

Integrating Information Communication and Technology into Classroom in Higher Education

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Abstract.

This paper describes the rationale for integrating Information, Communication and Technology (ICT) in a classroom environment of higher education institutions. It argued that effective integration of ICT will depends on the way it is deployed and positioned. ICT would facilitate improved students' knowledge and promotes positive attitude toward learning. There is urgent need to provide proactive institutional support in the usage ICT and E-learning in delivering educational materials. If Nigerian students are to compete with their counterparts in the developed world, effort must be made to develop their ICT abilities in an integrative teaching and learning environment. Regrettably, many institutions in Nigeria have invested heavily in the use of ICT but its benefits are yet to be manifested. Choosing a sustainable teaching and learning methods is not a passive process and academic communities are expected to provide additional ICT skills given the complex dynamics of the job market and increasing demand by employers for multi-tasking workforce. Various methodological approaches for knowledge dissemination in an integrated ICT environment are necessity for sustainable education development. Personal development and creation of supportive learning environment with the aid of ICT can bring about the urgently needed changes required in the emerging Nigerian economy.

Introduction

The growth and adoption of information and communication technologies (ICT) has dramatically reshaped the teaching and learning processes in higher education (Pulkkinen, 2007). Given improvement in technology, the use of ICT in higher education of developing economy is more critical today than ever before. The higher education institutions around the globe have increasingly adopted ICT as tools for teaching, curriculum development, staff development, and aid to students learning (Kumpulainen, 2007). Although ICT has the potential to improve educational methods and the quality of teaching and learning, the advantages of ICT are often under-realised (Surry and Farquhar, 1997) and more prevalent in the emerging Nigerian economy. It has been noted that ICT adoptions in many institutions are often poorly implemented resulting from unfounded optimism (Taylor, 1998).

Sadly, significant numbers of academia are still hesitant or reluctant to adopt technology for teaching tasks (Jacobson, 1998). Research has found serious obstacles in integrating ICT in teaching and learning processes of higher education (Becta, 2004). Further, there are no holistic solutions to the problems of ICT adoption as is often seen as mere technical issue. Furthermore, the rate of adoption is affected by factors such as economic, sociological, organisational, and psychological variables (Straub *et al*, 1997). In another inter-cultural study, Pelgrum (2001) argued that there was a substantial variation regarding the most significant barriers to ICT between academia in different economies.

This paper reviews literatures in public domain that identify issues in relation to the use of ICT in teaching and learning environment. It describes the importance of understanding and choosing a sustainable teaching and learning methods that effectively integrate ICT in a classroom environment. It synthesises the rationale for appropriate use of ICT in enhancing teaching and learning in higher education and argued for supportive learning environment that proactively engaged teachers and learners in a sustainable manner. It concludes by identifying the crucial ingredients of quality teaching and learning using ICT.

Historical Review of Integrated ICT Literatures in Learning Environment

Lim and Hang (2003) explains how activity theory is used to study ICT integration from socio-cultural and pedagogical perspectives in Singapore schools. The authors addressed how ICT was integrated for higher order thinking by the students. Taking activity system as a unit of analysis, the authors documented the processes by which activities are shaped in different levels of context. They argued that such understanding is critical to education research where the object of its inquiry is not simply knowledge, but useable knowledge. The authors concluded that effective integration of ICT in a learning environment depends on the way ICT is situated within that larger social cultural environment. Papert (1993, pp. 53) argued that as ICT enters the socio-cultural setting of school, learning are translated into many ways than originally envisaged. Further, Salomon (1993, pp. 189) postulated that no tool is good or bad but its effectiveness depends on how the events, activities and contents are configured and on how the interpersonal processes take place in the context of its usage.

Drawing on socio-cultural theory, Sutherland *et al* (2004) described how teams of teachers embedded ICT in everyday classroom practices as a mechanism for learning enhancement. The authors argued that it is important for young people to be able to work with both digital (word-processing package, computer simulation etc) and non-digital (hand writing, hands-on laboratory etc) tools. It was further stated that students should be engaged in discussion of the relative merits of different tools so as to make them a resourceful learners. Lim and Chai (2004) presented their findings of two case studies (two primary schools in Singapore) aimed at examining where and how ICT's are integrated to engage students in higher order thinking with autonomy over learning processes. The authors argued methodological approaches such as observations, focus group discussions with students, and face-to-face interviews with teachers generate an account of activity systems. The account identifies and describes five

categories of orienting activities: introductory sessions to ICT tools, advance organisers and instructional objectives, worksheets and checklists, dialogues among participants and tools for post-instructional reflection. The authors conceded that constraints of time and lack of knowledge and experience in the contexts that the teachers are working under are limitations of the proposed methodology – such a constraint is peculiar to effective ICT integration in the developing economy.

Electronic Business Systems (EBS) is playing an important role in attaining the effectiveness of enterprise operations. Li *et al* (2008) postulated that many enterprises have been re-directing their resources into critical business areas to keep up with economic and market changes during the past decades. The authors argued that many enterprises have adopted EBS such as Supply Chain Management (SCM), Enterprise Resource Planning (ERP), and Enterprise Application Integration (EAI) for seamless integration of internal processes, suppliers and customers. It was however stated that there is a constant complaint from recruiters that EBS professionals with the right skills are hard to come by. Amongst the remedial actions recommended for narrowing the gap between industry and academia are enhanced training in ICT's; e-marketing; e-business programming; and specialist networking.

Multimedia techniques can act as a means for fostering scientific understanding by presenting students with multilevel scientific thoughts. Su (2008) studied the performance of university students studied sciences using ICT including animation, static figures, power-point, and e-plus software. The author analysed the characteristics of students and their achievements and concluded that the application of ICT in multimedia environment for science teaching will facilitate acquiring the basic scientific knowledge and improved performance - it further promotes a positive attitude toward science learning. Texts integration in multimedia environments helped develop advance and meaningful concepts. Integrated science instruction enables advanced-level students to gain professional scientific knowledge quickly and gives low-level students the opportunity to receive remedial instruction of the scientific curriculum through repeated practice.

Al-Senaidi *et al* (2009) investigated the perceived barriers to adopting ICT in Omani tertiary institution using a survey, five factors such as lack of institutional support, disbelief of ICT benefits, lack of confidence, and lack of time were extracted. The authors stated that the faculty members perceived moderate degrees of barriers in applying ICT to their teaching practices. Group differences based on gender, academic rank, and academic field were generally not found except for the interaction effects on the barriers related to lack of equipment, disbelief of ICT benefits amongst others. The authors indicated that male faculty members with less usage of ICT perceived more barriers regarding the lack of computing equipment, disbeliefs of ICT benefits, and the overall barrier than the female counterparts. The authors called for the need to provide more institutional support, technical training, and personal time for faculty members to learn and upgrade their knowledge and skills in the use of ICT in education.

Vekiri (2010) described an exploratory study of middle school information science in Greece. The author stated that perceived teacher expectations were positively associated with students' ability and perceptions to learning activities. Significant predictor of students' interest in computing, and perceived parental support was said to be related to both value and efficacy beliefs. The author concluded that the study does not support the notion that boys have more positive ICT self-efficacy and value beliefs than girls. However, boys' and girls' beliefs are differentially affected by parents, teachers, and school information systems instruction. Akhshabi *et al* (2011) developed a mobile learning system for a training program where students are able to learn in an authentic learning scenario, in which they can physically face the target, with the personal guidance and supplementary materials from the learning system. In showcasing effectiveness, the authors employed the system on virtual university environment and argued that the developed approach is helpful to students in improving their learning achievements and that most students showed favourable attitudes toward the usage of the mobile learning system.

Bidarian *et al* (2011) discussed the entrance of ICT into educational field as a valuable chance for performing some modifications and innovations that results in efficiency increase. The authors argued that by recognising betterment factors in learning and teaching, the decision makers would be able to effect the required changes. Specifically, the authors focus on educational programmes such as self-regulation, self-learning, self-justice, self-evaluation and innovative thoughts. Muñoz de la Peña *et al* (2012) presented a web-based education tool designed for automating the collection, evaluation and error detection in practical exercises assigned to computer programming and control engineering students. The authors argued that by using student/instructor code-fusion architecture, the conceptual limits of multiple-choice tests can be overcome. It was further stated that the proposed system is able to individually parameterise the exercises for each student and allows an instructor to implement an innovative self-learning techniques in which student can obtain a continuous measure of their knowledge.

Ulmanisa and Denins (2012) described a managerial model for ICT adoption. The authors proposed a decision model based on objective (economic) and managerial (firms level factors) components using a survey of 500 businesses in Latvia in 2008. Confirmation of the theoretical model was accomplished using Ordered Logistical Regression Analysis that revealed that the perceived efficiency gains, technology absorption capacity (i.e. employees openness to change, commitment to learning and overcoming obstacles), and cultural factors (general shift towards more collaboration, and cluster effects) mediate the adoption of ICTs. However the authors argued that earlier primary work supplemented by a survey confirms that ICT use has not changed significantly in Latvia since the beginning of the financial crisis in 2008. The model developed has relevance for policy makers in encouraging ICT adoption and for managers.

Bhuasiri *et al* (2012) adopted Delphi techniques in identifying the critical success factors that influence the acceptance of e-learning systems in developing countries. The authors asserted that e-learning is a popular mode of delivering educational materials in higher education throughout the world. Technology awareness, motivation, and changing learners' behaviour

are the prerequisites the authors suggested for successful e-learning implementations. The study argued that the most important factors influencing e-learning success in developing countries are enhancing basic technology knowledge and skills, improved learning content, computer training, motivating users to utilise e-learning systems, and requiring a high level of support from the education institution.

Rationales and Conception of Integrative ICT in a Teaching and Learning Environment

Regrettably, many institutions in the developing Nigerian economy has invested heavily in the use of ICT in a classroom environment, however its benefits are yet to be realised for the purpose for which it was intended. There are classical failings in the process of requirements gathering, sourcing, procuring and acquiring the proposed technologies which often result in the abandonment of the ICT by the users. It is the position of this paper that the process of choosing a sustainable teaching and learning methods that enhance the quality of student experience using ICT is not a passive process. Hence, the argument for holistic approach in acquiring sustainable ICT technologies that contributes to teaching and learning in a dynamic environment. Stakeholders should note that it is vital to develop a course that interest learners (students) and keep them engaged using the appropriate ICT in an integrative learning environment.

Figure 1 describes the generic conception of sustainable teaching and learning methods. It argues that such conceptions must impact information using the appropriate ICT tools and techniques. Information synthesise is crucial for learners during the course of their academic development and more important on resumption of duties in their life-long learning. ICT plays an important role in transmitting learners' attitude to knowledge. Learners need an attitudinal change to their ill-conceived perception of knowledge; undoubtedly the use of simulation software and other modelling techniques would aid students learning of complex systems in a dynamic learning environment.

Knowledge transmission, learning support, facilitation of understanding and change perceptions are other conceptions where ICT could play a significant role in the learning process. It is however important to argue for feedback mechanism that underpinned efficiency and efficacy of teaching and learning. Adopting holistic approach to teaching and learning would enable decision makers to make informed judgement in sustainable policy framework of pedagogic development.

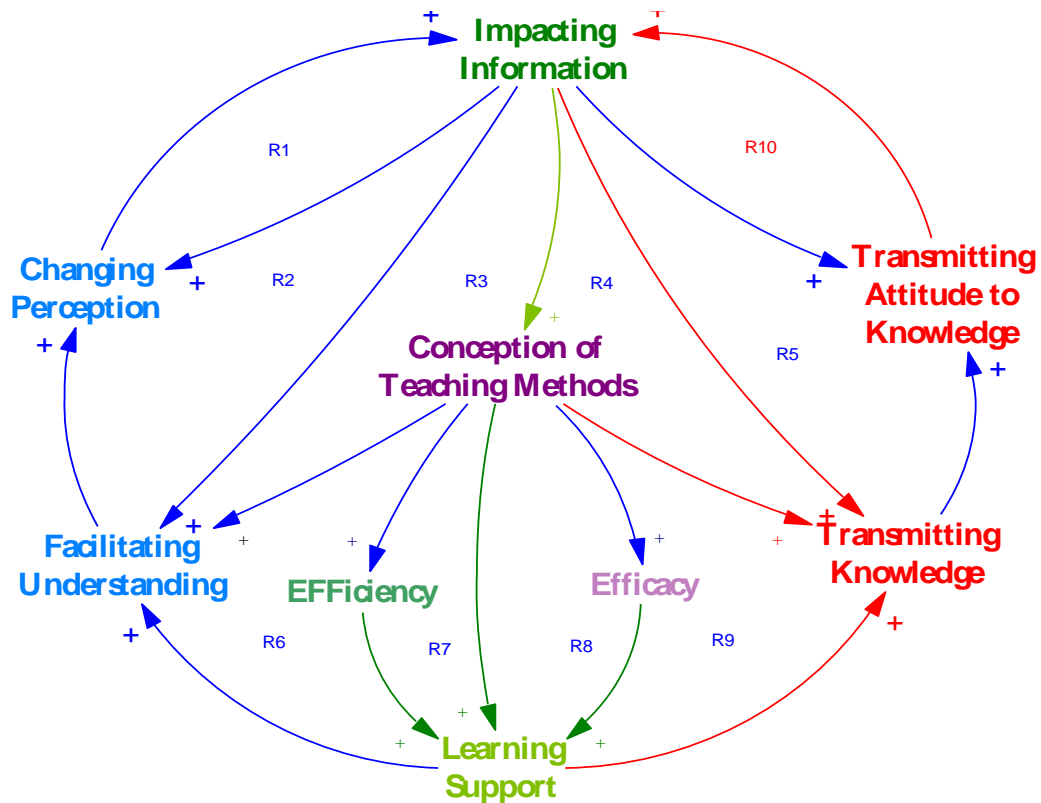


Figure 1 Sustainable Conception of Teaching Methods

Dissemination of knowledge to students is the major reason for the deployment of ICT in modern learning environment. Needless to state that students' development that improves their capabilities to use idea and information is an important aspects in modern academic settings. Further, ability to generate and test ideas as taught in the lecture and tutorial environment are needed in their career development. If students in the emerging Nigerian economy are to compete with their counterparts in the developed economies, effort must be made to help develop their ability to plan and manage their own learning using modern ICT in an integrative teaching and learning environment. Aspect of the need for students' personal development cannot be over emphasised in the emerging Nigerian economy. Given the dynamics of the job market and increasing demand by employers to recruit multi-tasking candidates, it is clear that academic community would have to give their students additional ICT skills, tools and techniques that would allow their students to stand out and compete favourably in the job markets.

Knowledge Dissemination Techniques for Sustainable Learning and Development

Methods adopted in knowledge dissemination plays a vital role in integrating ICT in classroom environment. Figure 2 gives an elaborate overview of the various techniques that could be adopted in teaching and learning environment. Worksheet and directed private study could make use of various ICT based Virtual Learning Environment (VLE) to complement lecture and tutorial sessions. ICT plays a crucial role in handouts development and visitation to gallery and museums via the use of multimedia technologies that aids students learning and development in real time.

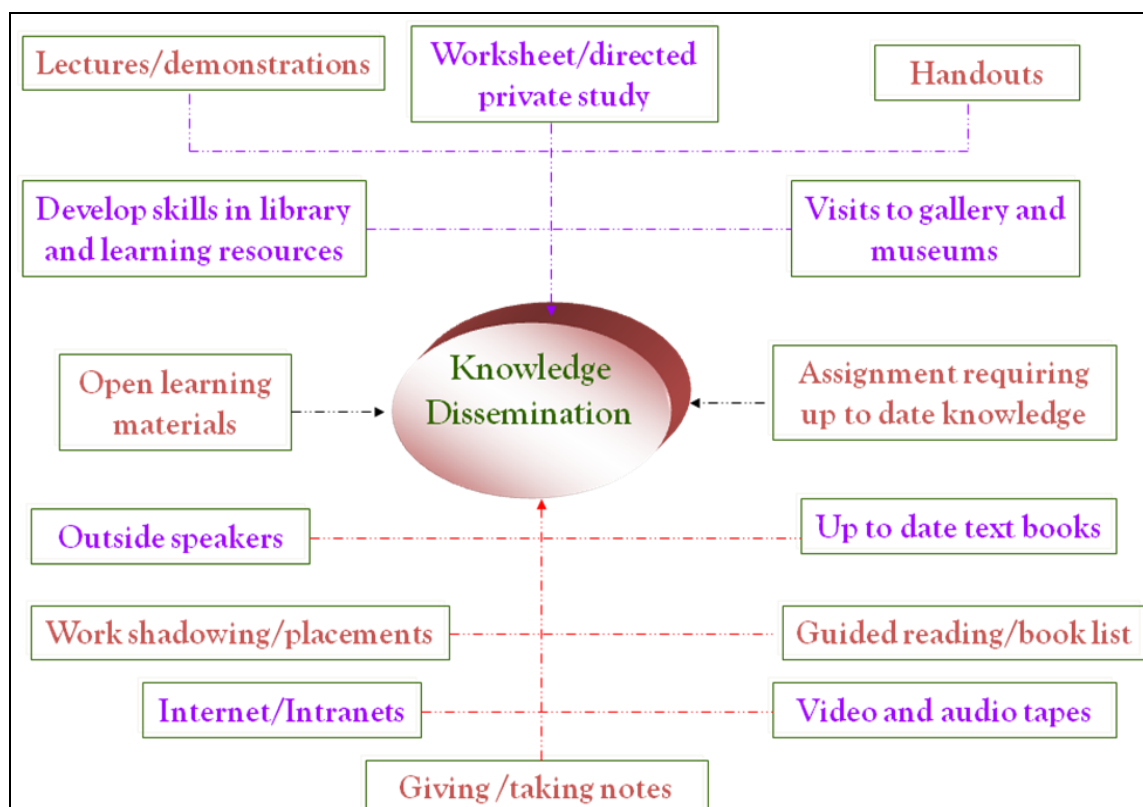


Figure 2 Sustainable Techniques of Knowledge Dissemination

Up to date text books including e-text are now becoming prominent in a global learning environment. Nigerian education institutions should take advantage of ICT enabled environment to develop their students learning and pedagogic development. The role of video and audio tapes in the dissemination of knowledge to students has been fully optimised in many education institutions in the developed economy; however, its uptake in Nigeria has been minimal. The use of modern ICT facilities via video and audio links would enhance learning and development – *students in the southern part of the nation could learn manufacturing processes in the northern part of the country without visiting the sites*. Notes taking and giving can be facilitated using modern ICT facilities including voice recognition software – *this has proven useful for students with learning impairment such as dyslexia*.

The use of internet and intranet facilities for teaching and learning cannot be overemphasised in a modern learning environment. Regrettably, despite the huge investment by many higher education institutions, the utilisations of these technologies are suboptimal and in some cases rejected by the users. The use of open learning materials has been widely adopted in many academic institutions in the developed world; however it is just gaining ground in the emerging Nigerian nation. Open learning materials enabled learners to learn at ease. The use of dedicated Learning Resource Centre (LRC) enables additional learning and development for students throughout their time at the institution. It facilitates knowledge dissemination in the development of students' skills (i.e. language, analytical, basic sciences, ICT etc) in library searches and the use of learning resource materials in modern education settings.

The use of ICT in the development of lecture notes and tutorial supporting materials has been widely adopted in the emerging Nigerian education establishments, however increased adaptation is still required. Management support from the leadership of academic establishments is still urgently required in fostering the adoption of ICT in the development of lecture notes and tutorial supporting materials; technologies of which are widely available in the open market. Training of academics and administrative staff will further encourage the adoption and better utilisation of ICT in lecture, seminar and tutorial preparations.

Facilitating Personal Development and Supportive Learning Environment

The primary purpose of a lecture in higher education settings is to serve as an avenue for '*subject-matter overview and stimulation of interest*' rather than '*dissemination of facts*'. The time limit for a typical undergraduate course is fifty-a minute lecture followed by in-class exercise remains a favourable option. In the case of tutorial, the primary purpose is to serve as an avenue for clarity of objectives (*learning outcomes*) and reinforcement of the lecture themes in a less-structured environment. The expected key outcome of tutorials is to acquire some of the '*personal transferable skills*', e.g. in presentation and group work. Hence academia must master the art of 'personal development' that is imparted on the students. It would include the use of action plan, learning log, group projects, self-help groups, time management exercises, exam techniques, giving feedback, learning contracts, role play, open learning computer packages, peer and self assessment etc.

The ingredients of quality teaching and learning in an ICT enabled environment would start by stating the objective of the session in clear and unambiguous terms. Learning objectives are an integral part of the Unit/Module Guide that are given to students at the beginning of the academic sessions and reiterated in the lecture summaries to avoid being forgotten. Sadly, Academic Accrediting Bodies in Nigeria do not give clear guidance in the development of learning outcomes, objectives, assessment criteria etc and hence leave the Academic Planning of various institutions to do the same. The use of clear overhead acetates and lecture slides with the aid of ICT will enable better learning and development. Academic management ought to support, monitor and assess the appropriate use of ICT in academic delivery of quality teaching and learning. The need for paced delivery to enhance students' learning and

development should be advocated amongst academic staff – the standard rule of thumb is that the larger the class and/or the more difficult the material, the slower the pace. The handouts should be developed with the aid of appropriate ICT in the cases of complex diagrams, difficult or critical text. Question and Answer Sessions should be undertaken at agreed times and places after the lectures. Academic staff should be encouraged to engage the students in the question and answer sessions to evaluate their grasps of the subject matter.

Figure 3 below describes the generic framework for a holistic and supportive learning environment in an academic institution of higher learning. The atmosphere of learning must be stimulating, calm, re-assuring and purposeful. The use of ICT in creating a welcome atmosphere of learning is paramount in many Nigerian academic institution of higher learning. Academia must encourage the relevance atmosphere is sustainable learning and development is to be ensured. Students must be motivated to study and taught on how to share their intellectual properties and proactively developed networking abilities using appropriate technological framework.

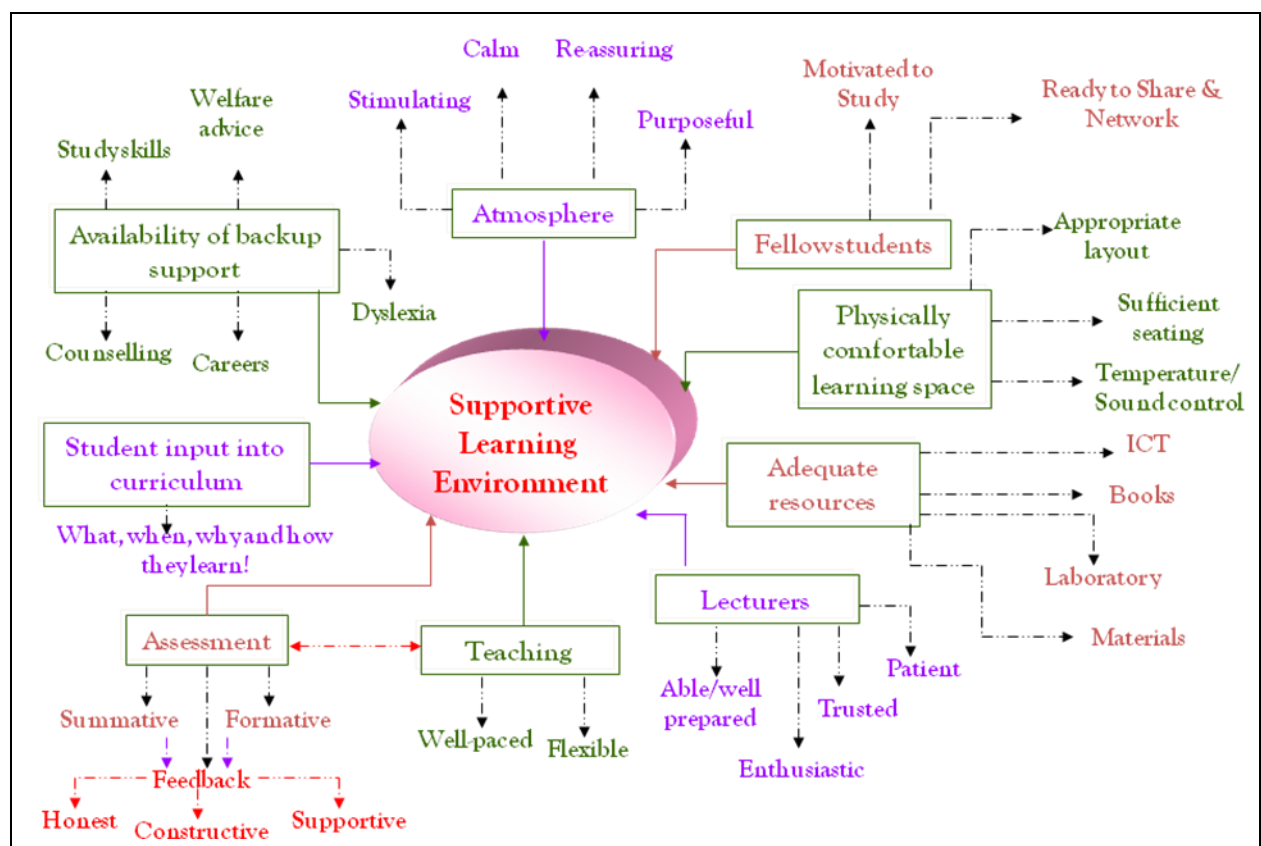


Figure 3 Holistic and Supportive Learning and Teaching Environment

Resource adequacy is a dilemma that is confronting academic institution of higher learning in the emerging Nigeria economy. It ranges from adequacy of teaching and learning materials, laboratory equipments, up-to-date text books, appropriate development of ICT etc. It is hope that with the appropriate deployment of ICT many of the resource shortcomings can be minimised. The use of ICT plays significant roles in simulating complex laboratory experimentation on personal computers in engineering, science, biological, social and management, medicine and health sciences and legal studies. The use of ICT is not a passive process on the part of academia - lecturers and other instructional staff must be able/well prepared, enthusiastic, trusted and patient. The issue in respect of 'trust and patience' is alarming in the education sector of higher learning in Nigeria – there are clear mismatch between attainment of discipline/morality and the need to ensure 'trust' in academic environment. It is imperative to state that '*home discipline*' differs from '*academic discipline*' and that morality in academic settings is a process. Proactive academias need to recognise that learners are drawn from various background and exposures. Hence, the needs for patients are crucial in enabling supportive learning environment in all academic institution of higher learning.

Assessment is an area of concern in many academic institution of higher learning in Nigeria. There is a need of clear guidance in the use of summative and formative assessment. In many sadden instances; assessors are at the liberty of setting assessments at will (including late nights, weekends, religious dates etc) without diligent adherence to the learning contracts. Sadly, many of such assessors have been jubilated by management as heroes while committing what is openly described as academic fraud in the developed nations. The issue in respect of students' feedback has become an important element in many academic settings. Students' feedback must be honest, constructive and supportive – instances of lack of feedback have been witnessed in many of the summative assessment across Nigerian higher education institutions. Assessors have equally reported lack of interest by students on the feedback given – *this is evidenced by many of the paperwork that has to be cleared from the classroom after assessment feedback*. It is position of this paper that an honest, constructive and supportive feedback will be retained by students for their future usage in other assessments and while practising in industry.

Students and industry input to curriculum development is gaining ground in the developed nations' academic settings. Student and industry involvement in the Nigerian higher education sector is negligible. Academic institutions need to recognise the importance of end users (students, and industry) in the development of their products (academic qualifications) and services (supportive learning environment). The need for backup support is an important aspect of learning and development and the usage of ICT would play a significant role in ensuring the same. Backup support services would include study skills centre, welfare advice, counselling, career and dyslexia support. Although many institutions boast of counselling students, however the natures of the counselling are mainly medical while failing on many other aspects of counselling services. Study skills centre should form part of the Learning Resource Centre where students are given an opportunity to develop their skills and knowledge thorough out their experiential learning in the academic institution.

Career and dyslexia support is another area lacking backup support in many academic institutions in the developing Nigerian economy. Many academic institutions do not see it as moral responsibility to make sure that their students compete favourably in the job market and in further education and hence do not provide adequate career development support for their learners. The issue in respect of dyslexia support is alarming in many education institutions in Nigeria. Assessors are didactically encouraged to pass or fail students without taking cognisance of the students learning methods. No considerations are given to dyslexia students and hence majority of the assessments are unfair and profoundly biased. The evidence from the developed nation is that students with learning challenges are inclusive in the assessment protocol; further allowances are given to ensure equity, fairness and transparency in the assessment framework – developing Nigerian economy can equally do the same as part of their assessment policy.

Conclusions of Integrative ICT in a Classroom of Higher Education

E effective integration of ICT in a learning environment will depends on the way it is situated within that larger social cultural environment. Further, no tool is good or bad in itself; its effective utilisation depends on the context of its deployment. Application of ICT will facilitate improved students' knowledge and promotes a positive attitude toward learning. Integrated ICT environment will enable above average students to gain professional knowledge quickly and gives others the opportunity to receive remedial instruction through repeated practice. There is a need to provide proactive institutional support, technical training, and time to faculty members to learn and upgrade their knowledge and skills in ICT usage in modern education settings.

Recognising success factors in learning and teaching would enable focusing on educational programmes that promotes self-regulation, self-learning, self-justice, self-evaluation and innovative thoughts. E-learning is an effective mechanism of delivering educational materials; technology awareness, motivation, and changing learners' behaviour are some of the factors for successful e-learning implementations. Success factors include enhancing basic ICT skills, improved learning and training, users' motivation to engage in e-learning etc.

If Nigerian students are to compete with their counterparts in the developed world, effort must be made to develop their ICT capabilities in an integrative teaching and learning environment. Regrettably, many institutions in Nigeria have invested heavily in the use of ICT but its benefits are yet to be manifested. The process of choosing a sustainable teaching and learning methods is not a passive process and hence the need for holistic approach in acquiring sustainable ICT technologies. Academic communities are expected to provide additional ICT skills given the complex dynamics of the job market and increasing demand by employers to recruit multi-tasking candidates.

Various methodological approaches are available for knowledge dissemination in an integrated ICT environment in Nigeria – such approaches includes worksheet and self-

directed private study, ICT produced handouts, e-books, video and audio tapes, internet and intranet, open learning materials, skill development in library and learning resource centres. Personal development and creation of supportive learning environment with the aid of ICT are urgently needed in the Nigerian education sector. Issue of concern would include the atmosphere, adequacy of resources (ICT, e-books, laboratory etc), lecturers (able, enthusiastic, trusted and patient), appropriate assessment and feedback, students and industry input into curriculum development, availability of backup support services amongst others.

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