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Chronology of review of ICT research in the field of education

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Abstract
As nothing is permanent but change so is the case with ICT: it evolution, past and present trends. With the introduction of computers since 1960s, it has been both a matter of intrigueness and frustration for teachers as well as researchers. Many of our expectations did not materialize but some do showed positive results. Many studies in the world have been conducted, to get a feel of its impact and to determine its future prospects. However, overall most of the studies have shown only a small positive impacts but has directed as towards more research in ICT is very much required to find out its utility in the present contacts and its potential in coming times. This study tries to review the already research conducted in this field and aims to serve as guide for further research in the field of ICT in other fields specially in sports. It this era of convergence between different subjects: facilitated by ICT it self it is required to broaden our perspectives and all researches conducted in the field of ICT has to be reviewed first, in this study we will reviewing the literature of study of impact of ICT on learning.

Keywords: ICT, qualitative analysis, quantitative analysis, learning.

1. Introduction
With the introduction of computers, the precursor of our modern-day ICT, and the promising potentials of computer-based instruction and learning, many researchers and funding agencies were led to invest much of their resources to investigate the possibility of computers replacing teachers in key instructional roles (Roblyer, Castine and King, 1988). Moreover, the 'Everest Syndrome' (cited in Roblyer *et al*., 1988, p. 5) also resulted in many believing that computers should be brought into the education arena simply 'because they are there' and the resultant perpetuation of the myth that students would benefit qualitatively from computers by simply providing them with the software and hardware.
However, this initial enthusiasm and novelty effect began to diminish as the realisation that the fulfilment of the promises and beliefs was not forthcoming, became increasingly evident.
Reynolds (2001) in his keynote presentation on 'ICT in Education: The Future Research and Policy Agenda' lamented that we are trapped in a cycle of classic innovation failure – a low quality implementation of a not very powerful new technology of practice produces poor or no improvement in outcomes, which in turn produces low commitment to the innovation and a reluctance to further implement more advanced stages of the innovation. It seems to be advocated that we are more likely to generate the improvement in outcomes that would produce the commitment to ICT utilisation. (Reynolds, 2001, p.2)

Scope of Review
This review seeks to examine and understand the methodology used by researchers to study the impact of ICT on learning. By reviewing this literature we will be able to work on more enthusiastically towards more research and can relate it to different areas.
Most of the studies reviewed are conducted in the various part of the world.A review of research in this field has been more consistent and well documented. Two periods of research have been suggested in this review.
(a) Research findings and their implications from 1960s to 1980s;
(b) Research findings and their implications from1990s to 2000s, and future research.

Methods of Analysis

The Qualitative Approach

In-depth case studies of small groups of learners are usually the norm in qualitative methods of research. Detailed records of ICT-related activities, as well as the learning taking place, are essential as they are necessary for the identification of relationships between them. However, because of the group size being investigated, it is often difficult to generalise any findings from such studies as they are not representative of the whole school population or community.

The Quantitative Approach

The quantitative approach often involves an experimental (or treatment) and a control group. The experimental group is directly involved in the ICT-related learning activities while the control group learns using the traditional method. Both groups are tested before and after the experiment and sometimes, a delayed test may be given to determine the retention rate of the learning. One of the limitations of the quantitative approach is that other factors, such as a novelty effect involving increased enthusiasm of teachers and students, may be unconsciously introduced to confound the results of the experiment.

The Quantitative-Qualitative Approach

In combining both qualitative and quantitative methods, a greater degree of accuracy and validity in the results of studies is obtained, thus strengthening the findings and implications put forward by the researcher. Two methods of this combined study have been advocated. The first method involves the conducting of a large-scale quantitative study, followed by case studies of in-depth investigation (Becta, 2001; Cox, 1993).

Research (1960s – 1980s)

The earliest studies took place in the 1960s and 1970s when researchers introduced pupils to educational software in a university environment (Cox, 2003). In those studies, learners did not use ICT in a normal classroom setting or within their subject curriculum, but were using software specifically designed to address specific conceptual difficulties in subjects such as science or mathematics. Other studies in the 1970s measured the impact of learning through traditional pre and post-tests using experimental and control groups. Their performance was usually assessed by the conventional end-of-year examinations.

Extensive Use of Box Score Method

In the early years of research, there was no reliable procedure for the reviewing of studies (Roblyer *et al*., 1988). As such, the so-called box score method was the only available method and it involved the following steps:

- collect all the experimental and evaluation studies;
- examine each study to determine the significant difference between the experimental and control studies;
- Count the number of studies which did and did not find such differences.

In the area of instructional computing, the box score method of summarising results was especially problematic where differences in treatment effects were rarely large enough to reject the null hypothesis and most studies tended to show non-significant differences. Edwards *et al*. (1975)

Completed a review on computer-assisted instruction using the true box score. They located some 30 studies and coded them for type of CAI, subject area, grade level, supplemental or replacement use, and results. Their findings indicated that CAI was more effective at elementary levels, and for supplemental use. It was also equally effective individual tutoring and programmed instruction, and found to reduce learning time.

Major Studies (1960s – 1980s)

Unlike today, computers were not as widely available in the early days of microcomputers. In spite of this limitation, a few major researches were advanced especially in the area of technology intensive programs. Some of these studies are highlighted below.

The Los Angeles Unified School District used the Computer Curriculum Corporation (CCC) effect was studied which revealed the different effect on variables like mathematicacal computational skills, concepts and application and reading and language.

Project IMPAC

Four different set-ups were used in this project known as IMPAC (Instructional Microcomputer Project for Arkansas Classrooms) (McDermott, 1985).

Effect sizes of 0.02 to 0.62 were reported for the study, with the most favourable results coming from the group where traditional instruction was supplemented by computer-aided instruction.

Minnesota Technology Demonstration Program

This was a major two-year study of microcomputer use with Grade 4 to 6 students in Minnesota schools. Over 20 per cent of Minnesota school districts were involved and both microcomputer and video-based technologies were used. The computer to student ratio was very favourable and computer software was selected and used extensively and systematically based on skill needs (Morehouse, 1987).

The final results indicated that the average effect sizes achieved in mathematics, reading and language were –0.09 to –0.31, a rather disappointing finding after much initial enthusiasm and optimism from the participating teachers.

Past Reviews, Findings and Implications

In their review, Roblyer *et al*. (1988) made comparison studies before and after 1980 and presented their findings. In the pre-1980 studies, nearly all the estimated 200 studies indicated positive evidence that computer-based treatments offered some benefits over other methods, although a clarification was that there were few clear disagreements among the reviews. A summary of the findings indicated:

- Reduction in learning time;
- Limited improvement in motivation toward learning;
- Computer-based treatments were generally effective in mathematics and reading/language;
- Computer-aided learning (CAI) was more effective as a supplement at lower grade level;
- Slow learners and under-achievers seemed to gain from computer-based methods than more able students.
- Computer-based methods are generally more effective at lower grade levels. Effectiveness of computer-managed instruction (CMI) seems to increase at higher grade levels while CAI effects seem to decrease at higher levels.

For the post-1980 review (Roblyer *et al*., 1988), positive effects were for achievements in every analysis of the 85

studies except for ESL, problem-solving CAI, achievement in females and attitudes toward computers as instructional media. The review concentrated on five main areas as shown below.

Attitudes, Content Area, Application Type, Grade Level, Types of Students

Recognising the need and urgency for research in this field as its priority seemed to be losing grounds, Roblyer *et al*. (1988) called for a change in the perception about the value of behavioural research

Research (1990s – 2000s)

Much educational research on ICT has been conducted over the said ten years. Literature reviews in this field are important not only to educators but to policy makers who are usually reluctant to fund large-scale longitudinal studies. Yelland (2001) reported the need for such funding to support a variety of research studies which should include a mixed-method research design (Yelland, 2001, p. 36).

Such research would recognise positive effects and identify any negative influences. In this way we could determine how best to promote effective learning so that outcomes are improved.

ImpacT Project

In this study, there was evidence of a positive contribution to attainment in English, with a statistically significant effect of using word processing for pupils aged 8-10 years but only a partial non-significant effect for pupils aged 12-14 years. The main finding from the study of primary pupils was that the frequency of use of ICT in their English lessons affected their achievements in English. There was a positive contribution from the use of word processing in the 'high IT' primary classes. When pupils composed directly with word-processing facilities, they were more prone to summarise and remove redundant information. At the secondary school level, the results were less conclusive, partly because of poor returns on the English essays and because of the limited use of ICT in English lessons.

In mathematics, pupils aged 8-10 years and 14-16 years in classes which were using Logo (a programming language) and subject-based mathematics software achieved statistically higher scores in tests than those pupils who were taught similar concepts through traditional methods. The results provided significant evidence of a positive impact of ICT on pupils' learning in mathematics where ICT were being integrated into the mathematics curriculum. The project's mini-studies provided additional evidence of positive effects of ICT on attainment in mathematical reasoning using Logo and Boolean logic skills using databases.

ImpaCT2 Project

ImpaCT2 was one of the most comprehensive investigations into the impact of ICT on attainment conducted in the United Kingdom (Harrison, 2001). This large-scale evaluation study, was funded by the Department of Education and Skills and managed by Becta. The study extended over three years (1999-2002) and its purpose was to make an independent evaluation of the impact of ICT on children's achievement in a representative sample of schools in England.

The study reported mixed results for the effects of ICT on pupils' attainment in English. At the primary level, there was a statistically significant impact of ICT on the KS2 English tests but not at KS3 or KS4 (Harrison, 2002). Case studies also showed the predominant use of ICT in English was for word processing (Comber, 2002).

Evidence from the study showed that ICT had a positive relationship to pupils' learning of mathematical skills and the results varied according to the amount and type of use of ICT in the mathematics curriculum

Future Research

There is clear evidence from the present findings that ICT has a positive, although small effect on the learning of students. Most researchers appear optimistic about the roles that ICT will play in the school environment in the future though some have their reservations. Christmann (2003)

Further Research

Recently, there has been an increased interest in neural network and learning. The brain, which is the centre of learning, memory and recall, plays an important part in the whole learning process. It is therefore important that further research should also be focussed on these areas:

A. Interdisciplinary research on how the brain learns and how ICT can be used effectively in the learning process;
B. The use of ICT to stimulate the memory process, leading to effective learning;
C. Innovative computer softwares or programs and other ICT tools that help students to think creatively and critically.

As it is evident that though ICT is an attractive field but still it is not able to attract researchers the way it should have been, so we require more research not only in learning but in wide areas which also includes field of sports.

Conclusions

As past is the key to present and history has always served as a guide to human kind for its development, so the case with ICT. Reviewing the already research will open new horizons for researcher as well as students alike.

In this review we have concentrated on learning specially done on students but this also applies in field of sports where learning, training, development all happens simultaneously.

The use of ICT in conjunction with other teaching strategies could be more beneficial for student learning. Another important finding revealed that teacher-developed programs were more effective than commercial software programs. Consequently, more attention should be devoted to specific educational objectives and curriculum goals when designing software for higher levels of effectiveness.

The newer level of sports performance could be achieved only when research in the field of ICT continuous opening newer horizons for sports person, coaches, trainers, sports scientist etc.

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