

The use of learning management systems: A Longitudinal Case Study

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Abstract

In this article the use of Learning Management Systems (LMS) at the School of Engineering, University of Borås, in the year 2004 and the academic year 2009-2010 is investigated. The tools in the LMS were classified into four groups (tools for distribution, tools for communication, tools for interaction and tools for course administration) and the pattern of use was analyzed. The preliminary interpretation of the results was discussed with a group of teachers from the School of Engineering with long experience of using LMS.

High expectations about LMS as a tool to facilitate flexible education, student centered methods and the creation of an effective learning environment is abundant in the literature. This study, however, shows that in most of the surveyed courses the available LMS is predominantly used to distribute documents to students. The authors argue that a more elaborate use of LMS and a transformation of pedagogical practices towards social constructivist, learner centered procedures should be treated as an integrated process of professional development.

Keywords: e-learning; learning management systems; engineering education; educational technology

Introduction

In this article the comparative use of Learning Management Systems (LMS) at the School of Engineering, Borås, Sweden, in the calendar year 2004 and the academic year 2009-10 is analyzed. The use, by teachers, of LMS tools is investigated and the patterns of use are compared. Data about the situation in 2004 was first published in *The use of learning management systems in engineering education: A Swedish case study* (Garrote, 2006).

It is a common complain that lecturers predominantly use LMS to facilitate their work without affecting their existing teaching practice, but earlier investigations provide surprisingly little hard evidence to support that claim. It is not clear if, or to what extent, lecturers' use of LMS can be expected to change over time as they become more familiar with the programs. Most of the earlier studies in this field fail to recognize the critical

difference between tools that merely facilitate existing educational practices and tools that promote a change in educational methods toward social constructivist, learner centered procedures.

This article introduces a classification of the tools in the LMS, based on their actual application in the surveyed courses. This classification offers a method to compare the level of utilization of LMS tools, no matter what particular LMS is used in the courses in question.

LMS, teaching and learning

In the literature about the use of LMS three points stands out. The first is the high hopes linked to LMS as a tool to facilitate flexibility in education and to enhance the learning experience by supporting student centered methods and the creation of effective learning environments (Blin & Munro, 2008; Bush & Mott, 2009; Findik et al., 2010; Ubell, 2000; Wilson, 2004; Ladyshevsky & Gardner, 2008).

Secondly, many educational institutions have made substantial efforts in terms of time and money to buy and maintain LMS and provide the technical and pedagogical support needed to run them. (Brill & Galloway, 2007; Browne et al., 2006; Czerniewicz & Brown, 2009; Marshall, 2004). (Klobas & McGill, 2010; Paulsen, 2003; Weaver et al., 2008).

The third observation is that, in spite of such institutional efforts and a promising initial phase, many lecturers only use a LMS to distribute documents to students. A number of studies also indicate that staff training will not suffice to change the lecturers practice (Blin & Munro, 2008; Selwyn, 2007; Lonn & Teasley, 2009).

According to the theory of constructivism, interaction is an important part of the learning experience and hence asynchronous discussion forums and similar tools may enhance the learning experience considerably (Cronjé, 2006; Baptista, 2003; Yarusso, 1992). Apparently, this is also the opinion of the providers of educational software: "Asynchronous conferencing or discussion groups form the heart of many VLEs [virtual learning environments] as they provide the means for students to engage in collaborative exchange about topics on the course." (Britain & Liber, 1999 p.5) It has also been asserted that both scholarly and social interaction may enhance learning by promoting the creation of a community of learners (Irwin & Berge, 2006 p.3ff; Hopperton, 1998; Murphy, 2004)

A number of the tools that are available in a LMS can replace existing technology, such as copying machines (Dutton et al., 2004). It has been convincingly demonstrated that when a LMS is introduced lecturers strongly favor the tools that facilitate distribution of information from teacher to learner (Bongalos et al., 2006; Garrote & Pettersson, 2007; Phillips, 2006). The choice of tools depends on how the teachers perceive the impact on their workload. If it saves time they are likely to use it. If it takes additional time to learn how to use it and implement it then they are less likely to use it (Mahdizadeh et al., 2008).

The use of LMS at the University of Borås

In 2004 there was no general policy for the use of LMS at the University of Borås (UB). Two different LMS with similar features were used, Luvit and WebCT. WebCT was used at the School of Engineering, the School of Business and Informatics and the School of Textiles. In 2007 a procurement process was completed and an LMS called Ping Pong was introduced at all faculties at UB. Since 2008 Ping Pong is the only LMS supported by UB. At the School of Engineering it is now policy that the LMS should be used in all courses and a course evaluation is performed using the “survey” tool in most courses. The three LMS have similar functions (for more information see Schultz & Nergell (2004)).

The School of Engineering currently offers 19 different study programs at Diploma, B.Sc., M.Sc. and PhD level in Engineering. In 2010 there was 2311 students registered, 1125 of them was full time students. There were approximately 70 employees.

Scope and purpose of the study

This study aims to provide useful information for educational institutions about critical points in the implementation process of a LMS. It compares the use of different tools in the available LMS by lecturers at the School of Engineering at the University of Borås in 2004 and in 2009 – 2010 with focus on lasting barriers to the use of tools, intended to enhance the learning experience by facilitating interaction, collaboration and the creation of communities of learners.

The investigation at the School of Engineering in 2005 and 2011

The investigation in 2005 was conducted using an observation scheme. 197 courses registered in WebCT in the year 2004 were examined. For every course each tool in the LMS was checked. Only if the tool had been actively used it was labeled “in use” (Garrote, 2006).

Out of the 197 courses that were examined in 2005, 107 were given at the School of Engineering and the data from those courses is shown in tables 1-4.

In the investigation carried out in 2011 data was gathered from all courses that were offered during the 2009-2010 academic year (from August 2009 to June 2010) at the School of Engineering at UB, a total of 185 courses. To enable a comparison it was decided to follow the procedure in the 2005 investigation as closely as possible.

The method chosen to study the courses in the LMS was the same on both occasions, that is, systematic observations to obtain quantitative data (Denscombe, 2000). To minimize the variations in the observation results, a scheme of observations was created. The scheme of observations was tested by two people independently examining 10 courses following the instructions, and the obtained results were in full agreement.

After a preliminary interpretation of the results was made a number of teachers were asked to give their opinions of the results. Five people from The School of Engineering gathered with the authors to discuss the findings, in particular, to see to what extent they agreed with the preliminary conclusions. All five are experienced users of LMS and all have several years of teaching experience. Two participants work as support persons for the LMS, one of them is also teaching and the remaining three are lecturers.

Classification of tools

When different LMS are compared a number of issues have to be considered. There may be some tools available in one LMS but not in the other. E-mail, discussion board etcetera, may be used in a course within or outside of the LMS. Tools that are very much alike may still be used differently depending on equipment and internet connections and even if some tools are perfectly similar, they may still be used differently.

It was a major consideration that the relation between educational practices and technology is very different for different tools. In particular, tools for disseminating information merely facilitate a traditional teacher-to-student practice, while the usefulness of tools for interaction depends on a change in pedagogical practice towards social constructivist, learner centered procedures.

With the tools divided into the four groups below it is possible to look at the pattern of use no matter what LMS the lecturers are using.

1. Tools for distribution that allows lecturers to upload documents and make them available for the students. Earlier it was mostly text documents, today it may also be different kinds of media files. Nevertheless the process is still one-way, that is, teacher-to-learner distribution of information.
2. Tools for communication that allow information to go either way as well as from student-to-student. The most common example is E-mail. It should be noted that if E-mail is used to work on a group assignments or to exchange messages in ongoing discussions, it should be classified as a tool for interaction in the particular course. However, we did not see that in any of the investigated courses.
3. Tools for interactions, which call for reaction and feedback. Discussion boards are the most typical example. The tools for interaction are of special interest since they can promote student activity and cooperation, hence enhancing the learning experience.
4. Tools for course administration, in other words tools that are primarily used to monitor and document the educational process, rather than facilitate teaching or learning.

There are many different LMS, both proprietary and free open source systems with similar features. Most tools may be used in different ways and the classification of specific tools depends on how the tool was used in the investigated courses. The use of the tool "surveys" in Ping Pong is an example; technically it may facilitate interaction in many ways

but in the courses investigated in this study it was only used for a course evaluation. Because of the way it was used, the tool was classified as a tool for course management and not as a tool for interaction.

Obviously, it is conceivable that some tools are used differently in different courses and that the tools cannot be unambiguously classified. As it turned out that it was not necessary, but if that had happened we were prepared to divide and report separately, i.e. "Surveys used for course administration" and "Surveys used for collaboration" etc.

It is important to note that each course was examined to see how different tools had been applied. In several courses many tools were made available to students but had not actually been used. To rely on data logs would have given a false indication of higher activity, a potential problem in several earlier investigations.

Limitations

In this study the interpretation of the results is based on a classification of all tools, depending on how they were used. Some tools in a LMS may facilitate a wide range of different methods. The classification of tools in this study is based on actual use of tools and the results reflect the methodological application of the tools and not the technical functionality of the tools.

In the literature we found nothing to suggest that the use of LMS at the School of Engineering is not typical of many institutions in developed countries. The teachers at the School of Engineering had access to similar support for their use of LMS in 2004 and 2009-10 and there were no major changes in the range of courses offered by the institution.

Results

Table 1: the use of tools for distribution in 2004 and 2009-10

WebCT, 2004 (N=107)			Ping Pong 2009-10(N=185)		
Tools for Distribution	n		Tools for Distribution	n	
Organizer Page	69	64%	Link (URL)	10	5%
Single Page	73	68%	Documents	136	74%
URL	58	54%	Overview	164	89%
Syllabus	41	38%	Contents	128	69%
Content Module	67	63%	Podcasts	0	0%
Glossary	9	8%			
Student Tips	4	4%			
Image Database	2	2%			
Multimedia	2	2%			
CD-ROM	0	0%			

The number of tools used to disseminate information is lower in Ping Pong than in WebCT. Both systems offer similar functions as the tool "Document" in Ping Pong may include text, image and multimedia files. In Ping Pong the tool "Link" is rarely used, because links to internet sites or other parts of the LMS can be included in any text.

Table 2: the use of tools for communication in 2004 and 2009-10

WebCT, 2004 (N=107)			Ping Pong 2009-10(N=185)		
Tools for Communication	n		Tools for Communication	n	
Mail/Privat post	36	34%	Participants	163	88%
Calendar	16	15%	Message Board	30	16%
Student tips	4	4%	What's new	21	11%
Student Homepages	2	2%	Ask/Answer questions	40	22%
			Calendar	4	2%
			FAQ	3	2%
			Log book	1	1%

In Ping Pong there is no integrated mail system. The tool "Participants" works as a mail list and connects the user to an external mail client.

Table 3: the use of tools for interaction in 2004 and 2009-10

WebCT, 2004 (N=107)			Ping Pong 2009-10(N=185)		
Tools for Interaction	n		Tools for Interaction	n	
Discussion	34	32%	Discussion	21	11%
Chat	7	7%	Assignments	24	13%
Self Test	6	6%	Project groups	17	9%
Assignments	22	21%	Tests	5	3%
Student Presentations	1	1%	Chat	0	0%
Whiteboard	0	0%			

The tools in this group were used sparingly; in addition, the use of “Discussion” has dropped by two thirds in five years. This result confirms our suspicion that lecturers refrain from using tools that are focused on the learners’ activity and interaction.

Table 4: the use of tools for course management

WebCT, 2004 (N=107)			Ping Pong 2009-10(N=185)		
Tools for Course Management	n		Tools for Course Management	n	
Quizzes/Surveys	26	24%	Surveys	158	85%
My Grades	30	28%	Objectives	16	9%
My Progress	0	0%	Statistics	8	4%
			Portfolio	1	1%
			Reports	0	0%

The current policy at the School of Engineering recommend that a course evaluation should be performed, using the tool “Surveys” in Ping Pong. However, if a lecturer prefers to conduct the course evaluation in some other way he or she may do so. That is why Surveys is used in so many courses, but it is also why the tool is classified as a tool for course management.

Summation of the results

The use of tools follows the same basic pattern in the investigations in 2005 and 2011. The tools for distribution are used far more than tools for communication or tools for interaction. Many tools available in the LMS are hardly used at all and lecturers choose to use tools that facilitate their teaching process without affecting the pedagogical or methodological design of their courses.

The most significant deviation is the decline in the use of OAD. That decline is of considerable interest since use of OAD suggests the use of teaching practices that call for student activity and collaboration. The decline can be explained if a number of teachers try working with an OAD in a course or two but then stop using it.

The biggest apparent difference (the use of the tool “Survey” in the latter investigation) is explained by a policy decision at the School of Engineering to use the LMS in the course evaluation process. It meant that the tool “Surveys” should be used to collect students’ opinions in all courses. The tool “Participants” enables the lecturers to send group E-mail to

their students and may be used to bring the course evaluation questionnaire to the students' attention. Those two tools were consequently used in most courses, but that cannot be taken as an indication of a change in the teaching practice.

Group discussion

Five experienced LMS users from The School of Engineering gathered with the authors to discuss the interpretation of the results above. The discussion was structured around six questions and the session was recorded (sound only). Notes were taken during the discussion by both authors. As an introduction the purpose of the discussion and the results shown in tables 1-4 above was presented.

Question 1: *Do you find that the classification of tools in the four groups is consistent with their impact on the educational process?*

Everybody agreed and no one objected to the classification of tools.

Question 2: *Is it fair to say, from your experience, that the LMS is used predominantly to distribute documents and handle the course administration?*

The group confirmed that the LMS is indeed used thus.

Question 3: *Do you think most educations would improve if more attention were paid to generic competences, such as information handling, problem solving and collaboration?*

The whole group agreed but everyone also agreed that it is not clear how to accomplish this.

Question 4: *Do you agree with our conclusion that the limited use of tools for interaction is explained by pressure on teachers and students to focus on course and subject specific aims?*

The group agreed, but after a short discussion they also wanted to point out that the tools for interaction does put additional demands on the teachers' time and hence the lecturers' workload is equally important.

Question 5: *Do you agree with the conclusion that the LMS must be integrated in the planning and design of education if the tools are to be utilized in a pedagogically sound way?*

Everyone agreed that it is probably advantageous to plan the use of LMS when preparing a course. However, the group did not agree that it is a necessary condition for a pedagogically sound application of LMS.

Question 6: *Do you concur with the view that handling of tools for interaction, and the knowledge about constructivist, learner-centered educational practices, should be treated as one process of professional development for teachers?*

Everyone agreed that learning to handle the tools and the pedagogical motivation to utilize interactive tools are closely connected. How this should be considered in teachers' training was not clear, and again the group pointed to time pressure and workload as major obstacles for professional development.

Summation of the responses from the teachers

Most opinions in the group were consistent with our preliminary interpretation of the results. The only point where the teachers' did not agree was our conclusion that to be utilized in a pedagogically sound way the LMS must be integrated in the planning and design of education. Still, everyone agreed that it is good if the use of LMS is considered in the planning process.

A general observation from the group discussion is the importance of teachers' motivation and attitudes about their work. The teachers' perceived shortness of time and strong resistance towards additional demands on their attention has to be taken into consideration when trying to change educational practices.

Discussion

The results above substantiate the hypothesis that lecturers predominantly utilize tools that facilitate the teaching process without affecting the pedagogical or methodological design of courses. Apparently there is a strong resistance to a wider implementation of LMS and the corresponding changes in the teaching practices.

The relation between educational practices and technology is very different for the tools for disseminating information and the tools for interaction. The usefulness of the latter depends on a change in practice towards social constructivist, learner centered procedures.

The balance between perceived usefulness and perceived ease of use decide the actual use of any available technology (Al-Busaidi & Al-Shihi, 2009). The group of teachers from the School of Engineering pointed to excessive workload as a major obstacle to adopt more learner-centered methods. That is not surprising, when teachers in developed countries are asked to identify barriers to the use of educational technology, the most common answers are lack of time and insufficient support (Al-Senaidi et al., 2009).

The choice of the lecturer, to use or not to use a certain tool, may be perfectly understandable from the teachers' perspective while it may be unfortunate from the students' perspective. With that distinction in mind it is easy to see how there can still be such a wide gap between the theoreticians' high expectations about the impact of LMS on the educational process and the lecturers' choice of tools.

It is possible to look at the usefulness of interactive methods and tools from two basic perspectives. One is teacher centered and is mainly concerned with how a tool may facilitate the lecturers' work within a set frame of teaching practices and institutional traditions. The other perspective, favored by most learning theorists, is that it is students who learn and therefore the teacher's role is to facilitate that learning. The first perspective tends to focus on subject specific competencies whereas the latter includes generic competencies such as the students' development of information handling skills, problem solving, social skills and the more general application of subject knowledge. This perspective is much more comprehensive than one that concentrates on transmitting and testing the subject specific content of a course.

The relation between educational practices and technology is very different for the tools for disseminating information and the tools for interaction. The former facilitates an existing practice and merely replace less efficient methods, while the usefulness of the latter depends on a change in pedagogical practice towards social constructivist, learner centered procedures.

We concur to the view that access to a LMS, support and training is a necessary, but not a sufficient condition, for the full utilization of LMS by teachers in the educational process. The interviewed group of teachers insisted that a LMS may be used in a pedagogically sound way even if it is not considered in the planning and/or design of a course. While we accept that it may not be a necessary condition, we still insist, as a general rule, that for the available tools to be utilized in a pedagogically sound way, they have to be integrated in the planning and design of courses.

If the pedagogical use of LMS is to be integrated in the planning and design of education, lecturers must be strongly encouraged to consider the learners' perspective and to look at the aims and purposes of education beyond the scope of single, subject specific courses.

It follows, that training of teachers in the handling of educational technology and education of teachers in pedagogical matters, cannot be separated. Instead they must be treated as one process of professional development if teachers, students and educational institutions are to reap the benefits of a pedagogically sound use of LMS.

Conclusions

Lecturers frequently use tools in a LMS that facilitate their existing teaching practice. In contrast, tools intended to enhance the learning experience by facilitating collaboration and the creation of communities of learners, are rather sparingly used. The lecturers' choices of tools suggest a strong resistance to changing their teaching practices, due to the lecturers' focus on the subject specific content of the courses they teach.

We conclude that the future utilization of tools for interaction, and the transformation of educational practices, should be treated as one process of professional development and that lecturers should be strongly encouraged to look at the aims and purposes of education beyond the scope of single, subject specific courses.

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