Software for Science Education
The demand of teachers and students

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The increasing accessibility of both off-line and on-line multimedia programmes is originating a resurgence of the public interest concerning information and communication technologies (ICT). For instance, in Portugal, which is a relatively small market (the best sales do not exceed 10 thousands units), about 100 new CD-Rom Portuguese titles, either edutainment or strictly educational, were commercialised in one year. An estimate of the use of Internet in the same country indicates that about ten new persons adhere to it each day. Following such a tendency, many schools have allowed ICT to enter into their libraries, media centres laboratories and classrooms.

The introduction of ICT in schools has also been encouraged by international and national funding programmes, curriculum orientations, parents demands and the willingness of teachers to use them as instructional resources. Another influence has been the drastic growth of home users. A significant part of students parents is looking for and buying multimedia products - reference titles in particular - in order to cultivate their children as well as to support them in their school homeworks. In some schools, it is more and more frequent for teachers to have their students referring to a certain multimedia programme or application, while solving a classroom task, what they have learned with a CD-Rom encyclopaedia, an interactive atlas or a specific site in WWW.

The situation described above may suggest the general use of ICT as aids for learning in schools throughout Europe. However, the picture conveyed by most of European countries is very different. Several sources indicate that the use of ICT as tools for the teaching and learning process of curriculum subjects is far from being a general practice among European primary, middle and secondary schools (E.C., 1993; E.C., 1995; E.C., 1996). The wide range of educational software available for science subjects is mostly irregularly and poorly implemented in science classes.

Several reasons have been suggested in order to explain the low level of ICT use in science classrooms; the culture of the school, the lack of resources, the lack of technical support in schools, the lack of appropriate teacher preparation and the
lack of quality software (Chagas, 1996). For the purpose of this communication, which is to give an overview of what teachers and students expect and demand from educational software for science education, special attention is given to the last two reasons presented.

The lack of appropriate teacher preparation is generally mentioned by teachers as one major factor for them to avoid introducing ICT in their teaching practices. Teachers claim for training programmes allowing them to update their knowledge about the software available, and to know how to integrate the software in classroom practices, according to both curriculum requirements and students learning demand. They also want to get acquainted about the multiple uses of ICT, to know how to organise the classroom and the pupils accordingly, and to know how to evaluate the extant software and educational programmes involving the use of ICT.

Research has shown that science teachers spontaneously decide to use ICT as resources for their classes because they like or feel curious about the technology, they have a certain feeling for innovation, and because they aim at motivating the students toward learning (Chagas and Abegg, 1996). Teachers with little experience tend to approach ICT as one more resource in order to improve regular teaching practices. They attempt to infuse the technology in classroom activities following a step-by-step manner, and to integrate it with older, conventional instructional technologies. Therefore, ICT are not viewed as something that can bring deep changes into the teaching-learning process. When a new and possibly innovative product is made available, non-experienced teachers use to approach it in the light of a previous framework that hinders them from perceiving its specific educational attributes.

ICT-experienced teachers use to regret the poor quality of the educational software available in the market. Science teachers in particular point out that available multimedia materials do not fit the curriculum. Chosen themes in present materials and the way they are approached have few connections with the themes and methodologies addressed in science classes. Another limitation is the low flexibility of the materials that do not allow multiple uses according to the initiative and creativity of both teachers and students. Moreover, extant programmes are not demanding enough. In general, they are centred on facts and ask pupils to learn by rote. These commentaries are consistent with the situation reported by the Task Force "Educational Software and Multimedia". This task force has described available materials in the European market as sparse, old fashioned in technological terms, rarely exploiting telematic networks, presenting
poor pedagogical quality and being difficult to diffuse in present curricula and teachers' practices (E.C., 1996).

Science teachers use to argue that materials should be used as tools for learning, allowing information research and management, helping teachers and students in processing the information, enabling problem solving and challenges, and stimulating discovery. Based on their students' reactions, teachers comment that materials should be flexible, attractive, engaging and surprising (Chagas, 1996).

Students who are used to the amazing games presently available in the market blame the poor graphics and the low interactivity of educational programmes. However, some of them (secondary level) consider that extant materials can work as mediators between the teachers' lecture and the personal study of the textbook in order to learn the subject. Students enjoy using ICT as a learning tool because it is possible to learn in a different way and it is allowed to use one's own knowledge in a science class context.

Teachers pay much attention to the interest shown by students toward ICT, especially when it leads to a positive attitude toward science topics as well as to a better understanding of the subjects under study. This is probably the main reason why they decide to implement ICT in their classes. However, many of them fear that students will not take the learning of science seriously, because of the playful side that any activity involving the computer potentially presents.

Some teachers are able to take benefit from such playful nature of the activities involving ICT. In spite of this, there is a general agreement that the software used in a formal learning context should assemble characteristics of games and edutainment with specific characteristics of educational programmes. Therefore, the demand of teachers and students show similarities in many aspects. High quality level on a technical point of view, involving high quality graphics and animation, and high levels of interactivity as well should come together with high quality contents.

The selection of the content to include in a programme is hence an issue of major importance. The content has to be correct and accurate on a scientific point of view. It has to be original and engaging, and closely related to the contents and objectives of school science curricula.


