

Instructional Design for Self-Directed E-Learning – Students' Experiences and Perceptions

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Abstract: Even if e-learning is nowadays a common, integral part in higher education, teachers and students often retain attitudes that they have developed in classroom education settings. The quality of e-learning settings and online learning materials still remains an open question. This is particularly true for self-directed e-learning environments that require a thorough instructional design. This paper describes how didactical elements can ensure self-directed e-learning. It gives insights into students' experiences with instructional online material designed for self-directed learning and describes how students perceived the learning experience. The paper ends with a discussion of the findings.

Introduction

E-learning in higher education is nowadays an integral part of the curricula and the share of distance and online learning in higher education will continue to increase in the next years (Gilbert et al. 2007; Kelly et al. 2007). Despite this, teachers and students often retain attitudes that they have developed in classroom education. Quite often faculty is not aware of the specific requirements of e-learning, particularly with regard to pedagogical or instructional issues. Teachers also may lack a command of designing and delivering e-learning solutions (Howell et al. 2004). On the other hand, students accustomed to forms of face-to-face lessons often expect the teacher to take the active part while they themselves participate more passively (Kelly et al. 2007). Thus, the quality of e-learning environments and in particular of instructional materials still remains an important question. Especially in e-learning environments for self-directed learning where learner's activation moves from teacher-learner interaction to learner-content interaction, the design of content or instructional materials becomes decidedly important, since all necessary learning support structures must be built into the e-content. Designing and developing e-learning settings and teaching online require adequate pedagogical skills rather than technical know-how.

A lot about e-learning has been written from the instructor's, designer's or developer's perspective, but only few papers and studies report about the learner's experiences with learning with new media (Alexander 2001; Song et al. 2004; Kerr et al. 2006). Literature on this topic mainly covers how students rate communication, collaboration and faculty support (Alexander 2001). Surprisingly, literature about students' experiences with self-directed online learning is hardly to find. Furthermore, there is barely research on how students interact with electronic learning content, what their experiences are in this field and what kind of support they do need (Song et al. 2004). Gilbert et al. (2007) allude to the importance "to focus attention on the student experience of e-learning, and to listen to student's voices in seeking to extend our knowledge of e-learning" (p. 562). Hence, the aim of this paper is twofold: First, to describe how successful self-directed learning can be guaranteed in e-learning settings by thorough application of instructional design, when little or no tutorial support is available. Secondly, to give insights into students' experiences with self-directed learning in an e-learning environment presenting evaluation results from an e-learning project. Within this project, conducted from 2004 to 2006, various self-contained online learning modules, which were provided complementary to a face-to-face lecture according the blended learning approach, were designed and implemented. During the creation process of these online modules particular attention was paid to the instructional design in order to support self-directed learning as good as possible and to provide students with guidance and orientation.

The paper is structured as follows: First, the role of instructional design especially for e-learning content is explained. In the chapter that follows some background information about the e-learning project is given before the instructional design of the online modules is described in more detail. The research method on how data about students' experiences were gained and the presentation of the results are the topics of the next chapter. The paper ends with a discussion of the findings.

Instructional Design for Electronic Instructional Materials

Learning in a formal context like higher education always aims to an intended learning outcome. But while in face-to-face classes teachers often interact with their students spontaneously and react on unforeseen or unplanned situations flexibly, in e-learning environments the teacher-student interaction becomes less directly and may almost disappear in self-directed e-learning environments, where learning occurs mainly through learner-content interaction and less through interaction with other learners or teachers (Kelly et al. 2007). The shift in the learning context and the disappearance of “details which might otherwise be managed by the teacher at the time of instruction” (Brown & Voltz 2005) require thorough planning and designing of the electronic learning materials.

In self-directed e-learning environments, where interaction with peers or tutors is not given, instruction must be part of the learning material itself. Instruction, like activating and motivating learners, initiating learning processes and fostering understanding, that is in face-to-face settings the role of the teacher is now incorporated into the learning material. Therefore, providing only documents or other materials, for example, over a learning management system is generally not sufficient.

Instructional design is “the systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation” (Smith & Ragan 1999). Many instructional design models are demanding and require time and experience for their effective application. But, instructional design needs not always to be ambitious and complex. As Song et al. (2004) stated, learners appreciate good instructional design and value highly the availability of quite simple didactical elements like, for example, clearly defined learning objectives that give them orientation and guidance through the learning process by explaining what is the expected learning outcome.

When designing e-learning content one has to bear in mind that learners interact differently with the instructional material. Learners follow different approaches. One didactical element that might be useful for one learner will be ignored or valued as unimportant for his or her learning from another (Alexander 2001; Gilbert et al. 2007). Hence, it will be useful to include didactical elements complementary, for example, learning objectives at the beginning and a summary at the end of an instruction.

Design of Self-Directed Online Modules

Background Information on the Project

The self-directed online modules were designed and developed within an e-learning project based on a blended learning approach. Within this project the modules were produced as a complement to face-to-face classes aiming to raise the overall quality of lectures (Hauske 2006). During the project duration from 2004 to 2006 twelve online modules were designed, developed and implemented into various lectures in the field of information systems. The target group were mainly students on bachelor level, who were, in general, novice learners and who had little or no knowledge of the modules’ subjects. The modules cover declarative knowledge like basics of hardware and software or fundamentals of information systems. Within a lecture the modules are compulsory, providing content which is relevant for the final assessment.

A needs analysis conducted before the actual design and development of the online modules yielded that the learners had to work with the e-learning products without any additional support or coaching. Therefore, the online modules were designed as self-contained e-learning and the instructional design focussed on supporting learners by their self-directed journey through the online learning materials.

Instructional Design of Instructional Materials

The instructional design of the online modules’ content focused on supporting self-directed learning and was aimed at triggering and fostering the learning process. Since learners in such e-learning environments have little or no support from a teacher or tutor, all necessary instruction must be incorporated into the learning material. Thus, the learning material had to be structured to that effect that it provided learners with guidance and orientation.

The instructional design of our online modules concentrated on two main parts. Firstly, on the structure and arrangement of the online content and secondly, on didactical elements which support the learning process. Each of the online modules dealt with a specific subject and was structured into smaller learning units which cover a single topic. This sequencing of content defined also the learning path and provided novice learners with guidance and

orientation. Beside this, particular attention was paid to the accurate interweaving of learning objectives, content and self-assessments.

As didactical elements we understand elements which fulfil an instructional purpose and which aim to support the learning process (Martin et al. 2007). The online modules contain following didactical elements:

Learning Objectives: According to Martin et al. (2007) learning objectives are stated at the beginning of an instruction and describe an intended learning outcome. They help the learner to guide him-/ herself through the whole learning process. In our self-learning online modules learning objectives are in the very beginning of each module. Also each learning unit starts with learning objectives formulated as questions.

Summaries: At the end of an instruction summaries allow learners to recapitulate their learning and to review the main points of the learning material. In our online modules each learning unit ends with a summary containing the main key words.

Examples: As Martin et al. state examples are useful to “provide additional clarification of rules or information presented to learners” (2007, p. 626). In our modules we used mainly examples from the business practise to demonstrate how specific information systems are used in organizations and which purpose they fulfil. For freshman information systems are normally quite abstract constructs and it is hard for them to understand how such systems work and which usefulness they have. Hence, examples, in particular from companies they know and for business applications they probably use themselves like online ticketing or buying CD’s or DVC’s on the web, help students to understand the new information better and put it into their own knowledge.

Practices: Martin et al. define practice as “an opportunity for learners to confirm their correct understanding” (2007, p. 625). Our online modules contain various exercises, tasks or questions which facilitate understanding,, activate learning processes, and support learning transfer.

Presentation of Content: Martin et al. (2007) summarize the research on information presentation and stress with reference to Gagne that information that is important for the learning should be emphasized and highlighted. In our self-learning online modules significant terms are marked bold and important textual elements like definitions, examples, exercises or hints to further information are put into coloured text boxes. Graphics are used for visualization and abstract processes are explained step-by-step with animations.

Self-Assessment: Each learning unit of our online modules ends with a self-assessment with which students can evaluate their learning progress and review the main points of the learning material. Moreover, the self-assessments also serve as a guidance through the learning materials since they refer closely to the learning objectives and the learning content.

Research Design

The evaluation of the online modules comprises several phases to ensure the overall quality of the modules. To gain insights to learners’ views and experiences, students were already involved during the design and implementation process: First, during the design phase members of the target group participated in an observed test and were interviewed afterwards. Second, after the implementation of the modules into the lecture students were given a paper questionnaire at the end of the semester.

Observed Test and Interview

In order to ensure the employability, each online module was tested with members of the target group before it was implemented into the lecture. Besides detecting errors and problems in form and content, we were interested in how students work with a specific module and how they evaluate the module regarding motivation and acceptance. In summer semester 2005, 23 students tested six online modules (each module was evaluated by three to six students). During a 90-minute test students were observed while interacting with an online module. Doing so, they were requested to think aloud. In the structured interview that followed we asked the participants what they liked about the specific module, what they did not like and what should be changed. Based on this results all online modules were revised before they were employed into the lecture.

Survey

At the end of the summer semester 2005, students were given a paper questionnaire, containing 17 questions in all. Eight of them were related to the measurement of students' satisfaction and to gaining insights to their experience: Five statements were assessed by students on a 6-point Likert scale ranged from strongly agree (scored as 6) to strongly disagree (scored as 1). Three open-text questions asked students what they liked best and least about the online modules and what should be changed for the next version.

Data Analysis and Results

The overall results of the observed tests with 23 students showed that the participants had no significant problems with the handling of the modules. The results of the interviews are presented in table 1. All comments were coded into following three categories: positive comments, negative comments, comments related to recommended modules' changes. Within these categories all comments were coded according to their frequencies of mention. Most positive comments referred to the arrangement and structure of the online modules. The participants also valued the integration of examples and graphics. Didactical elements like self-assessments, text boxes or summaries and learning objectives were mentioned only a few times. On the other hand, most of the negative comments referred to the performance of the self-assessments. Furthermore, students criticized the size of the modules and the lack of orientation within the modules. Asked for modules' improvements only few students made precise suggestions. These comments relate to the self-assessments, the summary and the overall orientation within the modules and contain concrete suggestions for improvements. Beside these, interviewees asked for more examples and more interaction.

	Category	Number of Comments (n=23)
Positive	Arrangement and structure of modules	15
	Examples	14
	Graphics	12
	Self-Assessments	5
	Text Boxes	5
	Summaries	5
	Learning Objectives	2
Negative	Size of Modules	4
	Orientation (Lack of orientation)	4
	Self-Assessments (Performance)	6
Changes	Self-Assessments (restrict number of attempts)	2
	Examples (more examples; examples considering students' experiences)	2
	Interaction (more interaction)	1
	Summary (summary highlighting important terms)	1
	Orientation (where I am in the module? What is relevant for the final examination?)	1

Table 1: Results of the Interviews

From 76 students attending the lecture, 51 students handed in a completed questionnaire. The results of the Likert-type questions of the survey are shown in table 2. More than 60% of the students (64,89%) agree (“+” or “++”) on the statement “I got on well with the handling of the online modules” and more than a quarter (28,05%) even strongly agree, whereas only 7,06% disagree on it. Also the second statement “I understood the learning content well” was mainly rated “+” or “++” (66,79 %). Again, a high percentage of 24,52% strongly agree on this statement, while less than 10% of the participants disagreed (8,67%). 74,13% agreed on the statement “I found structure and arrangement of the online module good to comprehend” (“+” or “++”), 10,10% disagreed. More than three quarter of the participants rated the statement “I think highly of my learning success” positively (75,76%), but 17,18% could

not agree on it. The last statement “I enjoyed learning with the online modules” was rated mainly with a “-“ (24,33%) or “+” (32,95), but at least 32,90% valued these experience positively (“++” or “+++”).

Statement	Strongly disagree ---	--	-	+	++	Strongly agree +++	N	Mean
I got on well with the handling of the online modules	0,36%	1,1%	5,6%	33,53%	31,36%	28,05%	47	4,79
I understood the learning content well	0,35%	1,02%	7,3%	35,29%	31,5%	24,52%	48	4,7
I found structure and arrangement of the online module good to comprehend	0,72%	0,36%	9,02%	32,88%	41,25%	15,76%	48	4,6
I think highly of my learning success	0,36%	3,46%	13,36%	37,81%	37,95%	7,05%	47	4,3
I enjoyed learning with the online modules	0,7%	9,12%	24,33%	32,95%	19,49%	13,41%	47	4,05

Table 2: Results of the Likert-type Questions of the Survey (the two most frequent categories for each statement are bold-typed)

Table 3 contains the categories which emerged from the analysis of the open-text questions and the respective frequencies of comments. The comments were coded according to those, which were positive and those, which were negative. The comments were then sorted according to categories related to the didactical elements. In addition, categories of comments, which were often mentioned by students, were included. The analysis shows that the students appreciate, above all, the flexibility of online learning. The modules' structure, arrangement and layout were also evaluated as helpful by several participants just as the integration of examples. Finally, the use of multimedia and the self-assessments were commented positively. Negative comments related mainly to the size of the online modules, the lack of a printable script and the dissatisfaction with online learning in general. The only negative comments which relate directly to the online modules dealt about the quality of the self-assessments. In the third open-text question students were asked what should be changed for the next upcoming version of the modules. All comments were coded into categories according to their content. As shown in table 3, most comments related to the provision of a printable script. Students also made several suggestions for layout and structure of the modules. Finally, some participants requested general improvement of the didactical elements like multimedia and self-assessments.

	Categories	Number of comments (n=51)
Positive	Flexibility (independence regarding time and planning; individual learning; permanent availability)	14
	Structure/Arrangement (clear structure and arrangement; very coherent; easy to understand)	8
	Layout (modules' overall layout; graphics; design of html pages)	8
	Examples (practise-oriented, taken from reality; foster understanding)	6
	Multimedia	3
	Self-Assessments	3
Negative	Size of learning modules (amount of learning material; different lengths of modules)	10
	Printable Script (availability not in time)	7
	Online Learning (reading on a computer; amount of text; preference of face-to-face)	6
	Self-Assessments (triviality)	3
Changes	Availability of printable script (PDF script should be always available, offline and online version of modules should be available at the same time)	12
	Layout and Structure (all modules should be equal in structure and length; specify more clearly what is relevant for the final examination; more mini exercises)	9
	Multimedia/Interactivity (more interactivity, more flash animations, more illustrations)	5
	Self-Assessments (more self-assessments, less trivial questions, more significant self-assessments)	4

Table 3: Categories which emerged from an analysis of the open-text questions of the survey and respective frequencies of comments

Discussion

To support and foster self-directed e-learning with online modules we included various didactical elements into the instructional materials. The emphasis that was put on the instructional design is a key success factor for ensuring the overall functionality of the self-directed online modules. Evaluation results and the fact, that all online modules are implemented into various lectures in the meantime, prove their efficiency.

A further purpose of this paper was to give insights into learners' experiences with self-directed online learning. Results of the Likert-type questions show that the students generally had no problems with the online modules at all. Besides the handling, students rated comprehensibility and structure positively. Compared to these values, students valued their learning success lower and declared that they have not enjoyed the learning experience so much. Whereas the results of the Likert-type questions can be mainly used to demonstrate the modules' efficiency and to draw conclusions about students' performance, the comments given to the open-text questions allows analyzing the learners' experience and perception in more detail. At first, participants of the survey valued the flexibility of the self-directed online learning modules the most ("As a working wife the flexibility that the online modules provide is very important to me", "I can define my own learning pace and can recapitulate content that I haven't understood"). Most other positive comments, however, refer to instructional design related topics. Much often, students mentioned the structure and the layout of the online modules ("The modules provide a good orientation and have a clear structure", "I appreciate the illustrations very much. For me, they are a real learning aid", "the very good layout helps me to learn and understand"). The comments illustrate that students value didactical elements for guidance and orientation, but also for motivation and general acceptance. Incorporated examples are accepted by the students as a valuable element for relating abstract content to praxis and to foster their comprehension on the learning content ("I enjoyed the examples. I need them to understand key concepts and theories", "The examples not only aid to understand, but also to keep and remember"). Even if comments on multimedia and self-assessment were less often, they nonetheless show that both elements were rated positively.

Other than the positive comments, negative comments refer mostly on general features of e-learning like problems with reading online or a dislike of e-learning in principle. From the students' perspective most negatively was the size of the learning modules ("Too much content for one learning session", "The effort working on the modules is much too high compared to the lecture"). Next often students rate the availability of a printable script negatively ("The script was not available in time", "Normally I print out the script and mark important parts of the text"). And finally, some students criticize the quality of the self-assessment as too trivial ("The self-assessments are too easy").

Asked what should be changed for the next version students most often mentioned the timely availability of a printable script ("scripts and modules should be available at the same time"). All other suggestions refer to specifics of the online modules. The suggestions show that the asked students have a clear understanding what is helpful for their learning or at least for their preparation to the final examination. Related to the online modules they recommended to equalize structure and length of all modules ("Standardization of structure") and to bring out more precisely what content is relevant and what is not ("Sometimes it is difficult to figure out, what is relevant", "Describe more precisely what is relevant for the final exam"). Furthermore, many students wish more exercises to support the understanding of the mainly abstract learning material ("I am missing additional small exercises they motivate me and support my learning"). Multimedia and interactivity were also a topic which needed improvement from the students' perspective ("more interactivity", "more animations"). Finally, the comments on the self-assessments show, that students expected more and more significant self-assessments ("I would appreciate more and more challenging self-assessments, which also helps me to prepare for the final exam").

Analysing the students' comments the success factors that students apply in the evaluation can be distilled. When discussing positive aspects of the modules students mentioned:

1. Clear structure and arrangement of the modules
2. Integration of examples
3. Integration of graphics

And when discussing negative aspects of the modules students mentioned:

1. Size of modules and amount of learning materials
2. Availability of a printable script
3. Orientation within the module

It is striking that students, compared to other issues, seldom referred to the specific didactical elements like learning objectives or summaries in particular. Findings from the observed tests show that participants dealt

differently with them. While some read the learning objectives carefully, others skipped them and used the summaries for recapitulation instead. And whereas several students made every exercise and each self-assessment, others ignored the activities and concentrated on reading the texts. It can be assumed, that the students did not consider the various didactical elements in particular, because they perceive them as an integral part of the modules and not as specific elements that require more comments. In further research it would be therefore of interest to investigate in more detail how students perceive and value the various didactical elements.

To sum up the findings, following key outcomes of our evaluation relating to students' perception of self-directed learning in an e-learning environment can be defined:

1. Integration of rather simple didactical elements like learning objectives, examples, or self-assessments into e-content ensures self-directed learning. None of these elements requires explicit didactical expertise or further training and can be therefore easily created and included into e-content.
2. Provision of different didactical elements, because one specific e-learning solution and one specific (instructional) design of e-learning never suit everybody. Therefore by designing e-learning the instructor, the instructional designer or the developer has to take into account the various preferences of learners and has to provide different support structures and elements, which help the different individual learners.

Resources

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