Multimedia Technologies in Education

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WHAT ARE MULTIMEDIA TECHNOLOGIES?

Multimedia technologies (MMT) are tools that make it possible to transmit information in a very large meaning, transforming them into knowledge through leveraging the learning power of senses in learners and stimulating their cognitive schemes. This kind of transformation can assume several different forms: from digitalized images to virtual reconstructions; from simple text to iper-texts that allow customized, fast, and cheap research within texts; from communications framework like the Web to tools that enhance all our senses, allowing complete educational experiences (Piacente, 2002b).

MMT are composed by two great conceptually-different frameworks (Piacente, 2002a):

- **Technological supports, such as hardware and software:** this refers to technological tools such as mother boards, displays, videos, audio tools, databases, communications software and hardware, and so on, that make it possible to transfer contents;
- **Contents:** this refers to information and knowledge transmitted with MMT tools. Information is simply data (such as visiting timetable of museum, cost of tickets, the name of the author of a picture), while knowledge comes from information *elaborated in order to get a goal*. For instance, a complex iper-text about a work of art, where several pieces of information are connected in a logical discourse, is knowledge. For the same reason, a virtual reconstruction comes from knowledge about the rebuilt facts. Contents can also be video games, as far as they are conceived for educational purposes (Egenfeldt-Nielsen, 2005; Gros, 2007).

It is relevant to underline that to some extent technological supports represent a condition and a limit for contents (Wallace, 1995). In other words, content could be expressed just through technological supports, and this means that content has to be made in order to fit for specific technological support, and that the limits of a specific technological support are also the limits of its content. For instance, the specific architecture of a database represents a limit within which contents have to be recorded and have to be traced. This is also evident when thinking about content as a communicative action: Communication is strictly conditioned by the tool that we are using.

Essentially, we can distinguish between two areas of application of MMT (Spencer, 2002) in Education:

1. **Inside the Educational Institution (schools, museums, libraries):** this refers to all the tools that foster the value of lessons or visiting during the time that they take place. Here we mean "enhancing" as enhancing moments of learning for students or visitors: hypertexts, simulation, virtual cases, virtual reconstructions, active touch-screen, video, and audio tools;
2. **Outside the Educational Institution:** this refers to communication technologies such as Web, software for managing communities, chats, forums, newsgroups, for long-distance sharing materials, and so on. The power of these tools lies in the possibilities to interact and to cooperate in order to effectively create knowledge, since knowledge is a social construct (Nonaka & Konno, 1998; Von Foerster, 1988; Von Glasersfeld, 1988).

Behind these different applications of MMT lies a common database, the heart of the multimedia system (Pearce, 1995). The contents of both applications are contained in the database, so the way that applications can use information recorded in the database is strictly conditioned by the architecture of the database itself.

DIFFERENT DIMENSIONS OF MMT IN TEACHING AND LEARNING

We can distinguish two broader frameworks for understanding the contributions of MMT to teaching and learning.

The first pattern concernes the place of teaching: While in the past, learning generally required the simultaneous presence of teacher and students for interaction, now it is possible to teach long distance thanks to MMT.

The second pattern refers to the way that people learn: They can be passive, or they can interact. The interaction fosters the learning process, and makes it possible to generate more knowledge in less time.

Learning On-Site and Distance Teaching

Talking about MMT applications in education requires separating *learning on-site* and *distance learning*, although both are called e-learning (electronic learning). **E-learning** is a way of fostering learning activity using electronic tools based on multimedia technologies (Scardamaglia & Bereiter, 1993).

The first one, **learning on-site,** generally uses MMT tools as a support to traditional classroom lessons: The use of videos, images, sounds, and so on can dramatically foster the retention of content in students' minds (Bereiter, Scardamaglia, Cassels, & Hewitt, 1997). In this context, researchers are investigating the effects of potential overload of information due to a massive use of MMT (Guttormsen-Schär & Zimmermann, 2007).

The second one, **distance teaching**, requires MMT applications for a completely different environment, where students are more involved in managing their commitment. In other words, students in e-learning have to use MMT applications more independently than they are required to do during a lesson on-site. Although this difference is not so clear among MMT applications in education and it is possible to get e-learning tools built as they were used during on-site lessons and vice versa, it is quite important to underline the main feature of e-learning, not just as a distant learning, but as a more independent and responsible learning (Collins, Brown, & Newman, 1989).

There are two types of distance e-learning: *self-paced* and *leader-led*. The first one refers to the process by which students access computer-based (CBT) or Web-based (WBT) training materials at their own pace. Learners select what they wish to learn and decide when they will learn it.

The second one, leader-led e-learning, involves an instructor, and learners can access real-time materials (synchronous) via videoconferencing or audio or text messaging, or they can access delayed materials (asynchronous).

Both the cited types of distance learning use performance support tools (PST) that help students in performing a task or in self-evaluating.

Passive and Interactive Learning

The issue of MMT applications in educational environments also suggests the distinguishing of two general groups of applications which relate to students' behaviour: passive or interactive. The first group of tools are those that teachers use just to enhance the explanation power of their teaching: videos, sounds, pictures, graphics, and so on. In this case, students do not interact with MMT tools, which means that the MMT application current contents do not change according to the behaviour of the students.

Interactive multimedia technologies tools change current contents according to the behaviour of students: Students can choose to change contents according to their own interests and levels. Interactive MMT tools use the same pattern as the passive ones, such as videos, sounds, and texts, but they also can obtain special information that any single student requires, or they can just give answers on demand. For instance, self-evaluation tools are interactive applications. Through interacting, students can foster the value of time that they spent in learning, because they can use it more efficiently and effectively. Furthermore, interactive tools allow simulations, which are very effective in underscoring specific or technical points during lessons (Lamont, 2001).

Interaction is one of the most powerful instruments for learning, since it makes it possible to actively cooperate in order to build knowledge. Knowledge is always a social construct, a sense-making activity (Weick, 1995) that consists in giving meaning to experience. Common sense-making fosters knowledge building, thanks to the richness of experiences and meanings that people can exchange. Everyone can express his own meaning for an experience, and interacting this meaning can be elaborated and exchanged until it becomes common knowledge. MMT help this process, since they make possible more interaction in less time and over long distances.