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A Methodology for Educational Software Evaluation (ESE)

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ABSTRACT

The pace to which the new technologies are being included in the educational context demand from teachers to develop skills to use technology and to evaluate educational software. Hence, the use given to technology for educational purposes will greatly depend on teachers' knowledge and management of it. Our objective is to propose a methodology for educational software evaluation (ESE) that includes four criteria (technical, didactic, functional and economical) as well as seven techniques for ESE. Finally, a complete model of the integration of those aspects in six steps to follow in any evaluation process is presented. This methodology can be defined as a whole, simple, qualitative approach, suitable for the evaluation of software of any subject and easy to use even by inexperienced teachers. The authors do not expect this methodology to be a unique formula for ESE but to offer a guideline for teachers to perform the task. It will be the teacher's decision to adapt this model to his group's needs, pedagogical approach and goals.

BACKGROUND

The use of educational software has become more common. Currently there is a wide variety: drill and practice, instructional games, integrated learning systems, problem solving systems, reference, simulation, tool-based, tutorials, and web-based systems (Bitter and Pierson, 2002 in Baker, 2003).

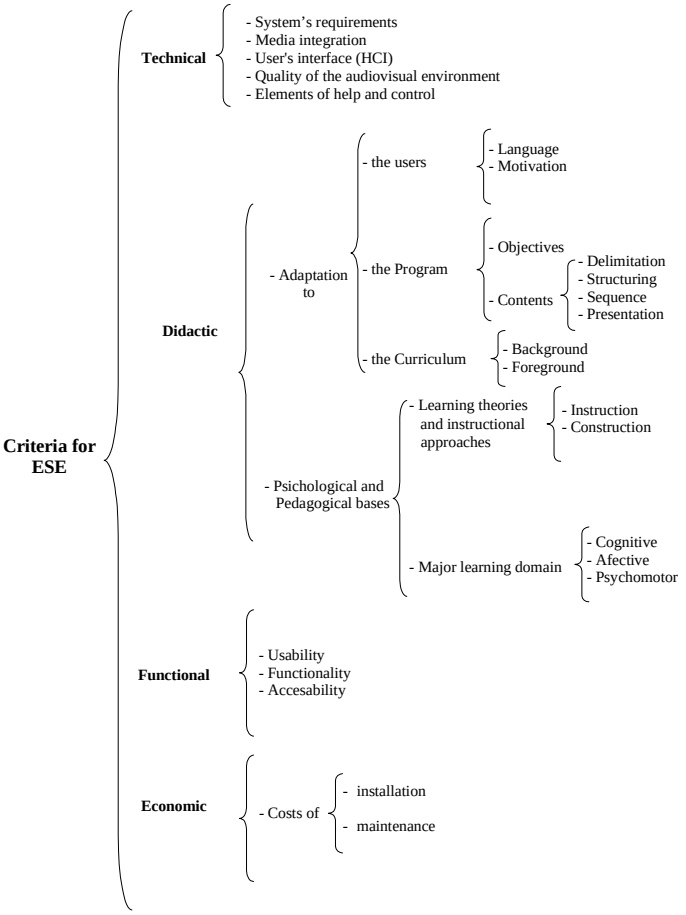
Among those that endorse the use of educational software are the Center in Applied Special Technology (1996), and Funkhouser (1993) cited en Pugalee & Robinson (1998). However, others like Owston (1997) in Pugalee & Robinson (1998) deny the direct advantage of educational software in the learning process. On this matter, Gimeno (1989) in Fandos, Jiménez & González (2002) indicates that failures might be due to that the real value of the media comes from the methodological context in which they are used rather than from their own inner characteristics and possibilities.

ESE is expected to produce judgments about whether the product helps in the achievement of the learning objectives (Espinoza, 2003). Software evaluation is part of the production process itself and it is achieved before the material is launched into the market. However, such evaluation is not enough to guarantee that it will fulfill the potential users' academic goals and needs. Niederhauser & Stoddart (2001), Orantes (2002) and Gutiérrez (2003) argue that ESE is teacher's task because even when software design companies publish good comments about their products, they generally are biased and subjective (Poole, 2001). Trigano and Giacomini (2004) explain that one problem with educational software is the bad quality of the products when comparing what the producers offer and what the users expect. At this respect, Poole (2001) says that it is important for teachers to be able to evaluate the software they will use, because the selection is related to the characteristics of the future users.

Squires & Preece (1999) indicate that to achieve predictive ESE teachers need to decide what software they will use with their students, for what purposes it will be used and in what contexts. However, teachers tend to evaluate and judge the quality and potential of the software based on personal experiences. This situation gets worse when teachers are inexperienced in the use of new technologies.

Teachers need to be guided for ESE to analyze the technical characteristics, psychological and pedagogical features of the software and its adaptability in terms of the potential users' interests and needs.

Figure 1. Criteria for ESE.



A QUALITATIVE METHODOLOGY FOR EDUCATIONAL SOFTWARE EVALUATION (ESE)

Jones & Paolucci (1997) state that available studies on ESE often provide unclear conclusions because a clearly defined framework is often missing. A well developed ESE methodology will provide teachers with good bases for making decisions about the software to be used (Squires & Preece, 1999). Such a methodology should be suitable to all subject matters and educational levels, and concrete and simple enough to be used even by inexperienced teachers.

A methodology for ESE should include well established techniques and clear evaluation criteria. There are different techniques to be considered: experimental evaluation, technical software contextualized evaluation, experts' judgments, technique based on questions, natural observation, cooperative evaluation, heuristic evaluation and checklist. The selection of each one will depend on the criterion that is being considered. Those evaluation criteria are classified within this framework as technical, didactic, functional and economical and they should all be included for ESE (see figure 1).

Criteria for ESE

1. Technical

It refers to the user's interface, as well as the quality of the audiovisual environment expressed by the right use of the multimedia elements. It also includes the system's requirements and the documentation to guarantee a good operation (Sobrino, 2000).

2. Didactic

It includes instructional materials adaptation to the users, the program and the curriculum, and the underlying psychological and pedagogical principles of the software. Jones & Paolucci (1999) indicate that key information about the learner can be used to develop a profile. The content should be presented in a pleasant, motivating way, making it easy for the learner to understand it. The software should also adapt to the program, the objectives should be explicit and well defined (Gutiérrez, 2003), and the contents should be structured and delimited accordingly to those objectives. Students' previous knowledge must be considered as well as the usefulness of the software for the learners in the development of skills to guarantee their complete success in their next level of formation.

Teachers must evaluate the pedagogic conception underlying educational software which is generally based on the principles of two main theories: behaviorism and constructivism. Behaviorism-based software, mainly used for drill and practice, is suitable for teacher-centered contexts (Dexter, Anderson & Becker, 1999). Educational applications based on this paradigm are called Integrated Learning Systems, a tool for hierarchically structuring a sequence of activities and managing the stimulus/response/feedback loop that constitutes the behavioral conditioning process (Niederhauser & Stoddart, 2001). Constructivism-based software is suitable for student-centered contexts and provides students with the experiences that allow them to discover or re-invent concepts. The focus on these materials is helping students to develop increasingly complex and thorough understandings (Niederhauser & Stoddart, 2001).

The theory of learning and instructional approach supporting the software will determine the interactive level: predetermined and free. In the former, the user can only navigate through a defined route, in a lineal, sequential way. In the latest the user can navigate by following predetermined or self created routes. The self created route should be built in the process of interaction between the user and the software. It will depend on the users' interests and previous experiences.

Although in practice it is difficult to separate the major learning domains (cognitive, affective and psychomotor), it is often possible to clearly emphasize one over the others (Jones & Paolucci, 1999) inside the educational software according to the learning objectives.

3. Functional

It refers to the usability or ergonomic quality of the interface (Trigano & Giacomini-Pacurar, 2004), the accessibility or the possibilities for students with disabilities to use the material; and the functionality: how well and reliably the interactive controls and media perform on the target platform (Graham, 1999).

4. Economical

It refers to the installation and maintenance costs of the software. Teachers must consider the available budget and equipment for the use of the software before selecting it.

A Model for ESE

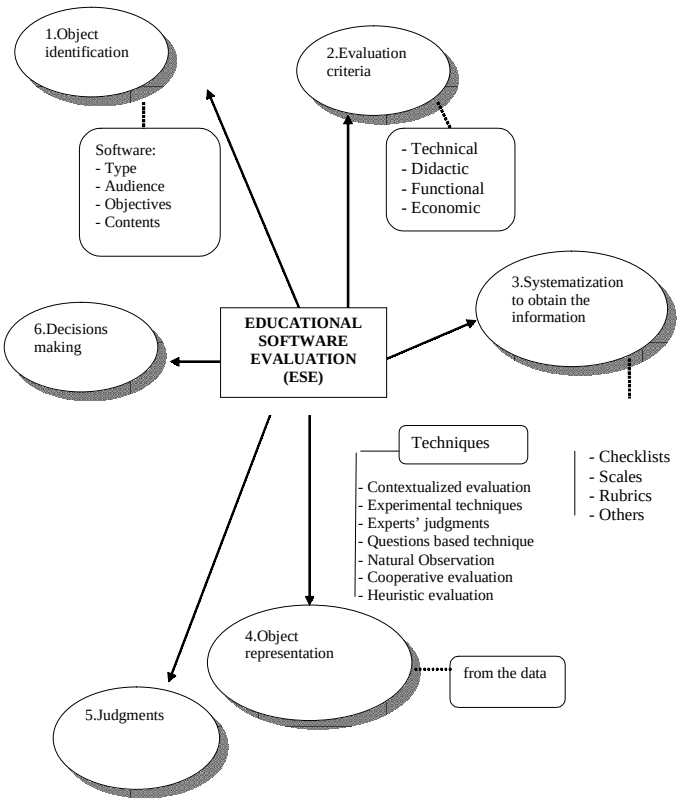
Our model consists of integrating six basic steps of a general evaluation process indicated by Mirás & Solé (1990), Saints (1993) and Wolf (1988) in Díaz & Hernández (2001) for educational software evaluation in a single process (see figure 2).

To achieve the ESE the kind of software has to be identified; teachers can follow Bitter and Pierson's (2002) classification cited in Baker (2003). Possible users and their needs as well as the materials, objectives, and contents need to be defined. Secondly, teachers establish the evaluation criteria. Then, they select the techniques and instruments to obtain the information. The next steps are to elaborate a representation of the object after analyzing the data and to establish some judgments to finally make decisions about using or rejecting the material.

CONCLUSION

Teachers sometimes use educational software even when they are not prepared to use it or to evaluate it. It is important to remember that the use of such a material must be accompanied of a critical revision of it. That's why we show a set of software evaluation techniques and criteria

Figure 2. Model for ESE addressed to teachers



integrated into a methodology that can be used by any teacher who intends to use software as a teaching resource.

As Oliver & Conole, (1998) said in Oliver (2000), there is no "magic bullet" for evaluation. We propose a qualitative approach, complete enough to be suitable for the evaluation of educational software for any subject because it is flexible and evaluators can conjugate the elements and criteria according to their needs. It may become a guideline for teachers to emit judgments about the use of any educational software. Besides, it can be used by any teacher experienced or not in ESE.

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