

Educational Technologies of the 21st Century: Imperatives to the practice of Teaching in Higher Education

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Abstract

The last two decades witnessed remarkable advancement in the field of information technology in India. Education in general and higher education in particular is one of the sectors that could reap the early advantages from such advancements. The internet technologies (Web 2.0) that pioneered such advancements in the early 1990s has subsequently followed a host of other technologies like Web 3.0, social networking, mobile-learning, android apps, Open Educational Resources (OERs), Massive Open Online Courses (MOOCs), You-Tube etc. A host of e-resources available online at the touch of a key have become much popular among the youths; but often pose challenges to the teachers to remain updated and well-informed all the time. While such challenges may also emerge quite rewarding to the practice of both teaching and learning, yet, a host of related issues also raise doubts regarding their practical applicability and utility. This paper is an attempt to summarise the emerging educational technologies and the imperatives to the field of education in general and the practice of teaching in higher education in particular.

Key Words: ICT, Mobile Learning, Social Networking, Android Apps.

1. INTRODUCTION

The title of the paper though suggests that our basic subject matter of discussion is the current educational technologies, yet looking back in brief at the historicity of educational technologies would, I feel, help the readers to lead through the discussion with well grasps.

Right from the ancient days of around 5000 BC, when education flourished in India in the *Gurukul Ashramas*, the oral tradition was the basic medium of teaching. In those days the *Guru (the teacher)* recited the hymns of the *Vedas* and the *shishyas (the disciples)* had to memorise them in correct order, accents and intonations. In that age, along with *Shravan* or Listening,

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Manan or meditation and *Nididhyaana* or realization and experience, question and answers, discourse, lecture discussion and debate methods were also prevalent alongside. Seven thousand years down the lane, the field of education has witnessed many a few major changes in its growth and practice. To put in a nutshell, Table 1 presents a brief time-line of the major educational events and the evolution of major educational technologies and media in the modern times.

Table 1: Time-line of Major Educational Events and Evolution of Educational Technologies and Media in the modern times.

Sl.	Timeline	Important Development in the Field of Education
1	1600s	Public Education – founding of first public schools in the US
2	1700s	Blackboard
3	1800s	Books
4	1840s	Postal system (correspondence education)
5	1920s	Radio, Motion Pictures
6	1930s	Film strips, Projectors
7	1940s	Overhead Projectors (Slides)
8	1950s	Gramophone; Overhead Projectors
9	1960s	Television, Language Labs, Chalkboards, Calculators
10	1970s	Video Cassette Recorders
11	1980s	Audio Cassette Recorders; Desktop Publishing, Audio Conferencing, Teleconferencing
12	1990s	Computers, CD Rom players, Internet, World Wide Web, Google, Smart Board Interactive White Boards, DVDs, Videoconferencing, Computer conferencing
13	2000s	Laptops; Online Learning; Mobile phones; Smart phones; LCD & LEDs; Wikipedia; You tube; iPods; Webcasting; Electronic Textbooks; I pads

Source: Srivastava, M. (2015)

Again, before we deal any further, it would also be helpful to the readers to have a clear understanding of two seemingly similar morphologies, viz., ‘educational technology’ and ‘educational media’, most often grossly confused, or rather, misused. However, I propose not to undertake any detail discussion on the topic. Interested readers may go through a few good reference articles available on the topic.

Educational Media vs. Educational Technology: The Educational Technology Department of San Diego State University has defied the term *educational technology* as “... the application of research, learning theory, emergent technologies, and child and adult psychology to solve instructional and performance problems”. On the other hand, *educational media* offer us the platform (or a medium) to communicate with other persons. The following Table 2 would help us to differentiate between the components of these two seemingly similar morphologies.

Table 2: List of Educational Media and Educational Technologies

Sl	Educational Media	Educational Technologies & Tools ²
1	Audio	Storytelling, Lectures, Debate, Radio, Audio Tapes, Audio CDs, Camera, Sound Mixtures
2	Text	Blackboards, Books, Journals, Newspapers, Magazines, Letters and Correspondences, Reports, Archival Records
3	Graphics, Imaging and Basic Mechanisation	Statistical Graphs, Pictures, Abacus, Educational Toys and Games, Calculators, Other basic educational tools (Scale, Geometry Tools, Colour pencils, Prism, Globe, Laboratory Equipments etc.)
4	Video	Televisions programmes, Video CDs, Motion Pictures and Cinema, Documentary, Digital Video Discs (DVDs), Digital Video Camera, Projectors
5	First Generation Computing	Computers, Laptops, Web 2.0, Internet, Emails, Video Conferencing, Online Chat
6	Second Generation Computing	High Performing Computers, Laptops, Social Networking, Web 3.0, Blogs, Online Learning, Open Educational Resources, Learning Management Software (MOOCs etc), Tele-Conferencing.
7	Mobile Communication, Mobile Apps	Mobile phones, Smart phones, Tablets, Laptop, Tablet PCs, Wireless Dongles, I Pads, Android Apps

Source: Author's Presentation.

From Table 2 it is obvious that educational technologies are the tools and services that we actually utilise in the communication process, while the educational media provide us the platform to utilize the educational technologies and reach us to the other party being communicated. It is also obvious that the educational media are broader in concept than the educational technologies.

2. THE CHANGING GLOBAL CONTEXT AND THE FIELD OF EDUCATION

The society we live in today is considerably different from the society that prevailed 50 years ago. An industrial economy like the US was led in those days by the manufacturing and agricultural sector. But in the last 50 years, we have moved towards new dimension of globalisation. Accordingly, we also need to change from the educational paradigms of that age, centering around 3 Rs (Reading, Writing and Arithmetic) to what has been proposed as 4 Cs (Critical Thinking & Problem Solving, Communication, Collaboration, and Creativity & Innovation). (Pacific Policy Research Centre, 2010; National Education Association, n.d.)

The 21st century teaching-learning skills has been defined as the ability to: a) collect and/or retrieve information, b) organize and manage information, c) evaluate the quality,

² Difference between Technologies and Tools: Technology is the knowledge, tools are the objects.

relevance and usefulness of information, d) generate accurate information through the use of existing resources. The key elements for fostering 21st century learning have been identified as: a) emphasise core subjects, b) emphasise learning skills, c) use of 21st century tools to develop leaning skills, d) teach and learn in the 21st century context, e) teach and learn in the 21st century content, and f) use 21st century assessments that measure 21st century skills. (Pacific Policy Research Centre, 2010; National Education Association, n.d.). Thus, it is obvious that the teaching-learning paradigm has fundamentally changed in the 21st century. And to survive and remain contextual to the present times, the students, the teachers and the teaching-learning process also must evolve accordingly.

In this short paper, it is not possible to make a comprehensive analysis of all the issues relevant to the 21st century educational contexts, particularly, relating to the students, teachers and the process of teaching and learning as such. However, we propose to discuss in brief the characteristic of the 21st century students as well as the 21st century teachers. We shall also discuss how a teacher should respond to the challenges and after that we shall discuss a few general issues of today's higher education and would finally conclude the discussion. But prior to that, we shall make a brief survey on the recent educational technologies that have emerged in the 21st century and are being currently used in the field of higher education.

3. RECENT EDUCATIONAL TECHNOLOGIES: A BRIEF SURVEY

A one stop enumeration of all the recent available technologies is not a mean task. In Table 3, we have categorized the educational technologies under four major heads, viz., e-Learning, Social Learning, Lesson Planning and Tools and Other Useful Tools. We have included six examples in each category, though there remains many more to be considered.

Table 3: Some of the Recent Educational Technologies and their Uses in Higher Education

Category	Name of the Technology	Description and Uses	Web source.
e-Learning	Khan Academy	Khan Academy was created in 2006 by educator Salman "Sal" Khan with the aim of providing a "free, world-class education for anyone, anywhere". Many teachers use this excellent collection of math, science, and finance lectures and quizzes to supplement their classroom materials.	https://www.khanacademy.org/
	Knewton	Knewton was founded in 2008 by Jose Ferreira. It is an adaptive learning company that offers a platform to personalise educational content.	https://www.knewton.com/
	MIT Open Courseware	MIT OpenCourseWare (MIT OCW) initiative was undertaken by the Massachusetts Institute of Technology (MIT). The project was	http://ocw.mit.edu/index.htm

		<p>announced on April 4, 2001 and uses Creative Commons Attribution-Noncommercial-Share Alike license.</p> <p>It aimed at bringing all educational materials from its undergraduate- and graduate-level courses online, freely and openly available to anyone, anywhere.</p>	
	NPTEL	<p>The National Programme on Technology Enhanced Learning (NPTEL), is a project funded by the Ministry of Human Resource Development (MHRD). It provides e-learning through online Web and Video courses in Engineering, Sciences, Technology, Management and Humanities. This is a joint initiative by seven IITs and IISc Bangalore.</p>	http://nptel.ac.in/
	Open Education Consortium (OEC)	<p>OEC is a non-profit, social benefit organization registered in the United States and operating worldwide. It is a global network of educational institutions, individuals and organizations. Its approach to education is based on openness, including collaboration, innovation and collective development and use of open educational materials.</p>	http://www.oecconsortium.org/
	StudySync	<p>StudySync is a fully-featured tool for teaching and learning that can be a big help in the classroom. It is rich with a digital library, weekly writing practice, online writing and peer reviews, Common Core assignments, and a large number of multimedia lessons.</p>	http://www.studysync.com/
Social Learning	Edmodo	<p>One of the most innovative tools of the recent times, Edmodo was founded by Nic Borg and Jeff O'Hara in 2008.</p> <p>Edmodo enables teachers to share content, distribute quizzes, assignments, and manage communication with students, colleagues, and parents..</p>	https://www.edmodo.com/
	EduBlogs	<p>An edublog is a blog created for educational purposes. Edublogs archive and support student and teacher learning by facilitating reflection, questioning by self and others, collaboration and by providing contexts for engaging in higher-order thinking.</p>	http://edublogs.org/
	ePals	<p>One of the benefits of the Web is being able to connect with anyone, anywhere. ePals does just that. It primarily focuses on helping students to learn languages and understand cultures different from their own.</p>	https://www.epals.com/
	Grockit	<p>Grockit was founded in 2006 by Farbood Nivi, and in 2013 was acquired by Kaplan Inc.</p> <p>Grockit prepares students for the SAT, ACT, GMAT, LSAT and GRE standardized exams. Students can take practice tests while</p>	https://grockit.com/

		collaborating online with other users. This also enables the teachers to connect the students with each other.	
	Skype	<p>Skype was first released in 2003 by Niklas Zennström and Janus Friis.</p> <p>Skype is an application that provides video chat and voice call services. Users may exchange such digital documents as images, text, video and any others, and may transmit both text and video messages. It allows the creation of video conference calls. It can also be used for keeping in touch with other educators or even attending meetings online and can help teachers to connect with other classrooms in other countries.</p>	www.skype.com
	Quora	<p>Quora was co-founded by two former Facebook employees, Adam D'Angelo and Charlie Cheever.</p> <p>It is a question-and-answer site where questions are asked, answered, edited and organized by its community of users.</p>	https://www.quora.com/
Lesson Planning and Tools	Google Docs	Through Google Docs, teachers can create and share documents, presentations, or spreadsheets with students and colleagues as well as give feedback on student-created projects.	https://www.google.com/docs/about/
	MasteryConnect	Through MasteryConnect's MasteryTracker, teachers can effectively assess core standards, monitor student performance, and report student mastery to parents and administrators.	https://www.masteryconnect.com/
	Mentor Mob	MentorMob is a website that presents media (videos, pictures, files) from the internet and groups them as "learning playlist." Users can create a "learning playlist" based on a selected topic and share it over the internet. It also allows collaboration similar to a Wikipedia. The high-quality materials in Monitor Mob can be easily used to study a specific concept.	https://www.mentormob.com/
	Planboard	Planboard helps a teacher to get organized and reduce your classroom preparation time. It is accessible from anywhere. A teacher can plan lessons, add curriculum sets, and manage class schedules with ease.	https://www.planboardapp.com/
	Quizlet	<p>Quizlet is a place where everyone can share knowledge in any subject, at any level and gain confidence as a learner. All the content in Quizlet is created by the users themselves.</p> <p>Quizlet makes it easy for teachers to create study tools for students, especially flashcards that can make memorizing important information at much ease.</p>	https://quizlet.com/
	YouTube	YouTube is an American video-sharing	https://www.youtube.com/?g

		<p>website located in the United States. The service was created by three former PayPal employees in February 2005. In November 2006, it was bought by Google.</p> <p>YouTube allows users to upload, view, rate, share, and comment on videos, and it makes use of WebM, H.264/MPEG-4 AVC, and Adobe Flash Video technology to display a wide variety of user-generated and corporate media videos.</p>	l=IN
Other Useful Tools	DonorsChoose	<p>DonorsChoose.org is a US-based nonprofit organisation. It was founded in 2000 by former public school teacher Charles Best. DonorsChoose.org was among the first civic crowdfunding platforms of its kind.</p> <p>It allows individuals to donate directly to public school classroom projects.</p>	https://www.donorschoose.org/
	Google Earth	<p>From geography projects to learning about geological processes, Google Earth can be an amazing and fast way to show students anywhere in the world.</p>	https://earth.google.com/
	MOOCs (Massive Open Online Courses)	<p>The first MOOC emerged from the open educational resources (OER) movement. A MOOC is an online course aimed at unlimited participation and open access via the web. In addition to traditional course materials, many MOOCs provide interactive user forums to support community interactions among students, professors, and teaching assistants.</p>	https://www.mooc-list.com/
	SlideShare	<p>Slideshare was launched in 2006. The website is considered to be similar to YouTube, but for slideshows.</p> <p>LinkedIn SlideShare is a Web 2.0 based slide hosting service. Here, Users can upload files privately or publicly in the following file formats: PowerPoint, PDF, Keynote or OpenDocument presentations.</p>	www.slideshare.net/
	Twitter	<p>Twitter was created by Jack Dorsey, Evan Williams, Biz Stone, and Noah Glass in 2006.</p> <p>It is an online social networking service that enables users to send and read short 140-character messages called "tweets". Registered users can read and post tweets, but those who are unregistered can only read them.</p> <p>There are so many ways Twitter can be used in education. Teachers can connect with other educators, take part in chats, share their ideas, or even use it in the classroom to reach out to students.</p>	https://twitter.com/?lang=en
	Wikipedia	<p>Started in 2001 by Jimmy Wales and Larry Sanger, Wikipedia is owned by an American organization, Wikimedia Foundation, which is</p>	https://en.wikipedia.org/

		<p>in San Francisco, California.</p> <p>Wikipedia is an Internet encyclopedia project in many languages. It is free of charge: users do not pay. Also, it is "open content". Anyone can copy it, and make changes to it if they follow the rules for copying or editing.</p>	
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Source: Author's presentation, Wikipedia.

4. 21ST CENTURY TECHNOLOGIES AND THE CHALLENGES TO THE PRACTICE OF TEACHING IN HIGHER EDUCATION

4.1 Characteristics of the 21st Century Students

Study (International Education Advisory Board, n.d.) indicates that the students of the 21st century possess the following characteristics:

- **To control the things themselves:** Defying the traditional boundary of standard schedules and/or classroom settings, the 21st century students prefer to use technology to study at any time of the day or night, telecommute from anywhere in the world and define "balance" in their own individual ways.
- **Want more choices:** The new students like to learn in project-based environments, use technology to complete tasks in new and creative ways. They also like to explore alternative methods to complete the tasks which are more productive and efficient.
- **Group and social environment in leaning:** A lot of social media tools keep the student remain in contacts with their peer groups easily. Thus, today's students are highly collaborative, they also frequently share what they learn with others.
- **Inclusive by nature:** Today's students are taught to be tolerant of all races, religions and sexual orientations. They are not limited by the information available at their local library or by linear searches in encyclopedias on topics. Instead, they use the Internet to search for information worldwide and use hypertext links to divert from original searches and learn about new subjects.
- **Frequent Users of digital technology:** The 21st century students rely heavily on digital media. ICT has always been part of their lives. In fact, beyond the ordinary function of technologies, a new language also have evolved which consists of acronyms like "LOL" ("Laughing out loud"), "ATM" ("At the moment"), "BTW" ("By the way") etc. Thus, today's technology allows students to voice their opinions in ways that were not available earlier.
- **Risk lovers:** The 21st century students are motivated by the 'success stories' available online and as a result have developed a common mentality: "If this doesn't work out, we'll try again."

4.2 Characteristics of the 21st Century Teachers:

Generally, today's educators also share the following characteristics (International Education Advisory Board, n.d.):

- **Resistant to new technologies:** Today's teachers are somewhat reluctant to adopt new technology too quickly, some educators feel intimidated by students' knowledge of tools they do not understand.
- **Need of professional development in teaching is ignored by the employers:** A survey undertaken by National Education Association (Quoted in International Education Advisory Board, n.d.) revealed that of the 75 percent of teachers who participated in educational technology integration professional development courses, the majority (above 60 percent) spent less than eight hours in a 12-month period in this type of training. When so few hours were dedicated to this training, 87 percent of teachers said they did not experience a lot of improvement in their teaching.
- **Teachers need support and planning time:** The number one reason teachers experience dissatisfaction with their jobs, causing them to either leave their profession or transfer to other schools, is lack of planning time.

4.3 Ways to respond to the Current Challenges

Today's learning environment demands teachers to play more of a facilitator role, rather than a more directive or authoritative one. However, this transitional role often comes in conflicts with the traditional teaching methods and requires teachers to step back and allow learning to happen without their hands-on direction. As teachers work to engage and educate the 21st century students, they need to keep in the mind the following:

- **Learning must be relevant to students:** The 21st century students find learning more attractive when practical applications for the information are included in the curriculum of study. Content must be specific, concise and fast. Today's students are hungry for information and will search for it on their own if teachers do not present what they perceive to be relevant. Because so much information is constantly available, the new age students do not feel they need to learn everything immediately. Instead, they want to be taught how and where to find what they need when they need it. This requires that teachers must try to be more practical-oriented, updated and facilitator of knowledge.
- **Technology can be distracting, yet unavoidable:** Although the new age students respond quickly to high technology, the teachers on the contrary may become very distracted by it. ICT in the classroom requires students and educators to be taught how and when to use technology as a tool appropriately and safely. Thus, teachers need to be open with experiencing new technologies.
- **Cost and use of Technology:** The costs associated with implementing new technological resources in academic institutions may be daunting. Funding hardware, software, infrastructure, professional development and technical support

must be an ongoing priority. ICT costs are recurring, as is the need for teachers to be repeatedly trained and prepared to use technology.

- **Understand the Changing Environment of the Students:** Today's students are pushed to succeed unlike any previous generation. High school students who excel arrive at college to find themselves unchallenged, sometimes finding no use for the first two years of higher education. It has been seen that not in the U.S. alone, individuals all around the world enter the workforce without graduating from secondary school. As a result, the role of educational technologies in delivering education has become an imperative without any alternate choices. In fact, students of today should also be encouraged to learn a few courses in the Open and Distance Learning mode so that they can inherit the culture of lifelong learning.

4.4 Challenges faced in Students' Evaluation

We have already argued that in the 21st century learning environment, we must also use 21st century assessments that measure 21st century skills. However, the same assessment methodologies of writing answers at the examination hall still continue. Our experiences suggest that students today can easily write answers by googling in their smartphone or by receiving an image/text file over their whatsapp account. This poses great challenges to education as such. We must therefore change our evaluation system accordingly. Only then the efficiency and effectiveness of the 21st century advancement in education would be achieved.

5. CONCLUSIONS

This paper made an attempt to make a brief survey of the educational technologies of the 21st century and the imperatives to the practice of teaching in higher education. We have made a brief review of the evolution of educational technologies and how educational technologies differ from educational media. We have also analysed the changing context in education. We have seen how the changing characteristics of both the students and teachers have changed in the 21st century and how a teacher can effectively respond to them. Finally, we have seen that along with the changing practices in education, the evaluation process needs to change to make education more efficient and effective. □

6. REFERENCES

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