How to evaluate the effectiveness of ICT in teaching

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This paper aims at finding a way to evaluate the impact of ICT on teaching. It is taken for granted, in the light of previous studies,that regular control of teaching and learning processes helps improve these same processes. Secondly, the use of ICT does not automatically improve the quality of teaching and learning. Therefore it is necessary to constantly evaluate how effective the use of ICT in the classroom really is. Five models will be illustrated into which any teaching project can fit. Finally, the application of the five-model theory to a sample group of Italian Junior High Schools will be illustrated.

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1 Introduction

1.1 Evaluation is a must!

As indicated by Angela Martini (Martini, 2008, p.9) research into education has come to the conclusion that the evaluation of teaching and learning processes improves the quality of both teaching and learning (Bishop, 1977; Wossmann, 2007; Hanushek & Raymond, 2005). The evaluation procedures introduced in many countries, especially English-speaking countries, and comparative surveys e.g. TIMSS, PISA have shown that evaluation creates a high level of responsibility among teachers and students which in turn produces better results. Teaching and learning processes which use ICT should therefore be subject to evaluation.

1.2 Measuring quality in ICT-aided teaching

BECTA (British Educational Communication and Technology Agency: URL www.becta.org.uk) has come up with five very useful indicators which help us decide whether ICT is of benefit to teaching and learning or not. These indicators are in line with those of Guastavigna (2010).

1. ICT Is of little effect if used in a traditional teaching environment.
2. The teacher plays a vital role in making ICT effective. He/she must be a facilitator who sets out clear didactic objectives.
3. ICT works best in a collaborative classroom where problem solving is involved.
4. ICT works when it is used regularly and in many subjects.
5. The users of ICT must believe in it, especially the teacher.

2 The five models

In our efforts to codify evaluation of ICT-aided teaching we start from the following three analytical parameters which can be applied to any didactic project.

Parameter 1 – Technology

What criteria are used when deciding to buy and use ICT?

Are the technical aspects of the hardware and software of uppermost concern or is acquisition and use tailored to fit into a well thought out didactic plan?

Does ICT dovetail with tried and tested teaching methods or does the traditional approach have to be abandoned completely?

Does the introduction of ICT mean producing completely new didactic material?

Parameter 2 – Didactics

Has the quality of teaching and learning improved thanks to the introduction of ICT?

Have clear didactic objectives been set out?

Has the use of ICT meant more participation and enthusiasm in the classroom?

Parameter 3 – Cross-curricular

Has the use of ICT become widespread in the school, that is, is it used in most subjects or only in a few? Using these three analytical parameters as guidelines we can then create five models into which any didactic project fits. These models are not mutually exclusive but provide useful "pigeon-holes" when evaluating projects.

Model 1: Techno-constructivist

This model contains those didactic processes which want to construct innovative projects thanks to the introduction of ICT. Attention is focused on the educational and didactic objectives that can be reached. The computer is used as a means to create a 'Brave New World' where new didactic horizons are explored. Class teachers collaborate closely in planning how to use ICT and plan lessons together. As McKenzie (2006) says: "the techno-constructivist class uses the Net, email, online projects, virtual field days, WebQuest, multimedia presentations, virtual classrooms, interactive simulations etc…and consequently revolutionizes the learning process. The teacher becomes a facilitator who guides the student between the real and virtual worlds."

However, in this model, ICT is not regarded as a magic wand or a "cure-all" (as often happens in the proto-technological model) and teachers are aware of the dangers of an over-reliance on ICT (poor concentration, isolation from the real world, poor socialization etc.)

Model 2: Techno/subject-centered

As with the techno-constructivist model there is a strong interest in the use of ICT and careful didactic planning. However, due to a series of extraneous factors (not enough space, too little time, lack of human and technological resources, lack of cooperation between teachers who don't want to or cannot use ICT), the new technologies are only used by a small number of highly-motivated teachers and consequently in a limited number of subjects.

Model 3: Proto-technological

This model includes projects that are using ICT for the first time. Teachers are eager to try out new teaching methods but they know very little about ICT and their use of new technologies tends to be superficial. They are happy to use audio and video because they feel students are more motivated. This approach to ICT is enthusiastic but is not backed up by careful planning and the setting out of clear didactic objectives. The fact that an effective use of ICT involves constant and time-consuming preparation is not taken into consideration. Consequently ICT is used very little and is only an adjunct to more traditional forms of teaching while students are not encouraged to use ICT at home.

Some teachers do express an interest in learning more about ICT but most are not prepared to dedicate any extra time to training. Very often, after an initial enthusiastic phase, ICT is abandoned altogether.

Model 4: Techno-traditional

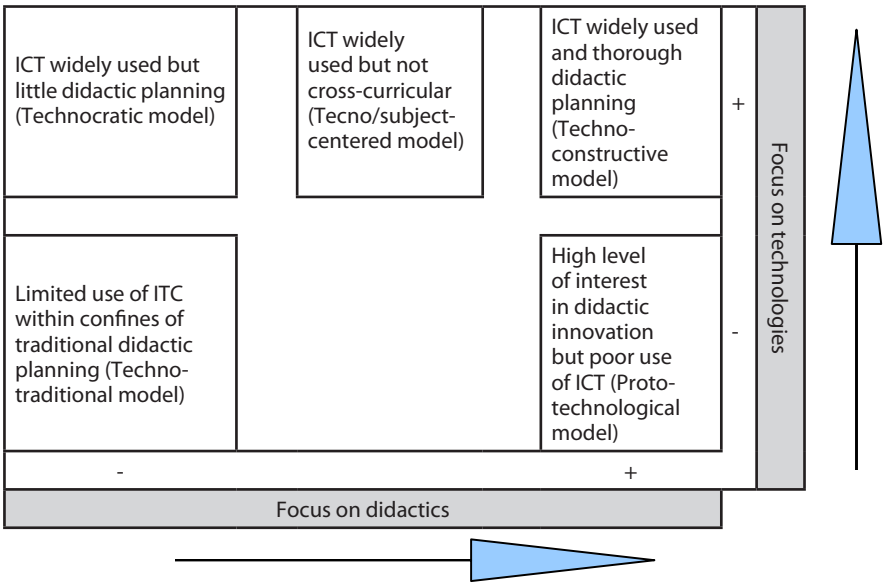
This type of project aims at maintaining the status-quo. Whereas in the proto-technological model teachers are enthusiastic about new technology, techno-traditional teachers tend to be extremely wary of any form of innovation. Technology is drip-fed in tiny doses so as not to upset traditional teaching methods. There is little or no interest in change. Didactic programming remains traditional and any technology which is used must fit into well-worn patterns. Lessons are teacher-centered and involve lecture-type imparting of information; collaborative work is reduced to a minimum or is non-existent. In an educational context in which the use of ICT is being strongly promoted the techno-traditional model is not widely used.Sometimes, however, in questionnaires about the use of ICT in the classroom, techno-traditional teachers manage to hoodwink the compiler into believing that technological innovation has been taken on-board whereas in reality teaching methodology remains unchanged.

Model 5: Technocratic

This model concentrates almost exclusively on developing new technology per se and helping students to be as proficient in the use of technological instruments as possible. Teachers, who are experts in the field, focus on technological-skills acquisition and tend to ignore the wider didactic context. In this model there are ‘Computer Science’ or ‘ICT’ lessons during which the computer ‘sings its own praises’ (Biondi, 2007). How to use technology is the priority. As in the techno-traditional model lessons are teacher-centered with little cooperative learning.

The following diagram illustrates the relationship between didactic- focused teaching and technology-focused teaching within the five models. The horizontal axis represents didactic –focused teaching while the vertical axis represents technology-focused teaching.

TABLE 1
ICT & didactics



The top of the diagram represents widespread use of ICT while the bottom represents limited use. The right-hand side of the diagram represents a strong interest in didactic planning while the left-hand side represents a weak interest. Therefore the top right-hand corner represents a strong interest in both didactic planning and ICT (techno-constructive model).The bottom right-hand corner represents willingness to innovate didactically but a limited use of ITC (proto-technological model). The bottom left-hand corner represents the worst-case scenario: little or no interest in didactic change or ICT (techno-traditional). The top left-hand corner represents a high level of interest in ICT but little or no didactic planning (technocratic model). The top middle square represents a strong interest in ICT albeit only in individual subjects and thorough didactic planning (techno/cross-curricular).

3 Project evaluation

In order to fit projects into one of the five models it is necessary to define

measurable indicators within the three parameters mentioned above:

Parameter 1 – Technology

Indicators:

A. Criteria for using ICT

B. Technological instruments used (LIM, didactic software, visualizer, networks, online platforms e.g. Moodle, virtual classrooms, blogs etc.)

Parameter 2 – Didactics

A. Didactic objectives
B. Evaluation procedures
C. Classroom activities
D. Class dynamics
E. Student responsibility
F. New teaching methods

Parameter 3 – Cross-curricular

A. How many days a week?
B. How many hours a day?
C. Number of subjects and teachers involved.
D. Use of ICT outside school hours.

Whether or not a project is compatible with the above indicators should be represented in Excel (1=compatible. 0 = not compatible).

Information about projects should be gathered by means of questionnaires, direct observation, and interviews with head teachers, teachers and students. Results should be as objective as possible and should help project managers not so much to reveal the mistakes of the past but promote future development.

Conclusion: from evaluation to future development

Research into ICT use in teaching using the procedures illustrated above was carried out on a sample of 150 Junior High Schools in Italy.

30% of classes did not fill in the questionnaires due,in some cases, to shortfalls in bureaucratic procedures within the schools. However projects must be subject to forms of control and evaluation given that they are financed from the public purse. To this end schools must be allowed more autonomy with regard to how and when projects are evaluated.

From those schools who filled in the questionnaires the following picture emerged:

- 44% in the proto-technological model and 40% in the techno-constructivist model. This means that in 84% of projects there is a strong thrust towards and interest in didactic innovation. However the use of ICT must become more widespread.
- No projects show an interest in the development of technology per se (technocratic model).
- A little over 10% of the projects saw ICT as a way to do what has always been done more quickly. This in itself is not a bad thing though one would hope that in future much more attention will be paid to how ICT can improve the quality of teaching and learning.

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