The integration of computers into the classroom as school equipment: a primary school case study

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Abstract

The past three years have seen a growing tendency on the part of Italian schools to embark on digitalization projects involving the integration of new technologies into the classroom. The current contribution examines the implications of this process, taking three classes at an Italian primary school as a case study. The findings suggest that teachers need to acquire a high level of digital skills in order to implement lessons with significant use of technology, and that the PC may be viewed as an "all-in-one product" although it cannot be expected to substitute all the tools of the traditional classroom.

1. Introduction

Recent initiatives by education boards and local authorities, as well as by individual schools, aimed at increasing availability and use of modern technology are laying the foundations, albeit partial, for what may be the digital school of tomorrow. Digital equipment has been provided to Italian schools through projects such as *Innovascuola, Classi 2.0* and *Scuola Digitale*; these programs are helping to modify the more traditional view according to which to set up a digital classroom it is sufficient to move the contents of the computer lab into the regular classroom. Furthermore, the current tendency is to acquire as many tools as possible for each classroom. In an overall context in which financial resources are scarce and funding is generally time-bound, schools often invest in technology as funds become available to them without planning a priori how the new equipment will be used in the classroom. However, the presence of technology in the classroom is a necessary but not sufficient condition for innovative processes to be implemented, or even initiated. In addition, the experimentation that is at present underway does not

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always take due account of the fact that not all teachers are ready to make "natural" use of technology at school; as a result, the methods applied are often those of traditional teaching.

The aim of the current contribution is to investigate the implications of these issues, using three classes at an Italian primary school as a case study.

2. Methodology

We conducted our qualitative investigation at an Italian primary school that had invested in a broad range of technological devices despite setting out from a traditional scenario in which none of the teachers had significant experience of educational technology. Most of the Italian schools that introduce technologies into the classroom opt to acquire an interactive whiteboard and one netbook per child (William, 2000). The school in this study was selected for analysis because the three classrooms involved were equipped with the same set of technologies including interactive tables.

In order to explore student perceptions of the use of computers in the classroom, qualitative research methods were adopted, including student focus groups (Corrao, 2005), teacher interviews (Kanizsa, 1993) and careful observation of lessons: the combination of these instruments enabled us to compare our observations of both the setting and the didactic methods implemented, with the information reported by students and teachers during the interviews and discussions.

3. Teachers' use of computers in the classroom

The study yielded a number of interesting findings in relation to teachers' use of technology in the classroom. The first finding regards the use of the Interactive WhiteBoard (IWB), an instrument similar to a chalkboard that has been widely accepted by teachers, even those who are normally reluctant to use technology in the classroom. Teachers predominantly use it in the operating mode (i.e., involving use of the marker) similarly to how they would use a traditional chalkboard, with the convenience of having all the tools in a single device connected to Internet. In the classrooms investigated, the children called the IWB *"Mother"* and the chalkboard *"Grandmother",* as though to emphasize that they belonged to different generations. The IWB was popular with the children who stated: *"We like the IWB because the teachers can explain better"*. These students held the clear view that the IWB had the potential to help teachers provide clearer explanations. For example, it allows them to enhance the presentation of new content with images, music, sound, animations and video. This helps to stimulate the different cognitive styles present in the classroom. The lesson does not change in substance, but is enhanced with extra details.

However, there is the risk of remaining stuck in what Betcher and Lee (2009, p.50) call "phase 1: doing old things in an old way" or at most, managing to switch to "phase 2: doing old things, but in new ways" with the associated danger of causing twin negative effects on the students in the classroom: the first potentially negative consequence is that content may only be passively absorbed; the second is that if the medium (IWB) is used similarly to a television to transmit content without inviting student interaction, it may create the same kind of relationship of subordination that exists between television technology and viewers. Teachers require assistance – involving training and input from academic research faculty with regard to the use of technology – in order to acquire the skills needed to move on to "phase 3: doing new things in new ways": this is the current major challenge to be faced.

Our research pointed up two instances of added value provided by the IWB: students said "*I like IWB because we can find out things that maybe we would not be able to find out this year with the chalkboard… in particular search for specific images or connect with people who can help us in our studies*". As well as promoting exchange, the IWB allows students to find resources in real time and communicate with other schools or students by means of video conferencing. In the children's own words, it emerged that the main benefit of the IWB was having a large

screen connected to the Internet that everyone could see *"because it has a big screen, everybody can use it, so you can go on the Internet looking for things"*. Students also showed awareness of the fact that the school of the future will increasingly adopt technological solutions: *"I think the more technology progresses, the more you'll see technology and IWB in all classrooms"*.

Another key finding regards the use of video and images in teaching: the Internet connection makes it possible to search for images and videos that in our case study were mainly used to supplement explanations provided in class. According to Clark and Lyons (2004), images may carry out a range of functions, which may be analyzed both from a communications point of view (in that images convey information) and from a psychological perspective (given that visual elements interact with the human cognitive system). Images are useful to teachers for explaining processes, mechanisms and procedures. They are also effective in teaching schematization (maps, graphs, diagrams), while image animations are useful for illustrating particular manifestations of phenomena.

However, images should be used with caution, when appropriate and in accordance with the principles of multimedia learning (Mayer & Moreno, 2002): it has been shown that in certain conditions, moving pictures place heavy demands on attention, resulting in saturation of cognitive processing capacity and diminished student learning (Lewalter, 2003). The cognitive overload is due to the excessive amount of information displayed in individual images, in terms of how the information is distributed and how it varies over time. Therefore, the use of images and video material in teaching should be regulated so as to avoid a disproportionate use of animation, information overload or the indiscriminate screening of film footage. It is particularly important at the primary school level to adequately prepare students for viewing video materials, because primary school children have not yet developed cognitive strategies for coping effectively with an excess of information or stimuli.

A final finding concerning teachers' use of the computer regards assignments: it is interesting to note that tasks were assigned predominantly via traditional teaching aids. Teachers preferred to use the chalkboard to write assignments (or in general to deliver any content requiring the use of writing): as expressed by the children *"we work on the IWB and teacher writes tasks on chalkboard"*. The same children suggested the reason for this: *"teachers can write better on the chalkboard because they'rere more used to it; although it is easier on the IWB, it is more difficult because there are technical problems. It's easy, you just take a piece of chalk and write"*. In other words, the teachers are forced to mainly use the chalkboard instead of the IWB for writing because it is more immediate and causes no technical problems. The children also recognize when the teachers are in trouble or have low skills, often intervening to give support: *"We have to tell the teachers, 'it's like this', because we have learned to use the Interactive Whiteboard more than the teachers"*.

Furthermore, the children were assigned more tasks to be carried out on paper than on the computer. The teachers, low skills aside, may believe that there are still many tasks that require learning processes to be supported by "traditional" teaching materials. The children reported contrasting views on this theme: some preferred to be facilitated by the computer for homework while others said that they learned better on paper and that technology does not simplify all operations; indeed, pencil and paper are more versatile for some purposes (*"For me paper is better than a computer, you learn more things because you get distracted playing on the computer but on paper you try to find out, listen and study"*). These children associated the computer with ease of distraction, and therefore tended to conclude that they could learn better on paper. Perhaps this hasty conclusion should make us reflect on the fact that we are in a transition phase, in which teachers are beginning to use digital technologies, but without being aware of its full potential. The computer is certainly a helpful tool for revision purposes. When we asked for children to describe when it was better to use the computer rather than a paper copybook, the students said *"when you know things, just to go over them, but it seems to be less effective if you need to learn a topic that you do not know, it's better to use paper when you have to learn something thoroughly, because you need to write notes and highlight things properly… e.g., Today we did an exercise in our copybooks instead of on the computer… this is a way to learn to write by hand"*. Naturally it is difficult to use the computer for drawing because it does not allow the same freedom of movement as drawing on paper.

4. Learning to use the computer as school equipment

The second focus of this study regards the use of computer as school equipment on the part of students. This is an important aspect because if students can use personal PCs during lessons and even take them home with them, then they should take care of these new devices as they would of traditional school equipment. In other words, students should learn to manage digital equipment responsibly, by means of self-governance and independent of the teacher's assistance (Montessori, 1916/1992).

Students appear to appreciate the opportunity to avail of a single tool that integrates many functions traditionally carried out by a number of different tools: as one student said *"there are a lot more possibilities with the Interactive Whiteboard and computers than with the traditional pen and paper"*. This view seems to be influenced by how the teacher proposes tasks: it is important that the teacher acts as a sense maker, leading the students to regard computers and other technologies as useful tools for learning, otherwise they tend to see the PC as an instrument of play. The latter vision of technology was more prevalent in the classroom where the teacher had more difficulty in making meaningful use of the computer, using it infrequently for learning activities; it followed that students had more time and opportunity to source and play video games, including during lessons.

A further key aspect regards the management of digital learning objects and how teachers present them in class: in most cases they were prepared in advance of lessons as "ready-to-use" digital materials, so that all students had to do was download them to their PC. This implies that students skipped an important step in the learning process, during which teachers can engage in discussion with the children before dictating contents to them, or implement a reciprocal teaching model whereby teachers and students take turns leading structured discussions about shared text (Palincsar & Brown, 1984).

Another interesting issue concerns the management of writing errors. This topic was raised during the student discussion groups: some of the students preferred to use a word processor because it is faster and easier to write and spell correctly on, while others claimed that word processors do not allow students to observe, reflect on and discuss their mistakes with teacher and classmates (Pontecorvo, Ajello & Zucchermaglio, 1991). Given that writing and reading skills require a higher level of abstraction, reflection and processing than oral speaking (Pinto, 1993), as well as support the development of flexible cognitive competence, it is important to spend time reinforcing them.

In other words, the word processor helps to produce a good outcome in less time, but is of less use in learning the rules of spelling and writing.

Finally, students seemed to prefer to use traditional school equipment for certain complex operations, on the basis that traditional tools offered more flexibility and support in achieving learning goals, while the PC was preferred when the primary objective was to ensure good quality output.

5. Conclusions

The research presented here is a case study, so we must be cautious in drawing firm conclusions about the experimental situation described. All the results outlined seem to be conditioned by the lack of digital skills reported by the teachers during interviews; this lack of know-how led to the restriction of the use of technological devices and tools to those situations in which the teachers felt confident that they could conduct the entire didactic process without too many technical problems. This means that most lessons are designed according to the teacher's level of digital skills. Furthermore it is still very unusual for all the teachers at a given school to have adequate technological skills.

Currently, the scenario seems to be more or less as follows: some teachers with good digital skills use technology in most lessons; many teachers use technology sometimes; and some teachers never use technology. This implies that students can formulate theories about these differences, especially when teachers achieve good results without making use of technology. Students notice methodological differences between teachers, and the introduction of technologies can further accentuate this difference, although does not necessarily lead to a rigidly negative judgment of the teacher's methods on the part of the student. However, if a "good" teacher does not use technology and a "bad" teacher does, then students tend to view the computer as an instrument of play because they have not

experienced its use as an effective didactic tool. Ultimately, technological tools – just like any other media – may be bad or good depending on how they are used by teachers (Mayer & Moreno 2002).

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