

Imperatives for Tech-Savvy Teachers for Twenty-First Century Learners

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ABSTRACT

Across the world, the rise of the Information and Communications Technologies (ICTs) and the numerous possibilities which they offer have instigated an examination of the benefits stemming from the use of educational technology in higher education. This paper looks at the impact of ICTs on educational standards and outcomes in relation to four identified teaching and learning strategies, namely, (1) planning (2) classroom organisation, (3) behaviour management and (4) assessment. It submits that introducing ICT-support tools across the curriculum and within all disciplines can raise educational standards in terms of building new networks of teachers, driving in new paradigms of teaching and learning, and putting teachers and students in contact with each other on a truly global scale. The purpose of this paper is to broaden and deepen our understanding of the future course of the digital technology and its impact on higher education in developing countries and elsewhere in the world.

Keywords: Learning; Teaching; information and communication Technology; ICT; Information Technology; IT; Higher Education; Teacher

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1. INTRODUCTION

Teachers may be forgiven if they cling to old models of teaching that have served them well in the past. All of their formal instruction and role models were driven by traditional teaching practices. Breaking away from traditional approaches to instruction means taking risks and venturing into the unknown. But this is precisely what is needed at the present time.¹

The above statement provides the foreground of the issues and challenges facing teaching and learning in higher education in the face of educational technology. In many higher institutions in the developing world, Nigeria in particular, there are increasing gaps in ICT literacy between the teachers or academic staff² and learners.³

¹ *Technology and the New Professional Teacher: Preparing for the 21st Century Classroom* (1997), the National Council for Accreditation of Teacher Education (NCATE), p. 5.

² Teachers are considered by this paper as the synonyms of academic staff, and so will be used interchangeably both in the singular and plural form.

The gaps will be even greater, unless concerted efforts are made by the teachers to develop ICT-based skills in order to prepare students for success in a globally competitive job market. Many teachers feel uncomfortable in moving to e-learning methods such as interactive teaching and learning, video tutoring, online course development, assessment, and blended learning between one tool (e.g. pencil) and another (e.g. Microsoft Word), not least because they might see these methods as a threat to their control and authority and also because many students know more about ICT-based resources than their teachers.⁴

³ Akuegwum B.A., Ntukidem P.J., Ntukjidem, E.P., & Jaga, G. (2011). Information and Communication Technology (ICT) Facilities Utilization for Quality Instructional Service delivery Among University Lecturers in Nigeria. *Education, Teacher Education and Use of Technology*, 3(1): pp. 33-53.

⁴ O'Hanlon, Charlene (2009). Resistance is Futile. *Technological Horizons in Education Journal* 36 (3): 32–36. Of course, the teachers who might have received professional development, however, would know how to more effectively manage their classroom and use the technology to create a more stimulating learning environment.

This seems the case. A typical university student today is a digital 'native' because s/he has been immersed in technology probably from birth. The student uses high-tech devices such as consoles and smartphones; good at multitasking, such as web browsing while on a call, and usually well-informed on the use of modern technologies. S/he has a personal laptop with large memory, bundled software, and functions, to take notes in the class as opposed to a pen and paper, contact peers, friends and even strangers a continent away, get the latest news about her/his favourite team, and hear from friend about the best applications to download to the laptop. In addition, the student also has an iPhone and a personal digital assistant (PDA), both of which can function as computer, telephone/fax, sender, and Internet and networking access at the same time. Faced with such tech-savvy student who is used to high-tech gadgets, the teacher still locked in a time warp may be filled with fear for lack of digital competences.

Yet, in spite of the technological expertise of a student often far ahead of his/her teacher, successful technological projects in the classrooms depend largely on the quality of the leadership, implementation and training. So a teacher needs to nearly always exhibit 21st knowledge, skills, and effective work processes in the classroom. In other words, the tasks of a teacher are multi-dimensional. The assumption of multi-dimensionality may be appreciated if it is recognised that a teacher is not only the person who teaches a particular subject or subjects, but he or she has responsibility for the curriculum development and construction. It goes without saying that ICT touches every aspect of education. Today, it is hard to understand educational changes in the world where ICT does not have a key role to play. If it is acknowledged, therefore, that ICT has become a powerful tool for enhancing the quality of teaching and learning, a teacher's tasks in higher education will invariably be always underpinned by technology-enhanced instruction and learning in the higher institutions.

In this respect, this paper looks at the role that ICTs play in raising educational standards, focusing on four teaching and learning strategies, namely, (1) planning (2) classroom organisation, (3) behaviour management and (4) assessment. The paper starts by defining the concept of Information and Communications Technology, comparing it with a similar concept, Information Technology (IT), and thereafter closely examines the four learning situations in the context of the ICT. It submits that introducing ICT-support tools across the curriculum can raise educational standards in terms of building new networks of teachers, driving in new paradigms of teaching and learning, and putting teachers and students in contact with each other on a truly global scale. The purpose of this paper is to broaden and deepen our understanding of the future course of the information and communication technology revolution in higher education in developing countries and elsewhere in the world. While the paper centres on teachers in higher education, it is valuable also to teachers in all educational settings, including primary, secondary schools.

2. DEFINING THE INFORMATION AND COMMUNICATIONS TECHNOLOGY

Bain observes that the term 'technology,' as a keyword to Information and Communications Technology, includes "all tools, machines, utensils, weapons, instruments, housing, clothing, communicating and transporting devices and the skills by which we produce and use them."⁵ According to Khosrowpour "technology" is "[a]ny electronic tool (digital camera, computer, scanner, laboratory probe, etc.) and/or software (database, spreadsheet, word processing, etc.)."⁶ The *Chambers Science and Technology Dictionary*, however, defines "technology" as the "practice, description and terminology of any or all of the applied sciences which have practical value and/or industrial use."⁷ Such definition implies that Information and Communications Technology should be concerned with acquiring, storing, processing, and distributing information by using technical means, including radio, TV, telephone and computers. In short, the ICT, as a subject and object, a topic and resource, involves finding, sharing and restructuring information in its diverse forms, while drawing upon such subjects as industrial arts, social science, engineering, applied science, and pure science.

There is remarkable consensus transcending national boundaries that the term, "Information and Communications Technology" had been used in academia since the 1980s to mean the combination of the television, the telephone, the computer and the video, and their interrelation with life, society, and the environment.⁸ Nevertheless, the term only gained prominence after it featured in a report to the UK government by Sir Dennis Stevenson in 1997 who explained that: "On a point of definition we talk in this report of ICT, adding 'communications' to the more familiar 'information technology.'... to reflect the increasing role of both information and communication technologies in all aspects of society."⁹

⁵ Bain, Read (1937) Technology and State Government. *American Sociological Review*, 2(6): p. 860.

⁶ Khosrowpour, Mehdi (2007) *Dictionary of Information Science and Technology*. London: Idea Group Inc., p. 676.

⁷ Lackie, John (2007) *Chambers Science and Technology Dictionary*, Edinburgh, UK: Chambers Harrap Publishers Ltd., p. 1191.

⁸ See generally, Csikszentmihalyi, Mihaly and Rochberg-Halton, Eugene (1981). *The Meaning of Things: Domestic Symbols and the Self*. Cambridge: Cambridge University Press; Silverstone, Roger, Morley, David, Dahlberg, Andrea and Livingstone, Sonia (1989). Families, Technologies and Consumption: The Household and Information and Communication Technologies. *CRIC Discussion Paper*, Brunel University; Silverstone, Roger et al., (1991). Listening To a Long Conversation: An Ethnographic Approach to the Study of Information and Communication Technologies in the Home. *Cultural Studies*, 5(2), pp. 204-227. Silverstone, Roger, Hirsch, Eric and Morley, David (1990) Communication and Information Technology and the Moral Economy of the Household. *Paper presented to ICA Conference*, Dublin.

⁹ Stevenson, Dennis (1997). *Information and Communications Technology in UK Schools: An Independent Inquiry*. London: HMSO, p.12

The addition of ‘communications’ to the hitherto term ‘information technology’ (IT) suggests that ICT is rather an expansion of IT, and that either can be used interchangeably (see section 3 below for details). The use of the ICT in teaching and learning is immense and diverse. As will be seen in sharper form in the chapters that follow, ICT can be used from a range of devices (e.g. interactive whiteboards, light pens and speech-sensitive devices to enable students with a variety of learning difficulties to participate in learning) and associated interactive materials (e.g. TVs and VCRs, and Data projectors for students’ access to hypermedia databases involving the integration of audio, video, plain text and hyperlinks into a whole network of interactivity). Teachers and students are able to write and publish with word-processing and desktop publishing packages; conduct research and access databases through web services and information systems; access e-learning resources through virtual libraries; use electronic communication and intimations for the free exchange of academic and other information; contribute to online discussion forums on the distant learning courses; and, use a range of online options such as blogs, Facebook for teaching and learning to create additional vehicle for students’ participation, alongside active engagement in class-based activities.

3. COMPARING IT WITH ICT

There has been a great deal of commentary within academia and industry on the difference between IT and ICT. On the one hand, while IT is said to be purely concerned with the hardware, software and skills relating to computer technology, ICT, on the other involves sharing and distribution of information using computers as a tool, a medium, or a resource in the process.¹⁰ The word “IT” was coined by Leavitt and Whisler in 1958 to describe (1) the means of processing large amounts of information rapidly by computer, (2) the application of statistical and mathematical models to decision-making problems during research operations, and (3) the simulation of higher-order thinking through computer programmes.¹¹ The *Dictionary of ICT* defines “IT” as “the technology involved in acquiring, storing, processing, and distributing information by electronic means, including radio, TV, telephone and computers.”¹² Such definition implies that the IT, as a means of accessing, storing, sharing, processing, editing, selecting, presenting and communicating information through a variety of media, is coterminous with the ICT, since either relates to acquiring,

storing, processing, and distributing information by a variety of media, including broadcasting, telecommunications, and computing technologies¹³. If that is agreed, it means, therefore, that both two terms can be used interchangeably.

Moreover, it is widely understood that different terms are sometimes used for the same entity from different aspects. It is also widely accepted that while the term “ICT” is used mostly in the general academia, the use of the term IT is much more common in industrial sectors.¹⁴ That being so, it is important to remember that with a rise in convergence of ICT (i.e., merging of broadcasting, telecommunications, and computing technologies to carry similar range of services), there is possibility that the two terms will soon converge to one term for ease of description and definition.

In what appears to be an attempt at ICT convergence, the UK National Curriculum is due to replace ICT by the term “computing” from September 2014 in order to “emphasis on computational thinking and practical programming skills, [and] to help England retain a competitive edge in the global digital economy.”¹⁵ With this clarification in place, the following sections will look closely at four learning situations, planning, classroom organisation, behaviour management, and assessment in their turn to elucidate the role that ICTs play in raising educational standards.

4. PLANNING TEACHING AND LEARNING

In studies of curriculum planning, Cohen et al identify four stages in addressing the several focuses of planning teaching and learning, namely, Stage 1: a situational analysis; Stage 2: the construction of schemes of work; Stage 3: weekly and daily plans; and Stage 4: individual lesson plans.¹⁶ In the first stage (situation analysis) a teacher is required to first identify both the physical features of the institution, the classroom and the information to record in the planning of teaching and learning, as well as curricula. The second stage (the construction of schemes of work) has to do with class syllabus that the teacher will be required to teach during her/his teaching activities.

¹⁰ La Velle, Linda; Nichol, John. Intelligent Information and Communications Technology for Education and Training in the 21st Century. *British Journal of Educational Technology*, 31(2): pp. 99-107.

¹¹ Leavitt, Harold & Whisler, Thomas (1958). Management in the 1980's. *Harvard Business Review*, November-December, 1958, p.41.

¹² Collin, S.M.H. (2004). *Dictionary of ICT*, 4th Ed. London: Peter Collin Publishing, p. 125. See also Collin, S.M.H. (2004). *Dictionary of Computing*, 5th Ed. London: Peter Collin Publishing, p. 171) IT is defined as “the technology involved in acquiring, storing, processing, and distributing information by electronic means, including radio, TV, telephone and computers”).

¹³ Collin, S. M. H., Collin, P. H. & Collin, M.H. (2002) *Dictionary of Information Technology*, 3rd Ed. London: Peter Collin Publishing, p. 279

¹⁴ For further discussion of this sort, see, Sallai, Gyula (2012). Defining Infocommunications and Related Terms. *Acta Polytechnica Hungarica*, 9(6): pp. 5-15.

¹⁵ *Consultation on the Order for Replacing the Subject of ICT with Computing: Government Response*, London, UK, p. 2. Available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/205921/ICT_to_computing_consultation_report.pdf. Accessed 07/04/2014.

¹⁶ Cohen, L., Manion, L., & Morrison, K. (2004). *A Guide to Teaching Practice*, 5th Ed. London: Routledge.

Stages three (weekly and daily plans) and four (individual lesson plans) concern a relatively short period of time planning, i.e., “the tactical level of planning rather than the strategic levels of medium-term planning, clarifying specific learning objectives and intended outcomes.”¹⁷ Underpinning the four-stage model is a recognition of the planning as a fundamental aspect of the role of a teacher in higher education. The importance of teacher planning is further emphasised by Yinger who notes that: “Of the many different things that teachers do ..., planning is probably the most important. The wealth and variety of instructional materials available, the emphasis on meeting school ... objectives, and the wide range of student aptitudes in most classrooms are but a few of the factors that virtually necessitate thinking and planning for the term, coming weeks, or even the next day.”¹⁸

While there are acknowledged peculiar culture and ethos associated with different institutions in different jurisdictions, the task of planning teaching and learning is supposed to be carried out with primary aim of advancing education and development. In a familiar context, this means recognising the global trends in a higher institution towards a networked society, with digital communication as its hallmarks. As noted in section 2, ICT literacy implicates a variety of educational uses, e.g., for lesson planning, preparation and recording, communication, timetabling, recording (e.g. student progress, attendance, personal details, electronic mark books), in teaching techniques (e.g. lecture, Microsoft PowerPoint slides, handouts, demonstrations, discussions, and in-class activities), in learning styles (e.g. using checklists, modified rubrics, and e-mail), as well as administrative work.

Given that these ICT applications/resources are all important to education, not least, in creating positive learning environment and improving educational standards, a teacher needs to get much better at researching and understanding the rudiments of information and communication technology because they will inevitably influence the curriculum planning and preparing courses and lessons. This in turn will, of course, influence how the teacher plans the learning experiences s/he eventually makes available to the students, such as preparing lesson plans, marking papers, setting up equipment, making and running dittos, thinking about how to address students' behavioural or learning problems.

Toffler examines the effects of technological changes upon the individual, the family, and society, and warns that the world is undergoing a notable revolution in cognition which comes on the back of advances in technology. Hence the 21st century illiterate “will not be the man who can't read; he will be the man who has not learned how to learn.”¹⁹

This is a negative verdict on education system that does not keep pace with a rapidly changing world. Another point to make is that there are no digital borders; laptops, tablet computers, smartphones and other personal technologies grant users greater control over what they investigate, how they acquire knowledge and what they do with it.

With students feeling a greater degree of independence and responsibility for their teaching, the business of acquiring knowledge and accessing information will be done with ease by any students with access to the Internet. In *iPad Scotland Evaluation*, a study that assessed the impact of tablet computer schemes across a number of schools in central Scotland, it was found that 70 percent of parents reported their child's persistence in learning was significantly affected and that 84 per cent of children were more likely to work at home when using these devices.²⁰ And given that many students are increasingly more adept at using technology than their teacher, a good strategy against the teacher becoming a victim of the shock of futurelessness predicted by Toffler is for the teachers to develop new passion for learning, and relearning, and the key component in this process is the technology-enhanced learning of which the ICT is in the forefront of this.

5. CLASSROOM ORGANISATION

In this paper, classroom organisation can be taken to refer to systematic arrangement of the classroom by the participants, including teachers and students, to promote deep understanding and interest about learning, as well social and intellectual growth of the students. This conception of classroom organisation suggests that classroom participants engage in interactional work, setting up the organised structure of classroom events and activities such as lessons, furniture, materials, and displays. It also shows that, in the words of Kohn, “students play an active role in decisions, teachers work *with* students rather doing things *to* them”²¹ to achieve the orderly progression in teaching and learning.

Classroom organisation provides the foundation for effective teaching and learning. As Marzano et al explain, “If students are disorderly and disrespectful, and no apparent rules and procedures guide behavior, chaos becomes the norm. In these situations, both teachers and students suffer. Teachers struggle to teach, and students most likely learn much less than they should.”²²

²⁰ Burden, Kevin; Hopkins, Paul; Male, Trevor; Martin, Stewart; and Trala, Christine (2012). *iPad Scotland Evaluation*. Faculty of Education, The University of Hull. Available online at: <http://www.janhylen.se/wp-content/uploads/2013/01/Skottland.pdf>. Accessed 17/05/14.

²¹ Kohn, Alfie (1996). What to Look for in a Classroom. *Educational Leadership*, 54(1): p. 54.

²² Marzano, Robert J., Marzano, Jana S., & Pickering, Debra J. (2003) *Classroom Management That Works: Research-Based Strategies for Every Teacher*. Alexandria, VA: Association for Supervision and Curriculum Development, p. 1.

¹⁷ Ibid, p. 141.

¹⁸ Yinger, Robert (1979) Routines in Teacher Planning. *Theory into Practice*, 18(3): p. 163.

¹⁹ Toffler, Alvin (1971) *Future Shock*. New York: Bantam Books, p. 355.

This means that a well organised classroom provides an enabling environment through which teaching and learning can flourish, otherwise this cannot take place in a poorly organised classroom. Another characteristic of classroom organisation is that it provides means to enhance teachers' situational awareness of the potential problems in the classroom.

This in turn helps the teachers to improve their own overall instructional and behavioural management skills in terms of planning, implementing, and maintaining effective classroom practices.²³ Thus, classroom organisation is germane to effective interaction between teachers and students, which in turn promotes excitement, socialisation and group work amongst the students.

Unfortunately, this necessary solid foundation of relationships between teachers and students working in concert to create collaborative and supportive classroom organisation is more readily imagined than realised in traditional model of classroom organisation. The traditional conception of classroom organisation is, for example, unvarying in structure and technique, and is usually teacher-directed, not socially organised as to allow for interactional work between teacher and the students. The result of such a model is that academic lessons are usually conducted by a teacher who stands in front of the students who are seated in fixed rows, facing a fixed and immovable chalkboard. Toffler gives a succinct insight into the framework of such traditional model thus:

One adult and a certain number of subordinate young people, usually seated in fixed rows facing front, is the standardized basic unit of the industrial-era school. As they move, grade by grade, to the higher levels, they remain in this same fixed organizational frame: They gain no experience with other forms of organization, or with the problems of shifting from one organizational form to another. They get no training for role versatility.²⁴

It is, of course, arguable that the model of traditional organisational structure described by Toffler seems too incredible to be taken seriously at the present moment, given that his book was written more than 40 years ago. But it is important to realise that even today it takes a good deal of effort to create classroom organisation that allows teachers and student not only to interact, but also promote both desirable academic and behavioural performance, as well as critical and deliberative skills.

Such varied learning expectations are mostly encouraged by technology-rich learning environments or classrooms rather than in a traditional, directive approach system of education. In the world of microchips, a class is, for instance, taught with computers and multimedia displays to provide students with a more interactive learning experience. Such classroom usually have a wide range of A/V (audio/visual) equipment in it, ranging from TVs and VCRs (Video Cassette Recorders) to Data projectors for PowerPoint presentations and networked computer units for students' access to hypermedia databases (i.e., databases which integrate audio, video, plain text and hyperlinks into a whole network of interactivity), telecommunications, and simulations. Tamim, Bernard, Borokhovski, Abrami, and Schmid (2011) reviewed 25 meta-analyses of the uses of computer technologies to determine their impact on student achievement in formal face-to-face classrooms as compared to classrooms that did not use technology.

Types and uses of computer technology examined for these studies included computer assisted instruction, computer-based instruction, digital media, information and communication technology, hypermedia, simulations, and word processors. They found that students in technology-enhanced face-to-face classrooms have higher achievement levels than students in classrooms without technology.²⁵ This suggests that ICT-support teaching and learning tools can help maintain the interest of students in learning, promote their critical and deliberative skills, and get them more involved in E-Learning activities. In addition, the tools could also contribute to the organisation of classroom events in terms of promoting face-to-face encounters between teacher and students as interactive teaching.

Nothing is more clearly adaptive. A key feature of ICT-Supported classroom is that it allows for inclusion of students with special learning needs, including social, emotional and behavioural difficulties, to achieve their potential in teaching and learning²⁶. As part of the "ENABLE Network of ICT Supported Learning for Disabled People 2011–2014," a project established by 16 European Partners and four third country partners to explore how ICTs are being used to support lifelong learning by disabled adults in order to overcome barriers and increase opportunities, Starcic and Bagon gave considerable coverage to the use of ICT-based resources to help many special needs individuals, including students to overcome the barriers they would otherwise have faced but for these resources.²⁷

²³ Evertson, C. M. (1995). *Classroom Organization and Management Program: Revalidation submission to the Program Effectiveness Panel, U.S. Department of Education*. (Tech. Report). Nashville, TN: Peabody College, Vanderbilt University. (ERIC Document Reproduction Service No. ED403247).

²⁴ Toffler, Alvin (1971) *Future Shock*. New York: Bantam Books, pp. 349–350.

²⁵ Tamim, R. M. Bernard, R. M., Borokhovski, E., Abrami, P. C., & Schmid, R. F. (2011) What Forty Years of Research Says About the Impact of Technology on Learning: A Second-Order Meta-Analysis and Validation Study. *Review of Educational Research*, 81(1): 4–28.

²⁶ Hopkins, J. 2006. All Students Being Equal: Help Your Special Needs Students Using These Resources. *Technology and Learning* 26 (10): pp. 26–28.

²⁷ Starcic A. I. & Bagon, S. (2014) ICT-Supported Learning for Inclusion of People with Special Needs: Review of Seven

With the world-wider evolution in the classroom organisation, built upon an ICT-based, student-centred and constructivist model²⁸ of learning, the ultimate goal of all the teachers in higher education is to harnessing the full potential of ICT for their educational needs in order to deliver good-quality learning experiences to their students.

6. BEHAVIOUR MANAGEMENT

Behaviour management is a key concern which a teacher in any levels of educational activities has to contend with on daily basis, and in every lesson.²⁹ Too often students misbehave and become unruly in the class, keeping themselves and their peers from learning. Such misbehaviour, of course, takes up a teacher's time, limits teacher's effectiveness in the class and, at times, may force the teacher to abandon teaching for another profession.³⁰ Traditionally, different behavioural models, developed by behavioural scientists—psychologists, sociologists, economists, political scientists—and ranging from ignoring, direct intervention, to third party intervention to deal with the situation, have been adopted to address indiscipline, disruption of the teaching-learning process and several other negative behavioural issues.³¹

However, the relative impact of these models on a student's behaviour and concerns depends upon the context in which student misbehaves and the teacher's response. As Derrington and Goddard observes, the context of any kind of response adopted by a teacher to manage student behavioural problem is usually driven by the teacher's particular belief or perception about the problem itself.³²

Educational Technology Journals, 1970–2011. *British Journal of Educational Technology*, 45(2): pp. 202–230

²⁸ Constructivist model of learning is a form of learning in which the learners construct and internalise any new knowledge they gain from the perspective of their own present and past experiences. For a full discussion on the concept of constructivism, see generally, Crowther, D. T. (ed.) (1997) *The Constructivist Zone. Electronic Journal of Science Education*, 2(2): pp. 1–9; Brooks, G. J. & Brooks, M. G. (1999) *In Search of Understanding: The Case for Constructivist Classrooms*. Alexandria, VA; USA: Association for Supervision and Curriculum Development; Beck, Clive & Kosnik, Clare (2006) *Innovations in Teacher Education: A Social Constructivist Approach*. Albany, NY State University of New York Press.

²⁹ Westling, D. L. (2010). Teachers and Challenging Behavior: Knowledge, Views, and Practices. *Remedial and Special Education*, 31(1): pp. 48–63.

³⁰ McKinney, Sueanne E., Campbell-Whately, Gloria D., & Kea, Cathy D (2005) Managing Student Behavior in Urban Classrooms: The Role of Teacher ABC Assessments, *Journal of Educational Strategies, Issues and Ideas*, 79(1): pp. 16–20

³¹ For the analysis of strengths and weaknesses of different models developed to address classroom behaviour problems, see generally, Dunlap, G., Iovannone, R., Wilson, K. J., Kincaid, D. K., & Strain, P. (2010). Prevent-teach-reinforce: A standardized model of school-based behavioral intervention. *Journal of Positive Behavior Interventions*, 12(1): pp. 9–22.

³² Derrington, Chris & Goddard, Hilary (2008) *'Whole-Brain' Behaviour Management in the Classroom; Every Piece of the Puzzle*. Abingdon, UK: Routledge, p. 3.

Thus, different teacher, different tool. By way of illustration, Derrington and Goddard describe the responses of three hypothetical teachers:

The first teacher tends to use the tool of 'tactical ignoring' on a frequent basis, and this is grounded in her perception that when students misbehave in class there is a conscious intention on their part to divert and steal her attention away from other, more deserving students. ... The second teacher regularly yells at students when their behaviour irritates her. ... The third teacher often threatens his lively class with the intervention of a senior colleague because he believes deep down that he himself lacks the authority and credibility to manage the students' behaviour as effectively as his colleague.

This absence of a uniform approach in addressing student's misbehaviour thus suggests that idiosyncrasy common among teachers, like any other professionals, plays a significant role in creating conducive and effective classroom environments

But looking at the realities of contemporary educational technology, more still need to be done to create effective classroom environments, in the case, through the use of technology-based resources.

In this context, Rogers makes the point that the central goals of all behaviour management have to do with three objects, namely, ownership of behaviour, respecting of mutual rights, and building confidence in personal locus of control.³³ Over the years, ICT has been delivering on these objects. For example, ICT provides cognitive tools such as LOGO programming language, word processing application, design and technology (D&T) lesson packages and Expert Systems which can be used by students to extract, sort, structure and model knowledge on their own. Again, there are also available ICT-specific and institution-focused tools such as *Serco e-Portal* and *Vivo Miles* which are used to manage behaviour and reward students respectively. Whether to investigate, record and process disturbing and disordered behaviour in the classroom, all these ICT-based tools are geared towards helping the students to focus on what they should be doing, what the fair rule is, and/or where they should be and, as a result, expecting and inviting ownership, respect for mutual rights and self-discipline.

Learning is always preceded by engagement and given the several claims for the potential benefits of ICT's tools providing positive behaviour support to enable students to be more successful in behaviour and learning outcomes, education and the way that teachers teach will have to be technologically managed to meet the changed demands and expectations of the students.

³³ Rogers, Bill (2004) *Behaviour Recovery* 2nd Ed. London: Paul Chapman Publishing, p. 153

7. ASSESSMENT

According to the Office for Standards in Education, assessment is a major contributor to raising standards in terms of contributing to learning process, measuring understanding of subject discipline and students' achievement.³⁴ In other words, assessment provides information to all educational stakeholders—parents, teachers, learners—on learning, performance and improvement in higher education sector. Assessment is “the process of gathering, interpreting, recording and using information about pupils' responses to educational tasks.”³⁵ Accordingly, a teacher has the responsibility to respond to the students' submitted work against the standard expectation, and make judgements about this work for the purpose of instructional planning, progress evaluation, selection, decision making, and other matters. In short, the purposes of assessment are:

- To provide feedback to teachers and students about performance so that action can be planned to support future learning—*Formative role*;
- To provide information about the level of students' achievements and of overall knowledge acquisition and practice at the end of a programme of study—*Summative role*;
- To provide the means for selecting students by qualification by awarding them passes, fails, grades and marks—*Certification role*;
- To contribute to the information by which to assess the effectiveness or quality of individuals and institutions in the system as a whole—*Evaluative role*.³⁶

Assessment has tradition been the work of the teacher who sets the examinations, marks them privately and writes a report about the success or failure of a student's performance and, thereafter, deliver this privately to the student's parents or guardian. The truth, though, is that students are usually not involved, whether in the assessment usually in the form of summative – end-of-course – testing or in the construction of the report.³⁷

However, with the arrival of ICT, students have been involved in the assessment process connected with their educational career. For example students, wired to the Internet, can submit, say, a draft piece of work (e.g. project) online for assessment by their peer who will then provide feedback comments on the work and allocate grades to allow the submitters to reflect.

By so doing, more learning occurs and improvement is made before the final submission of the work for assessment.³⁸ Collis et al emphasise that such student-generated online feedback has a lot of benefits, for example, for another student or a group of students who have carried out the same work, especially when the teacher wishes these students to learn from each other's answers or integrate each other's concepts or expression into a new assignment.³⁹ Thus ICT has opened up a dialogue between students and teachers, creating a role for the former in the institution's assessment practice.

Recent evaluation studies suggest that instructional technology is thriving and can also make teaching more effective (Kulik, 2003 Kulik, J.A. (2003). Effects of using instructional technology in elementary and secondary schools: What controlled evaluation studies say. (SRI Project No.P10446.001). Retrieved from Stanford Research Institute (SRI) International website: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.20.7.3105&rep=rep1&type=pdf>) Various other research studies have examined the impact of technology on student learning and found its use is associated with skill development, content mastery, and increased exam scores (Strayhorn, 2006 Strayhorn, T.L. (2006). College in the information age: Gains associated with students' use of technology. *Journal of Interactive Online Learning*, 5(2), 143-155.); Hofman, 2002; Kulik & Kulik, 1991).

There is another sense in which assessment no longer stands for what may be called a teacher-centred practice. This is has to do with the burgeoning use of E-assessment for educational improvement. At that point, E-assessment is defined “as the use of information and communication technology to mediate any part of the assessment process, including both computer-based assessment (CBA) and computer-assisted assessment (CAA). Examples of CBA are electronic tests (e.g., multiple choice electronic tests). CAA refers to a variety of tools and encompasses very diverse applications from electronic submissions of coursework to the use of wikis or e-portfolios.”⁴⁰ On this definition, it means that E-assessment has the potential to increase school effectiveness and curriculum reform, as well as bring both administrative and pedagogic benefits to educational institutions. True enough, the demands of e-assessment are implicated in many areas, for example to provide “enhanced access (readability, easier access), efficiency (time and administration savings), transformation of assessment with

³⁴ Office for Standards in Education (2003) *Good Assessment in Secondary Schools*. London: OFSTED, p. 2.

³⁵ Lambert, David & Lines, David (2000) *Understanding Assessment: Purposes, Perceptions, Practice*. London: Routledge Falmer, p. 4

³⁶ For a full discussion on the purposes and types of assessment see e.g., Cohen, L., Manion, L., & Morrison, K. (2004). *A Guide to Teaching Practice*, 5th Ed. London: Routledge, pp. 323-365.

³⁷ Cohen (2004) *op. cit.*, p. 391.

³⁸ For an appraisal of discussion of this sort, see Grabe, M. and Grabe, C. (2001) *Integrating Technology for Meaningful Learning*. Boston, MA: Houghton Mifflin Co.

³⁹ Collis, B., de Boer, W. and van der Veen, J. (2001). Building on Learner Contributions: A Web-Supported Pedagogic Strategy. *Educational Media International*, 38(4): p. 235.

⁴⁰ Tomas, Carmen; Borg, Michaela & McNeil, Jane (2014) E-assessment: Institutional Development Strategies and the Assessment life Cycle. *British Journal of Educational Technology*, doi:10.1111/bjet.12153, p. 2.

alternative modes (e.g., use of wikis), improved traceability of assessments and feedback as well as progression data.”⁴¹

Finally, with numerous benefits of technology-based resources for instruction and learning in higher education, including e-assessment, bringing the concept digital technology into education is a paradigm shift from generations-long tradition of teaching and learning with only paper, pencil, books, and blackboard.

8. CONCLUSION

The preceding discussion sheds light on technology-based resources for instruction and learning. It highlights the impact of ICT literacy in higher education along four identified teaching and learning strategies, namely, (1) planning (2) classroom organisation, (3) behaviour management and (4) assessment. The discussion also highlights differing information and communication technology maturity between teachers and students which threatens the loss of control in the classroom as students, who are usually more familiar with technology than teachers, can have instant access to information made available online and challenge the teacher's role as the sole repository of information.

While technology-based resources may be hampered in higher educational establishments by a lack of infrastructure, hardware and reliable networks in, for example, most sub-Saharan African countries, but in places where these have been relatively provided, there could still be dearth of human resources to maintain and make use of them. So individual teachers, as urged throughout in the discussion, will need to be technologically educated many times over – they will have to have continuous knowledge updating about the technology dimension of the information revolution in higher education.

Overall, the discussion on digital technology and global networks has both predictive utility and policy implications, not only for technology-enhanced teaching and learning in developing countries' but for all other nations as well.

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⁴¹ *ibid.*

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