

IMPACT OF INFORMATION TECHNOLOGIES IN EDUCATION

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Abstract: *Information and communication technologies provide powerful tools to support the shift to student-centred learning and the new roles of teachers and students. The flexibility of IT for learning allows adults and others outside of full-time attendance at schools and universities to learn in their own time. IT can add a great extra value to the distance learning, such as is provided by an open learning university. Information technology can make teaching and learning more effective and efficient.*

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A shift from teacher-centred instruction to learner-centred instruction is needed to enable students to acquire the new 21st century knowledge and skills. Shifting the emphasis from teaching to learning can create a more interactive and engaging learning environment for teachers and learners. This new environment also involves a change in the roles of both teachers and students. The role of the teacher will change from knowledge transmitter to that of learning facilitator, knowledge guide, knowledge navigator and co-learner with the student.

The new role does not diminish the importance of the teacher but requires new knowledge and skills. Students will have greater responsibility for their own learning in this environment as they seek out, find, synthesize, and share their knowledge with others. Information and communication technologies provide powerful tools to support the shift to student-centred learning and the new roles of teachers and students.

The new view of the learning process as shown in Table 1, is based on research that has emerged from theoretical frameworks related to human learning. Many reflect a constructivism view of the learning process. In this view, learners are active agents who engage in their own knowledge construction by integrating new information into their

schema or mental structures. The learning process is seen as a process of “meaning-making” in socially, culturally, historically, and politically situated contexts. In a constructivism learning environment, students construct their own knowledge by testing ideas and approaches based on their prior knowledge and experience, applying these to new tasks, contexts and situations, and integrating the new knowledge gained with pre-existing intellectual constructs.

A constructivist environment involves developing learning communities comprised of students, teachers and experts who are engaged in authentic tasks in authentic contexts closely related to work done in the real world.

A constructivist learning environment also provides opportunities for learners to experience multiple perspectives. Through discussion or debate, learners are able to see issues and problems from different points of view, to negotiate meaning, and develop shared understandings with others. The constructivist learning environment also emphasizes authentic assessment of learning rather than the traditional paper/pencil test.

As technology has created change in all aspects of society, it is also changing our expectations of what students must learn in order to function in the new world economy.

Table 1 Changes in student and teacher roles in learner-centred environments

Changes in Teacher Role	
<i>A shift from:</i>	<i>A shift to:</i>
Knowledge transmitter, primary source of information, content expert, and source of all answers	Learning facilitator, collaborator, coach, mentor, knowledge navigator, and co-learner
Teacher controls and directs all aspects of learning	Teacher gives students more options and responsibilities for their own learning
Changes in Student Role	
<i>A shift from:</i>	<i>A shift to:</i>
Passive recipient of information	Active participant in the learning process
Reproducing knowledge	Producing and sharing knowledge, participating at times as expert
Learning as a solitary activity	Learning collaboratively with others

Organizations and governments need to learn how to make wise investments in IT for education and training.

Students will have to learn to navigate through large amounts of information, to analyze and make decisions, and to master new knowledge domains in an increasingly technological society. They will need to be lifelong learners, collaborating with others in accomplishing complex tasks, and effectively using different systems for representing and communicating knowledge to others.

Information technology (IT) can make teaching and learning more effective and efficient, but you need to invest in its physical and organizational infrastructure, in how to use it, and in integrating IT into the students learning. There are many potential advantages of the use of IT in education.

IT will replace some lectures, laboratories and tutorials where it provides resources for learning which are more effective, richer, and available for extended hours, and open to a wider range of students. With lectures,

students need to absorb material at a fixed rate, or make good notes. Test results seem to indicate that the material covered by their courseware is more accessible, and offers more opportunity for practice on a computer, than in textbooks and lectures.

Students will have greater control over timing and pace, and there will be more likelihood of resources suiting the style and stage of each students learning. Teachers can expect to gain time for more individual attention to students. Both students and their teachers need to be trained in IT, and its use for learning.

It is essential for a much larger number of employees to have a wide range of practical IT skills. It is also important for them to have more general skills in lifelong learning.

IT in education - for students

Because IT is so powerful, it can be used at all levels of education and training, in certain situations IT can probably be more effective than any other media, for example in: *graph drawing*, *models* which are under student control, *simulations* to save equipment and laboratory animals, *drill and practice* to replace material often covered poorly in crowded tutorials, *illustrated lecture* to improve visual communication.

Early learning of study skills can make students more effective learners overall. These can be skills in using IT for studying, or more general skills learned through IT. It should be worth students being educated in IT to be able to make full use of:

- word processing;
- presentations;
- communication tools;
- collaborative work;
- Internet information access;
- electronic mail and file transfer;
- numerical processing spreadsheets, statistics;
- programming;
- graphic design;
- database analysis & management;
- control of equipment & instruments, data capture;
- desktop publishing;

- integrated work environment;
- conferencing;
- gateway to information & data banks;
- the internet and the World Wide Web.

As well as using IT tools in learning, computer based learning materials can provide powerful aids to all students, in many different ways: *guide, aid, discovery learning, games, simulation, modeling, visualization, animation, instructor, tutorial, interactive multimedia, problem solving, drill & practice, revision resource, assessment - formative & summative, integrated learning systems.*

The flexibility of IT for learning allows adults and others outside of full-time attendance at schools and universities to learn in their own time. IT can add a great extra value to the distance learning, such as is provided by an open learning university.

Education in IT - for teachers

Teachers difficulties in adopting IT have tended to centre on lack of time, lack of support staff, lack of information and lack of suitable materials. Staff attitudes often contain objections:

- computers will never be more effective than lectures;
- information technology will solve our problems;
- we can't give up laboratory space for computers;
- the students will always learn, whatever way we try to teach.

The ways in which a teacher may see IT fitting into their teaching depends on the many views that teachers hold on what is important in the teaching and learning process. In discovery learning, students learn through projects, investigations and problem solving, with the teacher providing motivation and advice, and pointing to resources. Such teachers may prefer a package to be a resource collection, or use access to the Web.

The main objective of *Computer Aided Learning (CAL)* is to exploit the technological advantages, so that teaching could be made more efficient and students would have vastly increased access to learning resources.

Most *CAL (Computer Aided Learning)* packages are constructed for subject specific

learning, providing knowledge and understanding of concepts, facts, trends, conventions, theories, principles, rules, laws and structures. Others are for professional skills: practical competences that are specific to a vocation, such as dentistry. It is less common for a *CAL* package to specifically address curricular aims for general skills: to analyze, observe, discriminate, conceptualize, classify, speculate, validate, explain, predict, apply, integer ate, evaluate, reflect, solve complex and new problems, form points of view, acquire motor skills, interactional skills, communication skills.

Courseware can simply be described as packages of teaching and learning material that are delivered to students via a computer. The recent advances in computer technology and multi-media allow courseware to contain a visually exciting mixture of text, graphics, photographs, sound, animations, and movies. More importantly, courseware modules can be interactive and constantly require decisions or input from the user.

Making a decision to adopt new technologies on a large scale is not a trivial one for an organization or nation. It requires long term survival as the criteria, rather than short-term profitability. Educational changes should be driven by teaching and learning needs, which in themselves are usually driven by external pressures. The key issue to be addressed is how to help teaching departments and individual teachers evaluate and make decisions on investing in the effective use of IT in delivering learning, and then to support them until they become self-sufficient, during the period when using this technology for learning is a novelty, with sparse local expertise. The many teachers who have engaged in the use of IT for their students learning should be linked by informal networks, coordinated by a service which responds to the demands of educational and IT issues and of users. Information gathered on integration efforts of IT helped a more general focus on improving teaching and learning.

The question of how to integrate IT led to much more attention on describing course objectives, assessing student learning, and reflections on teaching methods. Information

gathered on integration efforts of IT helped a more general focus on improving teaching and learning, which reflected a deeper appreciation of the relationship of IT to teaching.

These points of view suggest that, in order to make a satisfactory technological change, the following inter-related factors need to be identified and understood:

- Issues: quality, access, accountability, efficiency, economy, government policy, uncertainty, stress, conflict, strengths, weaknesses, opportunities, threats or failures - a perception that identifies dissatisfaction or a problem to be solved;
- Tasks: mission, aims, objectives, and nature of specific tasks associated with the problem;
- Systems and subsystems: inputs, outputs, processes, assessment, evaluation, feedback, control, culture, organizational structure, hierarchies, networks, power, resource allocation, room to move, training, staff development and support;
- Know-how of technology, pedagogy, organizational and project management; ability to learn;
- People: attitudes, values, beliefs, personalities; subversives, mediators, leaders, sponsors;
- Interpretations: of all these factors, by people in all parts of the identified system;
- Concepts: comparison of activities considered necessary with the perceptions of reality;
- Action: agents of change to create a climate for change, and carry out a project to solve “the problem”, modify goals, or reach a better understanding that leads to

less dissatisfaction in the lives of those in the system;

- Methodology: analysis/planning, action, evaluation/appraisal, reflection and revision, proceeding in a spiral fashion over extended periods of time, as in the critically reflexive action research form of social inquiry and in the systems based approach to solving human activity problems;
- Resources: time, resources, cooperation, support, goodwill and priority to carry out a project.

All business and industrial enterprises, employers need workers skilled in all aspects of IT, and rely on the education system as well as their own training schemes.

Each enterprise and educational establishment needs to invest in computers and networks, coordinated nationally, and linked to the internet.

Education is an investment in the future of a nation. To educational economists the evaluation of costs and benefits of education must include all costs and all benefits to the whole of society.

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