Researching IT in Education

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1   Members of the group

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*Co-author of the briefing paper but unable to attend the conference.

(N.B The terms IT and E-learning (synonymous with ICT in education) are used throughout this paper to avoid ambiguity.)

2   Focus of the working group discussions

The focus of the group's discussions was on Researching IT in Education, based on the specific calls to action from the EDUsummIT 2009 listed below and in the EDUsummIT 2011 briefing paper by Cox and Sakamoto (2011):

- To actively study both research on and the development of ICT applications in classrooms;

- To use findings presented in the Handbook (Voogt & Knezek, 2008) to inform research, policy and leadership for IT in schools;

- To develop mechanisms for sharing and distributing research that suggests promising policies and practices for ICT in education.

The group identified the following aims for the research community in exploring ways that the IT in Education community might address these calls:

- To identify how research is currently conducted and how best practices can be shared;

- To identify ways that research can affect policy and vice versa;

- To articulate methods that can be used to inform policy makers, and to influence change in education;

- To provide recommendations to guide future research and to identify gaps in research that need to be addressed.

The report below is a synthesis of the original briefing paper enhanced by discussions with the working group.

3   Introduction

Past evidence from research into IT in education is relevant to all the goals of the Call to Action; see the International Handbook for IT in Primary and Secondary Education (Voogt and Knezek, 2008) and an extensive literature of the impact of IT in education. The effectiveness of previous national and international policies and strategies for integrating IT in education has been dependent upon knowing what has previously influenced the uptake, impact and sustainability of IT in education and the accessibility of results for policy makers.

Although there is still a main emphasis for national policy makers on formal educational settings, e.g. 'classrooms,' actual IT use by many learners in developed countries permeates their wider informal learning experiences, requiring policy makers, researchers and practitioners "to reconstruct the conceptual framework of IT in education and E-learning" to take account of a networked learning community (Sakamoto, 2002). The 21st Century community of learners has no school or national boundaries; however, as is illustrated in this Working Group paper, IT resources in educational settings range from hi-tech classrooms with extensive resources to schools in developing countries with no IT access; to online social networking sites such as Facebook and Twitter to blended environments which may combine traditional and online experiences. These diverse settings will change entirely the role and contribution of IT in education and profoundly affect research agendas and methods. It was clear from many of the delegate's examples that there is a disturbing lack of clarity about what is meant by such fundamental terms as IT/ICT, and formal and informal learning.

4   Research update

Recent evidence from specific major research studies in Technology Enhanced Learning (TEL), show that the current research component is remarkably similar to that found 40 years ago in which researchers investigate the relationship between an IT application/resource through its stages of development, and teachers and learners engaged in its use (TLRP-TEL, 2011). The change in TEL resources over time has been in their power and diversification and the globalisation of access to information. For example, the current eight large national TLRP-TEL projects in the UK all involve the innovative development of an IT resource in educational settings and include for example: merging video analysis with Web 2.0 technologies to create a semantic network; a large scale multi-touch screen that can be used by a whole classroom; and a haptics based virtual dental chair enabling students to practise treating virtual dental problems before working on the real patient.

Where students are still studying within formal education, recent research trends reflect the increased mobility of the technology; from use of small but very portable devices (Looi et al., 2011) to connected online learning enabling students to study anytime anywhere. Previous research in TEL (E-learning) shows that some methods ignore the learning conditions which might promote changes in cognitive structuring and therefore how the impact the IT environment will have on the learner. The way in which new technologies have changed the representation and codifying of knowledge and how this relates to learners' mental models has shown that learners develop new ways of reasoning and hypothesizing their own and new knowledge. Therefore measuring the effect of IT on students' learning needs to address student literacy in the IT medium as well as learning outcomes related to the aims of the curriculum. All of these considerations also need to address changes taking place between the 'Present Stage' where in many cases the main concept is still based on traditional face to face teaching with E-Learning as an enhancement or optional extra, to the 'Future Stage' in which the primary instructional mode is E-learning which may include a Face to Face Learning component as shown in Figure 1 below.
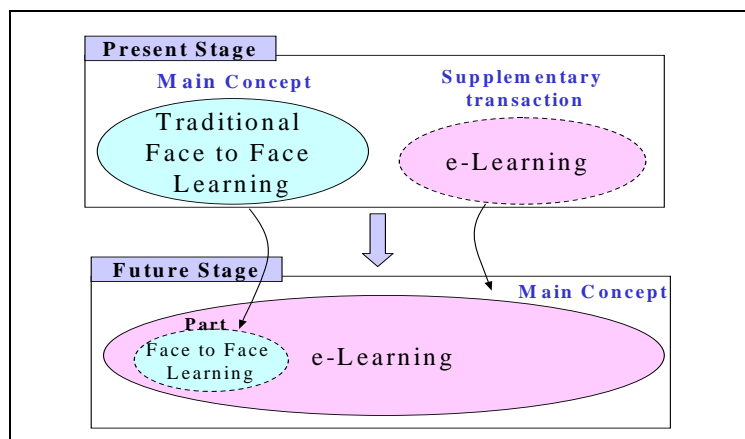
In this paradigm shift in education, E-learning networks of researchers are more effectively sharing knowledge, research results and practices, and overcoming cultural and national boundaries (Sakamoto, 2002). Therefore research practices will be intertwined with cultural differences, national priorities and global agendas.

Figure 1 – The present and future conceptual frameworks for E-learning (Sakamoto, 2002, p. 3)

Furthermore, in the field of researching IT in education more effort has been made in recent years to identify theories which will underpin research methods and scope such as attitudinal and pedagogical theories about teachers' pedagogical beliefs, sociological theories about educational change and institutional innovations, system theories relating to IT in schools such as activity theory, and psychological theories relating to human computer interactions and knowledge representations (McDougall et al., 2010). The challenge for the research community is to know enough about the technology to be able to: (a) identify a range of effective research methods; (b) underpin the research with appropriate theories; and (c) report, share and distribute the research outcomes in a manner which will enable policy makers and practitioners to benefit from the findings (OECD/CERI, 2001; McDougall et al., 2010, Wilson et al., 2010 and Zenios (2011).

5   The digital divide

If we consider the implications depicted above in Figure 1, for the wider international community, current evidence, national government policies and regional experiences show that there is a lack of clarity about what is meant by the term E-learning, how people conceptualize the continuum of formal and informal learning opportunities; and what is meant by the digital divide. Opportunities to participate in the digital culture including access to E-learning between developing and developed countries, or within regions (in some countries) can show large differences. However, our definition of digital divide needs to be updated to include attitudes, culture, abilities, cognition and literacy. There is also a divide in utilization and productive application of IT for learning amongst those who have the IT skills. There are cultural and individual differences and interpretations as well. Researchers and policy makers need to consider what communities can and are doing to overcome digital divides, and respect differing learning cultures related to digital resources. Digital difference or digital diversity may be preferable to the term 'digital divide.' Therefore, when research is done it is necessary to be clear in the use of this terminology.

Considering the use of E-learning in specific schools and classrooms in different countries across the globe, discussions in the working group showed that the following issues still remain:

- It is often impossible to distinguish between global and regional uses of E-learning or how policy-based solutions might improve its use;

- There is a lack of homogeneity in different research contexts: countries, regions, communities and classrooms.

For example, for many years students have continued their learning outside of formal school settings without having access to IT. If we define digital divide as some having and using access to IT in education and some not, national evidence shows that there is even a digital divide amongst students in the same school due to uneven availability of resources, different levels of IT literacy skills amongst students and different abilities and pedagogical content knowledge of the class and subject teachers to use

IT. Therefore it can be misleading to assume that there is consistent use in a particular region of the world or even within a specific school.

The digital divide in terms of IT access and skills between developed and developing countries requires diverse approaches to researching IT at the learner, institution, national and global levels: e.g. Does the same IT resource used in a secondary science classroom in which most pupils have mobile phones have the same impact on the students' learning as in one where electricity supplies are intermittent and the IT resource costs the same as a teacher's salary?

6   Addressing the issues

As we are becoming an increasingly connected but still divided international community, researching IT in Education faces specific issues and unresolved questions in addition to the 'digital divide' problems discussed above:

- *IT provides new knowledge representations that are dynamic and unstable as the technology evolves. What kind of research methods can accommodate this "uncertain" learning experience?* Such research may be highly individually driven and this needs to be taken into account.

- *Representations of learning objects are also a challenge to be considered*. Researchers should move beyond confirmatory methods; as explorative methods may give richer information about what learning is taking place.

- *The balance and interface between formal and informal learning environments is nebulous and often difficult to measure.* It is therefore essential to isolate the effects of the technology itself relative to learning, and how learning outcomes are the result of an integrated process.

- *rapid growth and changes in technology leave researchers, as well as teachers and learners, struggling to keep up with functionality and educational potential.* We propose following the lead from other disciplines which have set up observatories to research and monitor what is happening in the longer term. This would support studies looking into long-term developments of learning environments and their uptake and impact in education. The important goal is not how or whether technology changes education but what kinds of use improve education. On the other hand technology changes society and thereby changes the goals of education over time (although past research has shown that education has not changed significantly in spite of technology).

- *The exponential growth of information flow has long outstripped most individuals' ability to benefit in a coherent way. What kind of research approaches can account for this dilemma and which mechanisms for collaborating in research will be most effective with 21st Century skills and connected environments?* Using a quantitative pre-post test methodology does not typically address the kinds of learning that occurs through collaborative ways of working and social skills developed through participation in the Web 2.0 digital world. Researching IT in education often occurs across subjects or disciplines, and in relation to publishing disciplinary research, isolation is certainly a problem. Therefore international collaborations amongst researchers and across disciplines and the establishment of observatories for IT in education would help address these issues.

- *New literacies (perceptions and understandings linked to new modes of presentation and representations) are changing the emphasis and the balance in terms of the production, content and meaning of educational resources, which is often not understood by teachers.* Researchers need to develop a common international taxonomy of learner interactions to form some common basis for educational evaluation. More communication amongst researchers at international levels would help achieve this.

7   Communicating research to the policy makers, practitioners and the wider community

Working group members identified many issues and problems concerning how to communicate research priorities, findings and implications to those who may be affected by research outcomes, whether policy makers or individual users. A communicative approach is needed to convey research needs and outcomes

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effectively. Figure 2 shows responsibilities around the outer circle and interaction considerations among researchers, policy makers and practitioners in the inner triangle.

8   Conclusions

In conclusion, the strategies recommended by the group to help address many of the dilemmas and issues identified above are:

1. Establishment of observatories

    a. Permanent centres such as already exist in other disciplines;

    b. Long-term research to monitor changes in research methods and outcome with changes in technology;

    c. Longitudinal studies to investigate impact of IT in education over time;

    d. Developing theories and methods to support the research communities.

2. Communicating and conversing

    a. At grass roots level by collaborating with end users: pupils, teachers, policy makers, parents;

    b. Working through UNESCO and other international entities to influence international policies and strategies;

    c. Using Web 2.0 technologies to support collaboration among research communities;

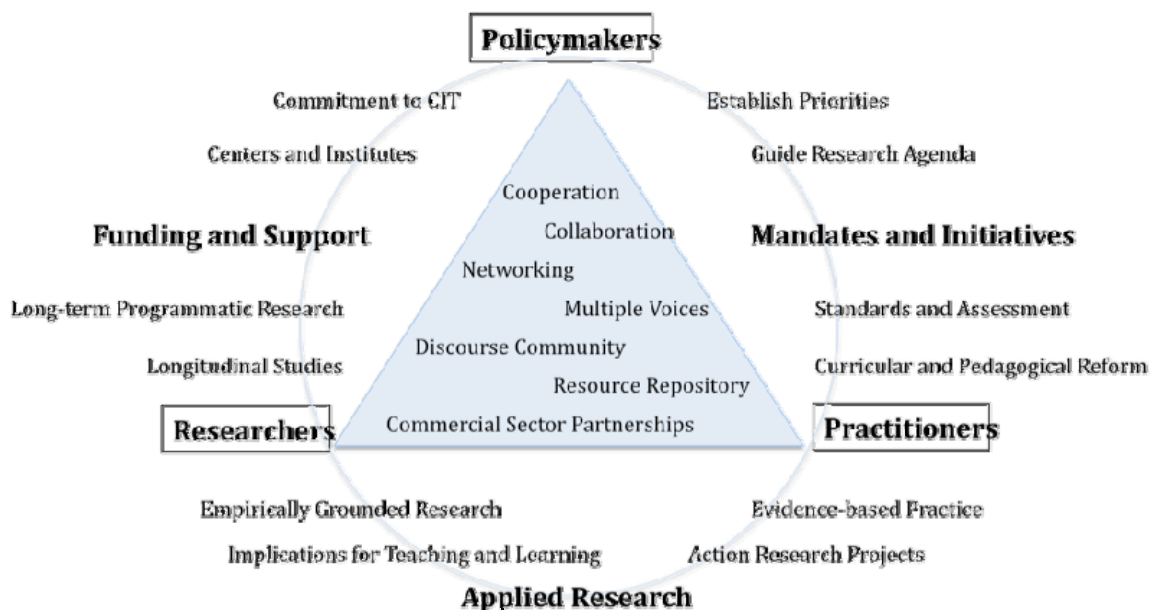   d. Reaching out to national electorates to influence politicians;

Figure 2   Roles and Interactions among researchers, policy makers and practitioners

    e. Addressing the current lack of credibility with the general public, which influences politicians, by sharing research with stakeholders;

    f. Improving communication among researchers.

3. Funding issues and opportunities

a. Convey to funders the interdisciplinary nature of the area;

b. Focus international research agendas to address different national priorities;

c. Accommodate universities' emphasis on publications in the academic journals;

d. Consider industry funding/UNESCO which can help address funding shortages and share their expertise.

9   Bibliography

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