Information and Communication Technology (ICT) Integration in Teacher Education

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Abstract
The use of Information and Communication Technology (ICT) such as internet applications, CD-ROMs, floppy disks, video technology including video conferencing, Intranet, Extranet, Ethernet for resource sharing and various computer attachments and software-application programs have bring enormous change in society. These changes are not only of technical nature but also are of structural nature. Many of the major institutes of our society have changed and the way we live our daily lives have been impacted. With ICT teachers are able to create their own material and thus have more control over the material used in classroom than they have had in the past. Many teachers use the ICT to support traditional learning methods, for example, information retrieval in which students are 'passive learners of knowledge' instead of 'active producers' able to take part in the learning process. Information and Communication Technologies have recently gained groundswell of interest. It is a significant research area for many scholars around the globe. Their nature has highly changed the face of education over the past few decades. The change caused by the introduction of ICT into learning environment, are not without some potential problems, which must be considered by administrators. The information from the college indicates that some fundamental rethinking of the education process must be necessary because of the use of ICT. This will also put pressure on the college system to restructure the way education I organized.

I. Introduction

For most developing countries, the use of ICT in education and training has become a priority during the last decade. However, very few have achieved progress. Indeed, a small percentage of colleges in some countries achieved high levels of effective use of ICT to support and change the teaching and learning process in many subject areas. Others are still in the early phase of Information and Communication Technologies adoption. Blanskat, Blamire, kefala (2006) conducted a study carried out in national, international, and European colleges. With an aim to draw some evidences regarding the advantages and benefits of ICT in college achievements. It seeks to measure the impact of ICT on students' outcomes. The study also tried to establish a link between the use of ICT and students' results in exams. The findings are interesting: ICT has positive impact on students' performances. Colleges with higher level of e-maturity show a rapid increase in performances in scores compared to those with lower level.

In addition, colleges with sufficient ICT resources achieved better results than those that are not well-equipped. There is a significant improvement on learners' performances. Finally, teachers become more convinced that educational achievements of pupils are due to good ICT use. Many pupils consider ICT tools very helpful in that it helps them to do assignments and teachers see that ICT enables students with special needs or difficulties. It also helps to reduce the social disparities between pupils, since they work in teams in order to achieve a given task. Students also assume responsibilities when they use ICT to organize their work through digital portfolios or projects. In addition, the study showed that ICT has significant impact on teachers and teaching processes. ICT allow for a higher quality lessons through collaboration with teachers in planning and preparing resources (Ofsted, 2002). Students learn new skills: analytical, including improvements in reading comprehension (Lewin et al, 2000). ICT also develop some writing skills: spelling, grammar, punctuation, editing and re-drafting (Lewin et al, 2000). Still new technologies encourage independent and active learning, and students' responsibility for their own learning (Passey, 1999) ICT proves that students who used educational technology felt more successful in college they are more motivated to learn more and have increased self- confidence and self-esteem. It is also confirmed that many students found learning in a technology-enhanced setting more stimulating and much better than in a traditional classroom environment (Pedretti and Mayer-Smith 1998).

II. Implementing ICT with Seven Principles for Good Practice in Education

Since the Seven Principles of Good Practice were created in 1987, new communication and information technologies have become major resources for teaching and learning in higher education. If the power of ICT is to be fully realized, they should be employed in ways consistent with the Seven Principles.

1. Good Practice Encourages Contacts between Students and Teacher

Frequent student-teacher contact in and out of class is a most important factor in student motivation and involvement. Teacher's concern helps students get through rough times and keep on working. Knowing a few teachers well enhances students' intellectual commitment and encourages them to think about their own values and plans.

Communication technologies that increase access to teachers help them share useful resources, and provide for joint problem solving and shared learning can usefully augment face-to-face contact in and outside of class meetings. By putting in place a more "distant" source of information and guidance for students, such technologies can strengthen teacher's interactions with all students, but especially with shy students who are reluctant to ask questions or challenge the teacher directly. It is often easier to discuss values and personal concerns in writing than orally, since inadvertent or ambiguous nonverbal signals are not so dominant.

2. Good Practice Develops Reciprocity and Cooperation among Students

Learning is enhanced when it is more like a team effort than a solo race. Good learning, like good work, is collaborative and social, not competitive and isolated. Working with others often increases involvement in learning. Sharing one's ideas and responding to others' improves thinking and deepens understanding. The increased opportunities for interaction with teachers noted above apply equally to communication with fellow students. Study groups, collaborative learning, group problem solving, and discussion of assignments can all be dramatically strengthened

through communication tools that facilitate such activity. The extent to which computer-based tools encourage spontaneous student collaboration was one of the earliest surprises about computers. A clear advantage of email for today's busy commuting students is, it opens up communication among classmates even when they are not physically together.

3. Good Practice Uses Active Learning Techniques

Learning is not a spectator sport. Students do not learn much just sitting in classes listening to teachers, memorizing prepackaged assignments, and spitting out answers. They must talk about what they are learning, write reflectively about it, relate it to past experiences, and apply it to their daily lives. They must make what they learn part of themselves. The range of technologies that encourage active learning is staggering. Many fall into one of three categories: tools and resources for learning by doing, time-delayed exchange, and real-time conversation. Today, all three usually can be supported with "Worldware," i.e., software (such as word processors) originally developed for other purposes but now used for instructions too.

4. Good Practice Gives Prompt Feedback

Knowing what you know and don't know focuses your learning. In getting started, students need help in assessing their existing knowledge and competence. Then, in classes, students need frequent opportunities to perform and receive feedback on their performance. At various points during college, and at its end, students need chances to reflect on what they have learned, what they still need to know, and how they might assess themselves. The ways in which new technologies can provide feedback are many, sometimes obvious, sometimes more subtle. Computers also have a growing role in recording and analyzing personal and professional performances. Teachers can use technology to provide critical observations for an apprentice, for example, video to help a novice teacher, actor, or athlete critique his or her own performance. Teacher (or other students) can react to a writer's draft using the "hidden text" option available in word processors: Turned on, the "hidden" comments spring up; turned off, the comments recede and the writer's prized work is again free of "red ink."

5. Good Practice Emphasizes Time on Task

Time plus energy equals learning. Learning to use one's time well is critical for students and professionals alike. Allocating realistic amounts of time means effective learning for students and effective teaching for teachers. New technologies can dramatically improve time on task for students and teachers. Some years ago a teacher told one of us that he used technology to "steal students' beer time," attracting them to work on course projects instead of goofing off. Technology also can increase time on task by making studying more efficient. Teaching strategies that help students learn at home or work can save hours otherwise spent commuting to and from campus, finding parking places, and so on. Time efficiency also increases when interactions between teacher and students, and among students, fit busy work and home schedules. And students and teachers alike make better use of time when they can get access to important resources for learning without trudging to the library, flipping through card files, scanning microfilm and microfiche, and scrounging the reference room. For teachers interested in classroom research, computers can record student participation and interaction and help document student time on task, especially as related to student performance.

6. Good Practice Communicates High Expectations

Expect more and you will get it. High expectations are important for everyone — for the poorly prepared, for those unwilling to exert themselves, and for the bright and well motivated. Expecting students to perform well becomes a self-fulfilling prophecy. New technologies can communicate high expectations explicitly and efficiently. Significant real-life problems, conflicting perspectives, or paradoxical data sets can set powerful learning challenges that drive students to not only acquire information but sharpen their cognitive skills of analysis, synthesis, application, and evaluation. Many teachers report that students feel stimulated by knowing their finished work will be "published" on the World Wide Web. With technology, criteria for evaluating products and performances can be more clearly articulated by the teacher, or generated collaboratively with students. General criteria can be illustrated with samples of excellent, average, mediocre, and faulty performance. These samples can be shared and modified easily. They provide a basis for peer evaluation, so learning teams can help everyone succeed.

7. Good Practice Respects Diverse Talents and Ways of Learning

Many roads lead to learning. Different students bring different talents and styles to college. Brilliant students in a seminar might be all thumbs in a lab or studio; students rich in hands-on experience may not do so well with theory. Students need opportunities to show their talents and learn in ways that work for them. Then they can be pushed to learn in new ways that do not come so easily. Technological resources can ask for different methods of learning through powerful visuals and well organized print, through direct, vicarious, and virtual experiences; and through tasks requiring analysis, synthesis, and evaluation, with applications to real-life situations. They can encourage self-reflection and self-evaluation. They can drive collaboration and group problem solving. Technologies can help students learn in ways they find most effective and broaden their repertoires for learning. They can supply structure for students who need it and leave assignments more open-ended for students who don't. Fast, bright students can move quickly through materials they master easily and go on to more difficult tasks, slower students can take more time and get more feedback and direct help from teachers and fellow students.

Aided by technologies, students with similar motives and talents can work in cohort study groups without constraints of time and place.

III. Examples of ICT-based Teaching and Learning

As part of their work towards the expected outcomes for the use of ICT in subject teaching (TTA, 1998), a number of teachers have worked on a teaching activity which involves students carrying out a web search and producing a report on their findings using presentation software such as Microsoft PowerPoint. For three different specialist IT teachers who worked with the author as their 'ICT mentor', the student learning objectives involved basic knowledge of data protection law and an understanding of the principles behind the legal framework for data privacy and computer misuse. Following the activity, the teachers were expected to evaluate the contribution that ICT had made to students' learning. Their ICT mentor had a key role in helping them to do this.

A. Teacher 1

The teacher considered a number of ways of enabling students to obtain information about data protection issues. He judged that a search engine would provide a suitable level of affordance for obtaining information, but that because of the lack of experience in using search techniques, a further constraint should be provided for the students. The teacher thus suggested that students use 'Data Protection Act' as the search term. This immediately produced the two most relevant web sites at the top of the list returned, and students quickly moved to the second phase of the task. They were required to load up a partially complete PowerPoint presentation prepared by the teacher and enter the answers to questions given in the title of each slide in the form of bullet points. They were able to work systematically through the prompts on the presentation slides and use the web sites found to obtain answers which they wrote into the presentation. The teacher then gained the attention of the whole class and displayed a complete presentation containing the desired responses, so that students could check how successful they had been. The students were then asked to write a report about data protection for homework, which would be used for assessment purposes. As many students did not have access to appropriate resources at home, this was allowed to be handwritten.

B. Teacher 2

This teacher was a colleague of Teacher 1, and they had jointly planned the approach to be taken. Teacher 2, however, imposed a looser constraint on students' web searches, suggesting only 'Data protection' as the search term. This resulted in a wider range of results concerning security as well as privacy issues from all over the world, from which students had some difficulty in selecting relevant information. This process provided less support for the outcome of the first stage of the task; although it provided opportunities for teaching about refining searches and about computer security issues, the time constraint was paramount and the teacher decided that, instead of finding their own answers, they should be given direct teaching using the complete PowerPoint presentation so that they would be in a position to produce their reports for assessment.

C. Teacher 3

This teacher worked in a different college, where the students already had a high level of ability in web searching. They were also judged to have a high level of literacy and metacognitive skills. He thus decided not to provide any constraints on this aspect of the activity, nor to provide any constraints on the use of PowerPoint. He produced a PowerPoint presentation himself which set out a number of questions concerning issues of privacy and computer misuse, and used it with the whole class both to demonstrate the use of PowerPoint as a medium for presentation and to raise the issues on which they were going to research and report. The students were organized to work in groups of three over an extended period of time to carry out the web research and to produce a PowerPoint presentation on their findings. They were then asked in turn to present their reports to the rest of the class, with assessment being carried out on their ability to use PowerPoint to present information as well as their explanation of the ideas which they had included.

IV. Result of Evaluation Issues

In each of the examples, the teaching involved the same topic, in the same course, using the same resources. The role of the WWW was to afford access to information for which cognitive effort would be required on the part of students in order to produce a reflective report. PowerPoint afforded the entry of responses in brief point form; it was for this reason that it was chosen, rather than Word. Despite these similarities, the impact of ICT was very different in each case. Teachers 1 and 2 provided constraints on the activity which Teacher 3 did not. First, they constrained the web search activity; next, they specified prompts to indicate the required responses. Finally, they required a separate assessment task in order to evaluate the learning which had taken place. These constraints made a fundamental change in the contribution of ICT, and influenced the nature and amount of learning which took place.

For Teacher 2, the results of the assessment task revealed that somewhat less learning had taken place than with Teacher 1. Teacher 2 felt that the students did not have the metacognitive and literacy abilities needed to bridge the learning gap, but the mentor had been present in both teachers' lessons and was able to discuss the effect of the difference in the web search term. Furthermore, the teacher-led presentation to the whole class had not engaged students in the sort of cognitive effort required to bridge the learning gap.

For Teacher 3, the students' presentations, explanations and responses to questions from the teacher and other students revealed considerably greater attainment than for Teachers 1 and 2. This may be partly due to the greater ICT and other abilities of the students, and partly due to the affordances of the media used in the assessment task, namely presentation software and oral communication, rather than written prose. It is currently impossible to quantify the factors involved, but it seemed that the depth of knowledge gained was influenced the most by the combination of the students' metacognitive abilities and a lack of constraint in the learning task.

The students were able to set their own constraints and reduce their dependence on the teacher, and their ICT abilities enabled them to increase their recognition of affordances, thus gaining greater value from the ICT resources. The teacher was able to set higher expectations for the student's use of PowerPoint presentations than were possible using the 'gap filling' approach of Teachers 1 and 2. As we would expect from the body of research carried out into groupwork with computers (e.g. Hoyles et al, 1994), it also seemed that the constraint of group collaboration, and the affordances of each others' suggestions, enhanced the learning. The group also afforded an audience for individuals' ideas and feedback on their viability, which helped each individual to bridge the learning gap. There is clearly scope for further analysis of the conditions for effective groupwork using the framework of tasks, affordances, constraints and abilities.

V. Conclusion

The examples described above highlight the context sensitivity of the impact of ICT on Teacher Education Program. Reflection on a teacher's use of ICT may be similarly restricted by difficulties in sharing an understanding of the relationships involved. The framework provides a means of making these relationships explicit, and individual teachers (on their own or with a mentor) can use it to highlight strengths and weaknesses and suggest improvements in a way which reflects the context-sensitive nature of teaching effectiveness. The model allows the influence of particular features of the setting to be analysed and provides a structure for alternative scenarios to be considered. For example, Teachers 1 and 2 could analyze Teacher 3's approach and identify how it could be adapted for their own context, or how they might change the features of

their own setting in order to provide the conditions required for success. Following use in this way for explicit representation during professional development work with a mentor, the process has the potential to be used implicitly as part of teacher's education program. Limited resources within colleges are a great impediment to the take-up of ICT. Lack of computers and software in the classroom can seriously limit what teachers are able to do with ICT. Limited resources results in lack of computer integration, which in turn results in lack of sufficient computer experience for both pupils and teachers. Teachers need to be provided with adequate facilities and training to be able to use those facilities in order to progress in a technology-rich context. Research shows that teachers who have a high value for ICT and perceive it to be useful completely transform their teaching (Cox et al, 1999; Pedretti et al, 1999).

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