountered in the classes observed. This is consistent with some of the challenges described in the model. This is also consistent with the submission of Adedokun-Shittu and Shittu (2014) on the problems of ICT integration in teaching and learning in Nigerian Higher education. Some of the incentives noticed in the observation include availability of Internet service, software and other facilities, good ICT skills of both students and lecturers, and students' participation as motivation. These are perfectly in line with the incentives identified in the model.

Lastly, ICT integration was seen in form of a blend of approach during the observation, though it varied from faculty to faculty. This is practically consistent with what obtains in the classroom observations conducted across subjects (Mathematics and Science) in Adedokun-Shittu and Shittu (2011). They observed that classroom instruction is a combination of

traditional and conventional ICT-enabled teaching. This is also in line with Collis and Moonen (2001) when they substantiated that ICT has clearly become part of the blend, serving as a complement to already existing instructional tools. It was thus ascertained that Computer, Science and Medical Faculties experience a higher level of ICT integration than the Faculty of Law. Even though one form of integration or the other exists across all faculties in the University; it is ascertained that ICT integration does not replace the traditional practice in the classroom; it only improves teaching and learning practices. This is consistent with Adedokun-Shittu and Shittu's (2011) submission that technology alone cannot do the trick but with an interconnected system in place.

Current Challenges

Having deduced the positive effects, incentives, integration and challenges of ICT in the University through the observation conducted, issues on how to maintain and improve the benefits and incentives while resolving the ICT integration challenges arise. An important issue identified is the fact that access to ICT facilities vary from one department or faculty to another within the University. Specifically, Medical and Science faculties have better access and utilize ICTs than other faculties. This situation needs to be fixed such that access is uniform and serves as an incentive and not as a deterrent to ICT integration. In line with this recommendation, Robinson (2007) asserts that a requisite for technology integration is provision of access to all, noting that integration is unlikely to happen in a situation where access is restricted to specific classrooms.

Regardless of the availability of ICT facilities in the University, adequacy of the facilities is also a critical incentive for usage and maximization of the benefits that are integral to ICT in teaching and learning. Training is also recognized as an essential incentive for a proper ICT integration in teaching and learning. Adedokun-Shittu (2012) described personal achievement with the use of ICT in students' academic sojourn, students' marketability, success stories achieved through teaching and learning with ICT as internal motivation. She regarded incentives like accessibility, adequacy and training opportunities, and the university's continued effort to procure more ICT facilities as external motivators for ICT use in teaching and learning. These are all incentives that are needed to generate impact to be felt in the area of integration into teaching and learning before the deployment of ICT facilities in the University of Ilorin could be deemed productive. It was also noted in Adedokun-Shittu (2015)'s study that the areas where ICT integration should reflect in a learning institution include: teaching and learning; curriculum; assessment; and a blend of ICT-based teaching and learning methods with the traditional method.

However, from the observation in this study, the form of ICT integration that took place in the University is more of individual lecturers engaging students in informal and online interaction through social networks like Yahooogroup and email. Some lecturers also make improvisations in class to provide students with relevant and updated information and resources. An element of ICT-based assessment was also inferred from the observation in terms of online assessment and feedback through social networks. This study indicates that there exist some form of traditional-based teaching and learning method in the University despite the lecturers' and students' comfort with ICT-based teaching and learning.

Despite all the edges ICT-based teaching and learning has over the traditional method, it is still assumed that 100% ICT-based teaching and learning should not be an option. A complementary approach based on course peculiarity is suggested for effective teaching and learning. Several authors (Adedokun-Shittu & Shittu, 2011; UNESCO, 2005) support this integrated approach or blended learning that enhances student learning and provide a degree of flexibility. They agree that the ICT-based approach should not replace the traditional method. Rather it should complement each other and harness their benefits to improve student learning.

Summarily, this study suggests based on the observation that access in terms of ICT facilities in laboratories and classes, infrastructures and buildings for the conduct of computer based exam, upgraded and updated software, technical staff, viable policy on ICT and consistent Internet and power supply are required for a sustainable ICT integration in teaching and learning in the university. Likewise, training on how to use ICT facilities in teaching and learning and how to integrate it into the curriculum is essential for students and especially lecturers. This study and other studies on ICT integration in Nigerian education system have found that insufficient training is a critical impediment to successful integration. Prominent among the problems encountered in the university's ICT integration in teaching and learning is power failure, internet inadequacy and less technical support. As such, administrators should ensure that the situation of ICT in the university be reviewed periodically in order to sustain the integration, address some of the implementation gaps and correct any problem encountered with ICT use in the system. Finally, the ICT impact assessment model employed in this study emphasized that no matter how perfect an implementation is, it will definitely have some loopholes that need to be observed to achieve optimal benefit. Likewise the essence of assessment or evaluation (formative or summative) is to examine if an implementation is achieving its desired goals. Thus to determine this, it is essential to foresee any immediate or future challenges to the successful implementation of the program. Specifically since ICT is an

ever evolving subject; it is appropriate to from time to time assess the challenges, gap and update needed to meet up with the developing nature of ICT required in the education system.

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**Appendix
Observation Checklist**

Resources/Issues	Comment	Lecturer	Comment	Students	Comment
ICT facilities available		Instructional Strategy Adopted		Students' reaction to instructional resources	
Technology integration		Teaching Approach		Students' reaction to lecturers' approach	
Utilized resources		Lecturer-student interaction		Student-Lecturer interaction	
Under-utilized resources		Lecturer-technology interaction		Student-technology interaction	
Technical issues		Lecturers' proficiency and comfort level with ICTs		Students' proficiency and comfort level with ICTs	
Intervention to technical issues		Lecturers' technical skills		Students' technical skills	
Teaching strategy		Teacher-centred		Student-centered	