APPLICATION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN ASSESSMENT OF LEARNING LEVELS OF STUDENTS

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The obsessive-compulsive behaviour of checking email or social media updates is distracting and is conditioning the human mind to accept interruptions. Researches have proved that to focus back on whatever was being done before the interruption, usually takes 23 minutes. Also, studies have shown that the designing of the technologies is such that it is training the human mind to be self-disruptive every 3 and a half minutes. This design in the technology has an adverse influence on learning. So, what should the future of technology look like when it takes in its design effect the goals of learning. Application of Information and Communication technology in assessment of learning levels of students is all about understanding one's success in terms of achieving the outcomes of learning rather than the 'likes' received, and the connections made. So, technology's contribution in improving learning through assessment is not just about a linear progressions made and the counts reached, rather it is in defining and describing the levels of learning outcomes achieved.

Learning process starts with defining the Outcomes related to three domains-cognitive, psychomotor, affective, to be achieved, (not necessarily in water tight compartments), through Learning Experiences, i.e., creating opportunities provided to learners to achieve the learning Outcomes. And it must be ascertained by Assessment of Learning the levels to which the outcomes have been achieved. Where both the constructs, i.e., the Learning Experiences and the Assessment are happening in tandem to each other. A Blueprint of the above process integrates the three-dimensional rubrics for capturing and describing the matrix involved in defining the Outcomes, facilitating the opportunities, i.e. Learning Experiences and describing the levels of Outcomes achieved, in other words, the Assessment of Learning.

The above permutation and combinations of Outcomes, Learning Experiences and Assessment is done differently in different pedagogies. Behaviourist pedagogy gives importance to imparting knowledge for behavioural change, whereas, in Constructivist pedagogy, using knowledge to create new knowledge and reflection on the learning process and performance is of paramount importance. Accordingly, the Outcomes differ. These abilities and

competencies which are developed in students, described as the learning outcomes achieved can be assessed with the help of Information Communication Technology (ICT).

Changing Perspectives of Assessment

Information Communication Technology (ICT) has influenced all aspects of our life— even our day-to-day routine life activities. The world is changing fast. Connectivity is ever increasing. In last couple of decades, more than half of Indian population is connected by mobile phones and internet and this number is increasing exponentially, day-by-day. Information is available to you at your finger tips on the computer. A new connected knowledge society is emerging. Educational needs of this society are also changing. Learners today, have to now live in this more and more technology driven world. Therefore, education has to develop new capacities, capabilities and skills as learning outcomes which will be useful and relevant for living in a world wherein the process of change is the 'ruling mantra'. It is essential for us to ensure that the process of assessment in any learning situation is comprehensive and is able to capture the different levels of dynamic adaptability of the learners to proactively equip oneself with the skills and competencies required.

In the recent past, traditional ways of assessment are being changed to more sophisticated Assessment strategies. Our single method strategies are replaced by multiple methods, and paper-and-pencil tests are being replaced by computerised tests. The normal pass/fail decisions are shifted to assessment standards, and the assessment of knowledge has been replaced by the assessment of competence. Efforts have been also made to standardise subjective judgments, to develop sets of performance appraisal standards, to generate assessment evidence from multiple sources, and to replace the search for knowledge with the search for "reflection in action" in a new learning environment.

Assessment for learning rather than assessment of learning, support the learner rather than punish for failure, prefer formative rather than summative assessment and use criterion referenced rather than norm referenced testing for assessment of the learners' performance. This trend leads us to School Based Assessment (SBA).

Using Computers in Assessment

Computer based assessment implies the use of computers as an aid in the development, administration, scoring and interpretation of psychological or achievement tests. Use of computers in testing has become a dynamic tool for student assessment. One of the major benefits of computer assisted assessments is that one can individually select students and provide customised help as per requirement. This saves more time to spend on designing learning experiences to be provided. This also improves the involvement and chances of success of students who often are ignorant about the domains in which extra time needs to be spent.

While using multiple choice tests, computerised Question Banks are the best suited device for selecting items of required types, content and difficulty and discriminating power. It is useful for setting papers, creating equivalent but different forms (random item

mix), designing seating arrangement so that no two students sitting next to each other get the same form of test, eliminating the possibility of copying, dispatch of forms to examination center electronically just a few minutes before the scheduled time, involving no examination security hazards, etc.

This approach to assessment is similar to the conventional paper-pencil tests. The only difference is that when the software like Moodle is used for testing, the items are accessible on screen and one can answer by marking the choices on screen or writing answers on computers, instead of using a printed test paper. This way, one can test a very large number of examinees, simultaneously, without much difficulty.

Even in conventional examinations where essay type test items are mostly used, computers can be used for dispatch of question papers by examining body to examination center through e-mail, suitably monitoring the access using the mechanical safety measures, getting the adequate number of copies photocopied locally, just a few minutes before the actual examination, eliminating the problems related to storing, security, pilferaging, copying, postal delays or mix up of papers; with standby arrangements ready for power supply like generators in case of exigency. Though scoring of these essay type questions need to be done manually, but again computers may be used for preparing results, creating necessary records like mark lists, certificates, etc.

Further, the main advantage of computers in evaluation process is that one can conduct a test on a very large number of examinees, simultaneously, in the same testing conditions, without any bias, assessing the answer sheets speedily. The Optical Mark reader (OMR) can read the marked answer sheets, check the answers against the pre fed scoring key for different forms, generate the score, rank them and prepare the list of qualified examinees on a certain cut off score with the speed of 5,000 to 10,000 sheets per hour, minimising the time spent on evaluation. The students can also get the score cards instantly, the moment they finish the test.

It is usually perceived that computer assisted assessment is costly to implement. The hardware like computers, servers and printers, as well as, the networking, maintenance and technology transition can also be hurdles for limited resources. Using standard software packages may prove to be too generic and may not be effective for specific purpose as expected and customisation may also prove to be expensive.

However, the cost is lowering down due to continued improvement in computer-based assessment techniques like using Web based programs rather than static software that often need to be customised. The benefits of computer assisted assessment will further expand as technology improves and becomes more accessible for teachers and learners. Advantage of scale also goes in its favor. The computer based assessment can save time and money. Some assessment software provides direct feedback to students regarding development of study skills and mastery over curriculum topics.

As computer networking is increasing fast, it would be possible for students to log on at any time to do formative or diagnostic testing, adding flexibility in testing and additional support for learners. It will lead ultimately to On-demand Exam.

In assessment technology, one can create their own content like open-ended free-response questions, 2-D and 3-D plots, built-in mathematics and randomisation tools, etc., for any subject like Maths, Science, Engineering for easy and reliable online testing and comprehensive assessment of anyone, anytime, anywhere-A3 situation. The academic market offers a collection of testing solutions which can free schools from the cost, effort, and limitations of paper-pencil assessment. Drawing on the strengths of ICT, Web-based solutions make it easy to deliver meaningful tests on any subject and content and cost-effective options designed to meet the needs of an individual teacher, department, or entire institution. They may include selection testing, drill and practice, assignments, quizzes and tests, or entrance examinations. Some of them enable to use the tests directly from inside the LMS like Blackboard classes.

ICT Based Tools and Techniques of Assessment

Anecdotal Records

Anecdotal records are the systematic and occasional notes of the teacher regarding development of the child, based on her observations of students in the classroom or outside for assessment. These observations provides the database for understanding the learning path of student, their interactions and collaboration with peers and general observations on their learning styles, attitudes and behaviours. Several areas not assessable by conventional exams or the paper pencil tests, with the help of computers, one can create, maintain and use a record of development in such areas for understanding the learning growth of the child. The anecdotal records are most useful and valuable tool for use in School Based Assessment (SBA). A simple form to keep such record may look like this:

Anecdotal Records Form

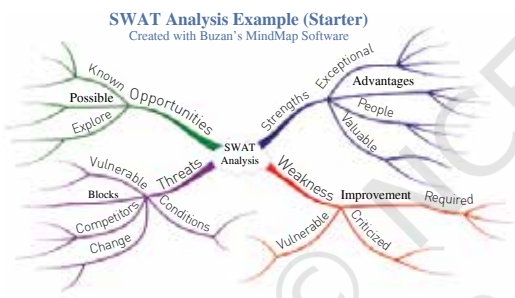
Name		**Name**	
Date of assessment		**Date of assessment**	
Observation period		**Observation period**	
Observation period		**Observation period**	
Comments		**Comments**	

Graphic Organisers

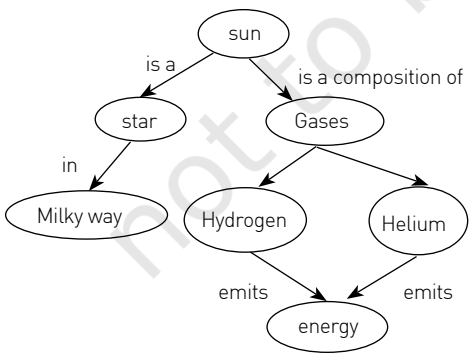
Two types of graphic organisers viz. Mind Maps and Concept Maps, are instructional tools but can serve the purpose of assessment. By definition, Mind Map is a graphical method of taking notes. It is a diagram to represent words, ideas, tasks, or other items linked to and arranged around a central key word or idea. It can be used to generate, visualise, structure, and classify ideas, and as an aid to studying and organising information, solving problems, making decisions, and writing.

A Concept Map presents the relationships among connected concepts and ideas. It is a tangible way to display how the mind "sees" a particular topic. In a Concept Map, the concepts, usually represented by single words enclosed in a rectangle (box), are connected to other concept boxes by arrows. A word or brief phrase, written by the arrow, defines the relationship between the connected concepts. Major concept boxes will have lines to and from several other concept boxes generating a network. Constructing a Concept Map provides a way to explore, reflect on, deepen, and share your understanding.

Mind Map of SWAT Analysis



Concept Map-Sun



Reflective Journals

Writing Journals can be used to assess the process of learning and student growth. They can be open-ended or can provide guiding, reflective questions for the students to respond to. The journals can provide insight and reflections on the learning processes of the students, if they are recorded and maintained on the computer.

Reflection is a process for looking back and integrating new knowledge. It is a meta-cognitive process that creates greater understanding of self and situations to inform future action. It is a process in which thoughts are 'turned back' so that they can be interpreted or analysed. Reflection may be accomplished individually and collectively. Interaction with peers, mentors, tutors, coordinators, experts provide opportunities to reflect on own experiences as well as others.

e Portfolio assessment

A portfolio is a purposeful representative collection of individual students' work- the art efacts and reflections that demonstrate how a student has reached the current standards of performance. This is one of the best tools for performance appraisal particularly when used in digital form. E-portfolio is a digital creation of the student, which helps to portray the knowledge, skills and abilities in a variety of different ways that cannot be assessed by conventional tools like paper pencil exams and essays.

Rubrics

A rubric is "a road map, telling students and teachers where to begin, where they're going, and how to get there." (Dr. Kay Burke). Rubrics are scoring guides for teachers which describes the expectations used to

assess students' level of understanding and allow students to know what they need to do in order to be learning at a higher level. Students take time to self-assess and peer-assess using the rubric created. By doing this, students understand the areas of their strength and identify areas that needs improvement.

Rubrics lists the dimensions (tasks) of the learnings to be assessed, and the specific criteria used to evaluate each dimension. It is different than a simple checklist since it also describes the gradations of quality (levels) for each dimension of the learning being assessed, and assigns a point value to each gradation of quality.

Simulation

Simulation is the imitation of some real situation, experience, state of affairs, or process. The act of simulation generally entails representing certain key characteristics or behaviours of a selected physical or abstract system. It can be used to show the eventual effects of the real conditions and courses of action. You can safely use simulation when the real system cannot be engaged or real experience cannot be provided because it may not be accessible, or it may be dangerous or unacceptable to engage. Simulations can be used as:
(a) live simulation - where actual players use genuine systems in a real environment, or
(b) virtual simulation - where actual players use simulated systems in a synthetic environment. The virtual simulation involves application of computers and technology.

Simulation permits mistakes during learning. Simulations in education focus on specific tasks. They model a real world environment in a simplistic way so as to help a learner develop an understanding of the key concepts. The learners assume roles in a simulated environment and perform tasks assigned to the roles. They are observed and assessed for their performance on the tasks allotted. Hence the assessment in a simulated situation is process oriented.

Question Bank

A question banking provides a well-organised collection of pedagogically sound, scientifically field-tested questions, bearing suitable psychometric properties like difficulty level, discriminatory power, etc., leading to reliable and valid evaluation. It minimises the time and energy required to construct a good test. Question Bank is developed for facilitation of teaching-learning process and also for assessment of learner in terms of learning outcomes. Question Bank becomes important when one assess a large number of students, or when continuity of assessment and record keeping over a time span is involved, frequency of testing is more, assessment is broad based and involves more parameters.

Question Bank can be a part of Assessment Management System (AMS), which often is part of Learning Management System (LMS). For example, Moodle is the most popular and user friendly software available to be used for inserting questions in the Question Bank and selecting them for testing. Moodle helps to store the questions under different subjects, topics and subtopics. Each topic can maintain its own pool of questions, which can be used to create a test or a quiz. Also, the questions can be uploaded from file, downloaded, used, answered, checked, imported and exported across the courses available in Moodle and can be inserted into the test directly.

e-Platform

The cyber infrastructure required for effective use of technology in education including assessment, mainly involves the e learning platform for the use of the learners and the teachers. Now the technology is poised to create such e platform on the cloud, making PCs obsolete. The components of the e-platform include the systems and procedures to be used for different purposes at different stages of education process. Different information and communication techniques, frameworks and tools like Web 2 technologies, can be included and used to create suitable e-Platform for evaluation system. Development and use of Evaluation Rubrics, selection of suitable Tools, Techniques and Frameworks, Search engines, OMR, Distributed Class, e-Platform like the one of IGNOU, network of Study Centers and counselors, etc., help in developing effective technology platform for assessment.

The e-platform may include—

- Learning Management System (LMS) – for delivery of online programs and conducting learning activities like Educational Revolution for All (ERA) of MKCL, Moodle (moodle.org), WebEx, Sakai (sakai.org), Ruby star, etc.
- Course Design and Integration Frameworks (CDIF) useful for development and updating the courses by the course teams. Even the students can provide feedback on the courses using this software.
- Assignment Management Systems (AMS) to manage the assignments right from their announcement, submission, follow up, evaluation, assessment, feedback, declaration of results, reminding the defaulters and keeping track of the progress of this activity.
- Distributed class (DC) with audio graphic and video conferencing facilities on broadband and on narrow band, using dial up connectivity, like SABA CENTRA for Mass interaction and mass personalisation, for an expert to deliver course content from central facility to learners at their places, to conduct learning activities, provide feedback, monitor group work, etc.
- Meta–database with SCORM compatibility.
- Tri-Band Technology, Mobile Telephony and Internet for network, communication and for working together.
- New tools and devices and social networks like Blogs, Orkut, YouTube, Facebook, Twitter, etc., for Virtual Conferencing/Working.
- Open Educational Resources (http://ocw.mit.edu/index.html), Open learn (http://openlearn.open.ac.uk), OER4S of Homi Bhabha Centre for Science Education (HBCSE) (www.mkcl.org/mahadnyan) and mechanisms for online mobilisation and training of functionaries and learners.
- Supplementary learning resources in multiple formats, print and non-print: like Power point and multi-media presentations, virtual lectures, Webinars, panel discussions, the digital resources like, eBooks, CDs, VCDs,

audio-video cassettes, journals and textbooks, readings on net / Websites, etc.

- Very strong and continuous, virtual, and real time student support system.

e-Platform can be used for conducting examinations in different modes like Online and On demand examinations, preparation and conduct of large scale competitive examinations; conducting viva voce test, preliminary interview for selection, for providing Feedback and counseling; using computers for development and operating Question Bank (Online), etc. But successful operation of such a system depends on the capacity building of teachers and students in ICT applications and development of required competencies and skills for using social networking for learning, working and developing together and using statistical packages such as SPSS, and computers, for data analysis and feedback for better learning and assessment.

Conclusion

The role of ICT in the teaching-learning process and assessment from different perspectives have been studied and compiled to give an insight to the use of ICT in assessing students leaning levels. Since learning and assessment cannot be compartmentalised, the use of ICT in both theses constructs have been elaborated upon. The different tools, techniques and procedures of assessment using ICT such as anecdotal records, mind maps, self and peer evaluation, e-portfolio assessment, reflection, project evaluation, rubric, Question Bank and simulated exercises, etc., have been expounded for the implications in their uses. The concept of e-Platform and its components like LMS, CDIF, and AMS, etc., and uses of e-Platform are also discussed.

The processes of assessment are critically important to check whether relevant learning is taking place to achieve the targeted outcomes and impact of education on the social system. Appropriate assessment can help us in determining whether useful life skills, competencies, and capabilities are being developed to equip the learners today, to live in the knowledge based society tomorrow and the support of technologies available for this task. The thing required to build is the knowledge base and capabilities of our teachers to enable them to use it productively for enhancing the skills and competencies of the learners to develop them as socially useful citizens for the society of Next Now.

References

Naik, S.P. (Ed.). 2004. *Role of Evaluation in Education.* Anmol Publications, New Delhi. p. 364. ISBN : 81-261-0162

Rammers, H.H. and N.L. Gage. 2010. *Educational Measurement and Evaluation.* Shri Sai Printographers, ISBN : 81-89996-22-2

SMITH, D. 2005. *Encyclopedia of Educational Measurement and Evaluation.* (5 Vols-Set) Commonwealth, xxxv, 1619 p, 5 vols, ISBN : 81-7169-897-2,

U.S. DEPARTMENT OF EDUCATION, 2016. Office of Educational Technology, Future Ready Learning. *Reimagining the Role of Technology in Education.* Washington, D.C.