Guidelines for E-Learning – Advantages and Disadvantages

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Abstract: Experience shows that guidelines for the development of e-learning systems have both advantages and disadvantages. One important disadvantage is the fact that it is difficult to generalize guidelines for e-learning systems because educational situations often vary considerably. Despite all the disadvantages, guidelines can be used effectively in this area. They should not be used as cookbook recipes but as flexible tools. The aim of the MobiLearn project, which is carried out at several Austrian universities, is to develop a cooperative and mobile e-learning system. In the course of the project guidelines for the design and evaluation of the e-learning system are developed. The project will also try to clarify how guidelines for e-learning systems can be used successfully.

1. Introduction

E-Learning is increasingly used in schools and universities. Nevertheless, there is still too little empirical research which can be used as a foundation for the design and implementation of e-learning courses (see Wolfe, 2001). The development of educational software, therefore, is very often based on the intuition of software programmers rather than on pedagogical theory and practice (Lowyck, 2002). This does not automatically imply that such educational software is lacking in quality but in many cases pedagogical and psychological theories might still be helpful. Nevertheless, it is often difficult to apply the results of pedagogical or psychological research directly to the development of educational software. Concrete guidelines can play an important role in mediating between basic research and application for e-learning. The following text describes the development of a set of guidelines for a learning system which teaches the topic of „Media Informatics" to students at Austrian universities. It will also discuss general problems relating to the development of guidelines and the possibility to generalize our findings.

2. The MobiLearn Project

The aim of the MobiLearn project (http://www.mobilearn.at/) is to develop an e-learning system to teach Media Informatics at Austrian universities. Media Informatics comprises courses on all aspects of the creation of multimedia systems. It is studied by undergraduate as well as graduate students. Four Austrian universities cooperate to develop several different learning modules. The project is funded by the Austrian Ministry for Education, Science and Culture.

One important aim of the project is to exchange written material between the four universities on a more systematic level than before. All material for lectures (lecture notes, transparencies, background material) is put on the WWW and can be used by all participants of the project for their own courses. The material will also be integrated by hypertextual links. In this context, the use of metadata also plays an important role. In this way, synergy effects between the four universities should be exploited and a common framework for Media Informatics courses developed.

Another important aim of the project is the support of mobile learning. It is possible to use various different media for learning: PC, laptop, PDA or cell phone. Most of these devices can be carried along and used in different locations. The idea is that students can learn anytime and anywhere. They can take their PDA with them on holidays and learn for tests, they can meet somewhere on the campus in a small group and prepare assignments, using their laptops or PDAs, or they can learn on the tram using the cell phone. All the material will be prepared in a way so that it can be read on all these devices. At some universities mobile learning can be supported by wireless LAN.

Cooperative learning plays a significant role in the MobiLearn project. Students will be able to interact with each other and with their teachers either synchronously or asynchronously via email, chat and other forms of

electronic communication. A certain amount of organisation by teachers will be necessary to make this communication work effectively.

The MobiLearn project uses the system Scholion developed by the Institute for Communications Engineering at the University of Linz as a learning platform. The system is still being developed. The end of the project will be in December 2004.

3. The Development of Guidelines for E-learning

In Human-Computer Interaction, guidelines are used quite extensively to improve the quality of user interfaces. In e-learning guidelines are not so common. There are several reasons which might account for that. One reason is probably that research about learning is very heterogeneous. Researchers with very different theoretical backgrounds using different methodologies often reach contradictory results (see Anderson, 2001). Therefore, it is difficult to formulate generalized guidelines. In addition, teaching is highly dependent on context. Guidelines which work in one situation might not work in another. All these arguments indicate that the formulation of guidelines for e-learning systems is very difficult. On the other hand, in many situations it is necessary that the creation of e-learning systems is based on the more theoretical knowledge originating from educational science and psychology to ensure that learners can use these systems effectively. To achieve this, the knowledge from educational science and psychology has to be somehow translated for system developers, so that it can be applied for e-learnings systems in a meaningful way. Guidelines are one possibility how this process of translation can be done. Very often, teams developing e-learning systems are interdisciplinary ones, and guidelines can support the communication between the different groups. In this way, guidelines can become a useful tool for the development of e-learning systems even if they are, in some respects, not a perfect solution. In the following, I want to discuss possible problems which might arise with the usage of guidelines and possibilities to overcome these problems.

Every educational software is based on theoretical assumptions about the process of learning, whether explicitly or implicitly (Baumgartner, 1995). Even authors of educational software with a very pragmatic approach cannot avoid making some tacit assumptions. It seems plausible to assume that in most cases it is sensible to make these assumptions explicit and relate the design activities to some theory of learning. This will have fundamental implications for the formulation of the goals of the learning process. The emphasis of e-learning systems based on Instructional Design will be on learning the facts presented by the computer. In contrast to that, systems based on a Constructivist approach will try to motivate learners to build their own knowledge structures and to think critically about the contents of textbooks. As a consequence, e-learnings systems based on Instructional Design will differ fundamentally from systems based on Constructivist approaches. This will also influence the formulation of guidelines. "Constructivist" guidelines will necessarily differ from guidelines informed by Instructional Design. In this sense, global guidelines do not seem possible. On the other hand, it should be mentioned that at a very concrete level, some guidelines will be relevant for most of the theoretical approaches dealing with human learning. Guidelines for the formulation of captions of educational diagrams will, for example, be probably similar for any sort of guideline irrespective of the theoretical foundation.

There is some empirical evidence that the effectiveness of educational software always depends on the context in which it is used (Moonen, 2002), for example on the classroom organization, the attitudes of the teacher, or the previous knowledge of learners. Guidelines have to be adapted to these environmental variables. Very complex forms of hypertextual organisation of contents should, for example, not be used in introductory lectures for undergraduate students whereas more advanced students can profit from such a form of knowledge representation (Spiro et al, 1992). Empirical research gives some indications when specific guidelines can sensibly be applied but more research in this area is certainly necessary.

Guidelines should always be based on empirical research, at least to a certain degree. So far, intuition played an important role for the development of educational software but this "caused a lot of instability and variability." (Lowyck, 2002, p.200). One disadvantage of this approach is that experience is isolated and tends to get lost. Apart from that, a more systematical approach is often advisable. This could lead to more sophisticated models of learning incorporating a broad range of previous experiences.

A good example for guidelines for educational systems was developed by Hannafin (see Hannafin 1997). His guidelines were partly incorporated into the MobiLearn guidelines.

4. Description of the Guidelines

The guidelines for the MobiLearn project are rather eclectic in their approach. They combine a constructivist and a cognitivist approach. Partly, this has something to do with the organization of the curriculum at Austrian universities. There are very large lectures for undergraduate students. In such a context, a constructivist approach does not seem to be an option. On the other hand, there are small courses for graduate students leaving room for interactivity and critical thinking. The MobiLearn learning system has to provide support and information for students on all levels of their education. It is obvious that these guidelines are not exhaustive. Nevertheless, we think that they are a starting point for a discussion about the usefulness of guidelines in general.

4.1. Structure

The MobiLearn learning modules are structured in a hypertextual manner. The guidelines in this section refer to the way the nodes look like and how links should be designed. In general, nodes should not be larger than a computer screen and scroll fields should be avoided. Otherwise, it will be very difficult for students to organize their studies because scroll fields make it very difficult for them to assess how much they have to learn. It must be mentioned, however, that this guideline is very controversial. Smaller nodes make it necessary to jump more which might be annoying at times. The design of links is very important (Fisher, 1992). Links should have meaningful names and lead to relevant material. In addition, graphical overview maps (sitemaps) should be used to give students a sense of the structure of the document (Jonassen, 1996).

4.2. Interactivity

Interactivity is again and again mentioned as one of the advantages of educational software. It must be mentioned, however, that in the literature, the word interactivity is used in many different ways. We define interactivity as the ability of the computer to react to the input coming from the student. A good example for this are simulations where students can change variables of the system to find out how this systems works under varying conditions. In this way, students get an idea of the complexity of the phenomena they are supposed to study. Interactivity also means that the computer can give feedback to the student.

4.3. Multimedia/Visualization

Multimedia is supposed to be another of the advantages of educational software. It depends very much on how Multimedia is designed whether this advantage can be exploited. William Winn (1993) has developed a rather comprehensive set of guidelines for visual material. These guidelines treat the use of pictures and diagrams, the layout of the screen, attention and perception and other important topics. Audio and video will not play a very important role in the MobiLearn system, therefore, we added only a few guidelines related to these topics.

4.4. Mobile Learning

Mobile learning is tested in several European countries right now. There is some experience already concerning laptops (Schaumburg & Issing 2002) but only little experience concerning PDAs and cell phones. One advantage seems to be that students possess a personal learning tool which contains all the material which they need for a certain course. The use of PDAs for field experiments, for example in archeology, also seems to be very useful.

4.5. Cooperative Learning

Cooperative Learning without any accompanying measures is usually not very efficient. Experience shows that Cooperative Learning has to be organized by teachers (Allen et al, 1996). Mailing lists or computer conferences usually need a tutor or teacher as a facilitator. Video coneferences only allow a restricted interactivity between students and teachers. In general, cooperative learning can be very interesting for students and teachers but it requires very much effort especially from the teachers.

Conclusion

Guidelines for the development of e-learning systems have advantages and disadvantages. One disadvantage is that it is sometimes difficult to generalize guidelines. Related to that is the fact that the efficiency of educational media always depends on the context in which they are used. Guidelines should, therefore, not be formulated as cookbook recipes but rather be flexible tools which can be adapted to various different situations and environments. If such a flexible approach is used, guidelines can be applied quite effectively. Guidelines can support a more systemativ approach in designing e-learning systems. They can be used as a basis for evaluation and as a tool to

support the communication between different members of interdisciplinary project development groups. To achieve all this a more systematic research in this area is necessary. This research should address when to apply a specific set of guidelines. The knowledge resulting from such research should enable developers to use guidelines flexibly. The project MobiLearn, which uses guidelines both as a basis for the development process of an e-learning system and for the evaluation process, will be a contribution to clarify these issues.

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