

In Search of Evidence: The Unbearable Hunt for Causality

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Introduction

Over the last decade, most OECD-countries have invested large amounts of money and human resources in the advancement of ICT in teaching and learning. Many countries have followed the same pattern of development, starting with investments in connectivity and teacher competencies in the 1990s, followed by a later focus on digital content and in recent years a struggle for integration of ICT in the curriculum and the search for a systemic and comprehensive embedding of ICT at all levels in education.

Since 2000, the issue of linking ICT with educational quality – a multi-faceted topic which I will elaborate on in the next section – has emerged on the R&D-agenda. A number of studies have tried to establish and document causal relationships between investments in ICT for learning on the one hand and improvements in educational attainment on the other hand.

This paper seeks to discuss the upsides and limitations of this approach in the first part. In the second part I will discuss how we can develop the knowledge base and future strategies in order to support the discourse on ICT as a vehicle for educational quality – both with a national and an international perspective in mind. The focus of discussion will be on ICT as a tool for the individual learner.

ICT and educational quality: Importance and facets

The issue of ICT and educational quality has emerged in parallel with the reinforced focus on learning outcomes in later years. Why is that the case? There are a number of possible explanations:

- Politicians and policy-makers have the responsibility of getting sufficient return on the investments, i.e. the money from the tax payers, made in ICT. As ICT has gained momentum as a tool for better learning strategies and outcome, the focus on what we gain from investments in ICT has grown stronger. Another important factor is the increased emphasis on evidence-based policymaking.
- The reality of politics and the pressure from the media and the public at large has changed. In stride with an increasing momentum and the pressure for fast results, our politicians need to produce results a lot faster than in “the good old days”.
- In the era of increasing globalisation and competition, countries are to a large degree taking part in international benchmarks. As nations we probably feel the pressure to show that we are capable in different areas such as education, and ICT is probably no exception.

What do we then mean by educational quality and performance? The answer to this question will probably vary across the OECD-community and across the academic community. In some, but far from all OECD countries, educational performance is linked to national, standardised tests. Harrison et al in the Impact2-study (20002) undertakes the distinction between output, outcome and impact. Output can e.g. be pupil-computer ratio, outcomes can

be the extent of use of Internet and ICT in teaching and learning, whereas impact e.g. can be improvements of students ICT skills.

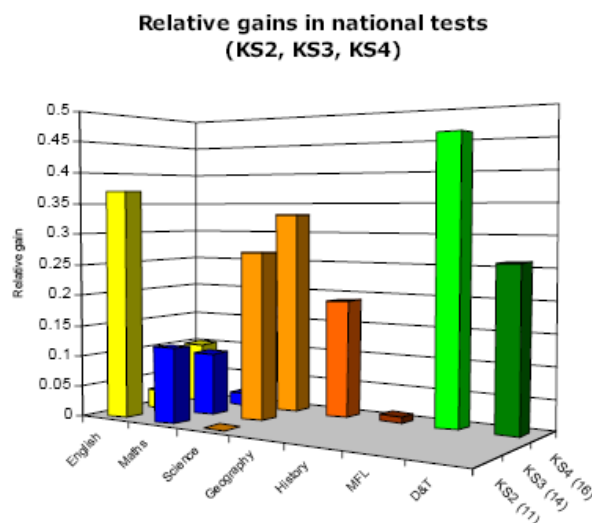
The eLearning Nordic study (2006) has a somewhat different approach, as described in the study “The ICT Impact Report” published by the European Schoolnet in 2006.

These are typical approaches to ICT and educational quality. However, other and wider approaches can be taken into consideration. A systemic and comprehensive approach going beyond the focus on learning outcome and impact is to look at how the integration of ICT at all levels and in all parts of the operations of our educational system can contribute to more cost-effective administrative solutions, improved home-school collaboration and better information security, to name a few. This approach will however not be pursued in this paper.

Barking up the tree of educational performance: What have we learnt from R&D?

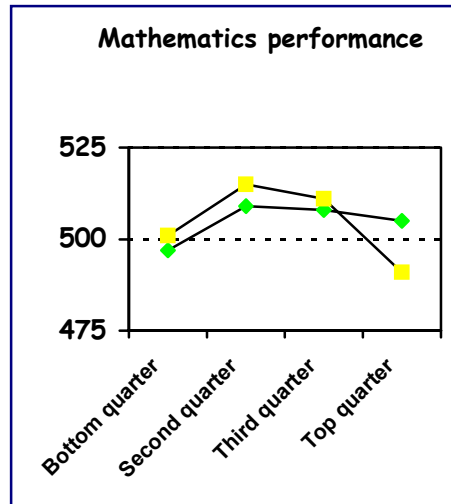
In recent years, a number of studies and reports have sought to investigate and document a causal relationship between the use of ICT and improvements in educational performance. In this section I will briefly mention some of these. For an overview, I recommend the 2006 European Schoolnet study and the research resources at Becta.

The work of reference with regard to impact studies is Becta’s 2002 study “ImpaCT2: The Impact of Information and Communication Technologies on Pupil Learning and Attainment”. The study comprised 60 schools in the UK, and it studies the correlation between ICT and educational attainment. One of the key findings of the study is that ICT use for pupils aged 7 to 16 years can result in significant relative gains in English, Science and Technology and Design. In other subjects, there were positive correlations, but these were not strong enough to show statistical significance. The graph below shows the findings in a number of subjects.



The OECD has done an ICT elaboration of the data from PISA 2003, this resulting in the publication “Are Students Ready for a Technology-Rich World? What PISA studies tell us”. The publication points to interesting findings related to mathematics (and reading). Access to

ICT at home influences the educational performance of the students as “... students reporting rare or no use of computers at home score much lower than their counterparts reporting moderate use or frequent use”. . The same can be said about the students’ familiarity with ICT, because longer familiarity with ICT correlates with higher scores in maths. With regard to the correlation between the amount of ICT used and the test scores, the study shows that moderate use of ICT as the most positive impact on the test scores in mathematics (and reading).



(Are students ready for a technology rich world? What PISA studies tell us, Figure 4.6, p. 65)

In the Nordic region, the 2006 study “eLearning Nordic” studied how pupils, teachers, school leaders and parents perceive the impact of ICT. With regard to the perceived impact of ICT on pupil’s performance the study states that “...pupils, teachers and parents assess that the use of ICT has a positive impact on the school’s overall target – improving the pupil’s learning. For instance, the results show that ICT has a positive impact on basic skills such as reading and writing as well as basic calculation skills. The study furthermore indicates that the assessed impact is slightly higher for boys than for girls.”

A study from the US, “What’s School Got to Do With It? Cautionary Tales about Correlations between Student Computer Use and Academic Achievement” shows a positive link between the use of PCs in schools and student achievement, but “... generally there is an inverse relationship between in-school computer use and student achievement...” due to socio-economic factors. The researchers in the study concluded that “...lack of access to computing at home is a more substantial barrier to achievement than lack of access to computers at school”. This is also in accordance with the PISA-study mentioned above.

Recent studies from the UK such as “Impact 2007: Personalising learning with technology” seem to confirm the positive impact ICT has on educational performance, but they also point to the challenges of isolating ICT among the many factors that influence educational performance. New issues are emerging on the policy agenda, as I will discuss in the next section.

Barking up the right tree?

Studies like Impact 2 represent an important contribution to our knowledge base on ICT for learning, and such studies give good input on the methodological challenges of such studies. However, the “rocket science” approach, demanding high degree of validity and emphasising

statistical significance, seems to have clear limitations. Other issues have also emerged that call for new approaches. The importance of schools e-maturity (Becta 2007) is a clear sign of this.

The emphasis on statistical significant correlations between ICT and educational performance has not only methodological constraints. On an international scale, the large differences between the educational systems among the OECD countries make international comparisons and benchmarking difficult. Some countries have the possibility of conducting large-scale studies based on standardised tests; other countries are far from this reality.

Another challenging issue is the technological development and the increasing diversity in applications. We see the emergence of handheld applications and social software being introduced into pedagogical practice in parallel with the use of existing technology. The dynamics of this technological development inhibits longitudinal “rocket science” studies. A different approach is needed.

Revising our strategies and knowledge base

Monitoring the impact of ICT on educational in a changing and dynamic world is a challenging, but far from impossible task. This task requires a revision of our knowledge base and a generic policy framework for ICT and learning.

Living in a world where ICT is increasingly embedded in all parts of the society, we need to look closer at the validity of what is (seems to be) the present underlying research question: Does the use of ICT improve students’ performance?

The R&D-agenda with regard to ICT and learning should mirror the fact that ICT is an integral part of our education systems. Hence, a constructive approach could then be to reformulate the key research question to: “In what way(s) can ICT be used in order to improve education, including students’ performance? How can the quality of using ICT in schools be improved, and to what extent do tests and international surveys take into account the presence and impact of ICT within the subject areas?”

With regard to the knowledge base I would like to point to the following:

- We must still monitor the development of access to ICTs in our educational systems. Careful attention should be made to the choice of indicators.
- In many countries, the development, distribution and use of digital learning resources are high on the political agenda. However, sufficient benchmarks have not been developed yet. The OECD-study “Digital Learning Resources as Systemic Innovation” has a benchmarking strand (OECD 2007) that may prove to break new ground here.
- Monitoring the actual use of ICT is a necessary, but not sufficient expression of educational performance. This work should continue. Careful attention to integration of new applications is necessary.
- With regard to gender differences, Pedro (2006) points to a somewhat confusing picture: “On the one hand, it seems to clear that boys and girls have different profiles of practices regarding the use of ICT, and, at the same time, both show alternative preferences regarding the particular ICT devices they use more often”. Gender differences in access to and patterns of use of ICT in OECD countries and related consequences are an important topic for further research.

- The OECD should repeat the ICT elaboration of the PISA studies. Such an exercise for PISA 2006 is desirable, and interested countries should establish a consortium for this purpose.
- Test methodologies for reviewing pupil's digital literacy have not been discussed yet. Piloting in this area should take place, because digital literacy will probably be integrated in future curricula and qualification frameworks in many countries.

In other words, the further evolution of our knowledge base is not a question of “one size fits all”. International collaboration and a multi-faceted approach is probably the best way to understand this part of our complex world.

With regard to a generic policy framework for ICT and educational performance, different approaches can be made. The framework must be fairly wide to cover national differences across the OECD area. However, let me point to a few generic features of ICT policies for educational quality:

- A number of countries have taken action in order to integrate ICT into the curriculum. The new national curriculum in Norwegian primary and secondary taking effect from August 2006 has digital skills as one of five basic skills that are integrated into subject curricula at all levels. The European Union has identified digital competence as one of eight key competencies for lifelong learning.
- Changes and upgrading of curricula should be followed by changes in M&E in order to ensure coherence between the curriculum, pedagogical practice and M&E. A special challenge in this area is to develop test methodologies for digital literacy, an area with a potential for future international collaboration.
- Teacher competencies and school leaders that are also technology leaders are important in order to develop the e-maturity of our schools.
- Narrowing the gap, i.e in terms of both impact and outcome, between home use of ICT and in-school use of ICT is important, because otherwise schools will lose relevance to our pupils, a development our educational systems can not afford.
- Standards and quality criteria are necessary tools for maximising the return on investment in infrastructure and digital content.

In the end

Our societies demand a sufficient return on the investments they make in ICT for teaching and learning. The rigorous search for statistical significant evidence of the quality improvements ICT can lead to has been a necessary, but not sufficient approach to the evidence-base in this field. Time has come to rephrase the research questions through a multi-faceted approach to the emerging knowledge base and future strategies for ICT in education. The academic community, national authorities and international organisations such as the OECD can all play key roles in this work –for the benefit of the future education our children deserve and need.

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