seminar.net
MEDIA, TECHNOLOGY & LIFELONG LEARNING www.seminar.net

Shaping or shaking the learning network? Insights into teaching practices using Virtual Learning Environments

Laurence Habib

Centre for Educational Research and Development
Oslo University College
Email: laurence.habib@hio.no

Monica Johannesen

Faculty of Education
Oslo University College
Email: monica.johannesen@lu.hio.no

Abstract

This article carries out an analysis of a Virtual Learning Environment (VLE) in an institution of Higher Education using Actor Network Theory (ANT). The ANT perspective is used to help explore the complex processes that come into play when a VLE is introduced in an organisation, especially as pedagogical goals, administrative procedures and technological artefacts are interwoven in a heterogeneous web or "network". The article identifies new actors that emerge in the traditional teacher-student, teacher-teacher and student-student relationships as a result of the presence and active usage of the VLE. It also describes how already existing actors may change roles or status in connection with VLE use.

Keywords: Actor-network theory, Virtual Learning Environments, teaching practice.

Introduction

The main purpose of the study described in this paper is to shed light onto the complex issue of VLE use and appropriation in an organisation of Higher Education, with a particular focus on the teachers' perceptions of how such systems may have affected their teaching practice. Oslo University College (OUC) implemented its first VLE in 1999. However, this first system was used only sporadically throughout the institution. A shift to a new system, Classfronter, later renamed Fronter, together with a commitment from the top management at the College led to a much more widespread organisational use[1]. Our study sets out to investigate how the implementation of the VLE may have contributed to the shaping or reshaping of teaching practice. It also examines whether there may be grounds to claim that the introduction of the VLE has "shaken" well-established didactical practices.

Throughout their practice as lecturers, the authors of this paper had noticed that the College management, when implementing a VLE across the organisation, mostly relied on an assumption that such systems were indubitably advantageous both for the administrative and for the pedagogical parts of the educational work. Another, apparently more moderate claim that such systems are merely "skeletons that can be filled in with whatever information is needed" was also a widespread argument throughout the implementation process. However, we could observe a significant gap between the management's expectations and the actual patterns of use of such systems throughout the College. While many managers trusted that the chosen VLE would be embraced wholeheartedly by lecturers and administrators alike, user data showed that many lecturers avoided some of the functions available in the VLE, while others chose not to use the system at all.

A lot of research involving VLEs focuses on issues such as speed of course delivery (Goldberg & McKhann, 2000; Langley, Marriott, Belcher, Wilson, & Lewis, 2004), learning efficiency (Bird, 2001; Broad, Matthews, & Mcdonald, 2004; Piccoli, Ahmad, & Ives, 2001), or the perceived effectiveness of the technology (Lee, Hong, & Ling, 2001). However, our research takes a slightly different perspective. It is part of a national project aiming at understanding how users relate to VLEs before, during and after their implementation. Within this broad perspective, we chose to focus more particularly on questions related to the role played by VLE in the teaching practice of academic staff at the College. More specifically, it aims to address questions about how VLEs become integrated within a particular teaching and learning context, which VLE functions are more easily adopted and why and how VLE technology enables or constrains the work of lecturers and student activity.[2]

Theoretical background and research approach

The focus of the research is on the teaching practice of lecturers at OUC. Among the theoretical models available in the literature, that of Løvlie (1974) provides a simple yet relatively comprehensive framework for understanding teaching practice, and this framework appears useful for the purpose of structuring data collection. However, the very complexity of the data collected via interviews and journals called for another methodological tool for analysis. Considering that our research was centred on the use of a particular technology (VLEs) in a particular social context (Higher Education), we set out to try using Actor Network Theory, which is a widely established theoretical and methodological approach within the fields of information systems and studies of technology in social settings.

Understanding teaching practice

Our study is concerned with what may happen to teaching practices in a changing technological environment. It aims to gather qualitative data both on the "operational", day-to-day aspects of teaching practice and on what practitioners consider to be its underlying principles and *raison d'être*. The model presented by Lauvås and Handal (1983) on the basis of the work of Løvlie (1974) portrays teaching practice as a triangle divided into three levels or zones: the "bottom" level (P1) refers to the concrete actions performed by practitioners within the realm of their professional activities. The "medium" level of the triangle (P2) consists of the reasons practitioners have to perform those particular actions. The "top" level (P3) encompasses the ethical and moral motives that inform the reasoning process that practitioners go through when planning, performing and evaluating their daily practice.

We found the division into three levels of practice to be useful when designing our data collection process. In particular, our guideline for interviews featured

questions that addressed all three levels: 1) questions about what lecturers actually do within the realm of their teaching practice, 2) questions about why they carry out certain types of activities and not others (e.g., whether they are encouraged or pressured by students or colleagues, inspired to try out certain functions in the system, or hindered in performing a particular activity by the limitations of the system), and 3) questions about the respondents' understanding of their own pedagogical approach.

Actor Network Theory

As we aim to achieve an understanding of user perceptions, attitudes and routines, a number of research approaches are available. For the purpose of this study, we choose a broadly interpretative approach that is inspired from Actor Network Theory (ANT). ANT is one of several schools of thought that aim to make sense of the role of technology in organisations and in society. This theory, or rather theoretical and methodological approach to research, was originally developed by Bruno Latour, Madeleine Akrich and Michel Callon for the purpose of studying the ways in which scientific practice, technology and society are interwoven and integrated (Callon, 1986; Latour, 1993). ANT has been the basis of a number of studies of information systems (Berg, 1999; Brosveet, 2004; Doolin & Lowe, 2002; Graham, 1998; Hannemyr, 2003; Hanseth & Braa, 2001; Wise, 1998) but, to our knowledge, has rarely been used to shed light on processes of VLE use in organisations.

One of the major originalities of ANT is that it considers both humans and non-humans to be actors (or actants). Actors bring in other actors as allies into an "actor network" and an analysis of those actors and of their interests can help understand how a "network of aligned interests" is initiated, developed, maintained, or sometimes dismantled. One of the key processes in ANT is that of "enrolment" whereby an actor or set of actors goes through a process of negotiation with other actors, so as to translate their interests in such a way that they become "aligned" with those of the negotiating partners (Akrich, 1992; Latour, 1992).

One of the main emphases in a study of actor networks is therefore to uncover in what ways the various components of a network interrelate, and in particular how they might influence or "mobilize" each other and how they negotiate with each other so as to create alliances. Some actors become indispensable to the stability of the network, while others might become marginalised or even disappear completely from the network (Callon, 1986; Latour, 1987).

One of the aims of this study is to identify the new actors that have appeared in connection with the introduction of a VLE within the organisation, as well as recognize the changes that others actors may go through as a result of the VLE implementation. This will also allow us to describe in more detail the actor networks that co-exist in the organisation, the elements that constitute them and the transformations they go through. This will in turn give us a richer understanding of the changes that teaching practice may undergo as a consequence of VLE use.

Findings

The findings reported here are drawn from a study involving ten members of staff from various departments at OUC. The empirical data is gathered primarily through in-depth interviews, diaries from teachers and evaluation reports from students. After each interview, every respondent was provided with a "daily log form" which they were asked to fill in during the working week

of their choice. Additional data was obtained from reflection notes from students and from course evaluation reports.

The interviews started as very open-ended conversations with the respondents. After having heard their own interpretations of the situation, we started to ask questions that would allow us to gather data related to the central notions in ANT (actors, networks, enrolment, etc.). Although the questions differed in formulation from one interview to another, they were broadly related to three main categories: what inspired the teachers to modify their practice, what hindered them in their practice, and what supported their existing practice.

The respondents in this study cannot be considered representative of the College's staff. First, not all the departments were represented in the study. Second, and perhaps more importantly, many of the respondents had contacted us after having read a notice we had published on the School webpage requesting participants to interviews. It is reasonable to assume that those members of staff who volunteered to participate in the study did so because they considered that their experience with the VLE could be of interest to researchers in the area of VLE use. Indeed, we did notice that all the respondents were active VLE users and had an altogether positive impression of the VLE. In order to counterbalance this possible bias, we will actively look for respondents among the "VLE sceptics" during the next phase of the study.

The analysis presented in this paper represents the first step in a complex process whereby we identify not only actors, but also the networks they create and are enrolled in. The focus here is on uncovering new actors that emerge when an organisation implements a VLE and on depicting the changing nature of the already existing actors.

Information and communication

As mentioned above, one of the most widespread understandings of why VLEs need to be used for communication between teaching staff and students is that they render communication more time effective and cost efficient. It seems, from the data we have gathered, that this belief is shared by at least some of the lecturers at OUC. Our informants often describe the VLE as an appropriate teaching tool because it reduces the amount of time used when communicating information to students.

> I think Classfronter is very good when it comes to messages and news to the students. As for me, it's about informing about the maintenance and what will happen with regards to machines and equipment, and general information. So I think it's very practical in that sense. [Interview with a lecturer, Faculty for Dental Technician Education]

> I need to write a collective e-mail to several people. I go into Classfronter to send the mail from there because it is easy to access the e-mail addresses because of the "participant"-function. [Diary entry from a lecturer, Faculty for Dental Technician Education]

The VLE has become an important actor in the actor network that encompasses the teaching staff, their colleagues, and the student body. In allowing information from one lecturer to reach all students and other lecturers simultaneously, a VLE renders some teaching-related activities less cumbersome than they would have been with traditional teaching means.

The VLE is here used as a tool to achieve a particular pedagogical goal, i.e. to render the process of information sharing more effective. In this context, the term "information" here does not primarily encompass learning material upon

which students are to base their learning, but refers mostly to administrative information such as timetables, deadlines, room numbers, which supports the process of learning. The improved delivery of such practical information is meant to render the students' quest for information less demanding and more easily structured.

In analysing the situation from an ANT perspective, we can suggest that the VLE goes through a process of enrolment both from the teachers' and from the students' part. The teachers who experience the VLE as an enabler to their teaching practice will enrol it as an ally in the network they establish with their students. In that sense, the VLE will be inscribed with the teachers' own interests. In addition, the VLE appears to be a significant actor in the relationship between the students themselves. It is apparent from the data that students who make the effort to use the VLE on a regular basis, for example to access course information, may put pressure on others to do the same.

> Some are getting skilled at going into Classfronter and if they have seen it [the material] they begin to mention it in class or in plenum: "Yes, but it's available online [on Classfronter]". That is to say, to those who are unhappy: "you could have know about it if only you had gone into [the system]" [Interview with a lecturer, Faculty of Business, Public Administration and Social Work]

It appears from the data collected that this type of "missionary work" by students is one of the main engines in the dissemination of VLE usage in the organisation. By integrating the VLE so tightly into their study routines, the students turn it into an "obligatory point of passage" for the gathering of necessary information for the course. They also start expecting all the teachers to put online the information that they feel they need.

> It is not always the case that all the teachers are equally good at putting the information out on the net. For example, sometimes the teachers have gone through an assignment that needs to be solved and those that do not have the opportunity to come to the lecture then don't have access to this information except through their co-students. [Excerpt from a course evaluation, Faculty of Education]

This example illustrates how students use the VLE as an ally in their quest towards a more flexible access to course information. In requesting that the teachers make all the information necessary for the course available online, they endow the VLE with a new status as an indispensable element to the learning process and therefore an essential part of the teaching practice. The students, their study routines, and the VLE can then be seen as constituting an actor network that also will work towards "converting" the teachers who are not yet using the VLE.

Feedback to students' written work

VLEs can be seen as supportive of the social constructivist approach (Bruner, 1986, 1990; Vygotsky, 1962, 1978) that lies at the core of much of the values purported in many institutions of Higher Education. In particular, many pedagogical processes rely on response and feedback given to the students either by their formal mentor or by their co-students. From the interviews it is apparent that VLE technology contributes to a more "effective" distribution of student production and feedback. Thereby, the main focus throughout a course is no longer on delivering the final version of an assignment to the teacher, but rather on publishing drafts or unfinished versions of assignments for the purpose of getting feedback from both teachers and co-students.

> ...assignments, that is to say the coursework they [the students] have in relation to the course, they put that out on Classfronter. They [the students] give comments on Classfronter both when they're going to give feedback [to their co-students] and when they are getting feedback from the teacher, and then it lies open so everyone can see it. [Interview with a lecturer, Faculty of Nursing]

This "mass publishing" process may represent a new challenge for the lecturers, as they generally do not have the capacity to give feedback to all the students. One way of dealing with those increased expectations may be to relate only to a segment of the published material. For example, some lecturers have developed a strategy whereby they select a number of student assignment answers, provide written feedback to those answers and make this feedback available online to all the students.

> We don't have the resources for them to get feedback and stuff right away. So then we took ten assignment answers from each of those [assignments]. So then we made use of the possibility we had to go in [the VLE] and take out the document and read it, and give... and found some general features in those ten then, which we then gave... put out as a commentary. [Interview with a lecturer, Faculty of Business, Public Administration and Social Work]

Availability of student answers online also seems to be a source of inspiration and insights for other students. The students can, by reading each other's drafts, get new ideas about how to develop their own assignment, and also feel more secure about their own work when they see that other assignments have a similar structure or direction.

> By reading other students' answers, I have got both ideas about how to make changes [to the paper] and a stronger belief that my own work was on the right track. [Excerpt from a student reflection note]

VLEs can also facilitate the procedure of re-using good answers from student assignments from one assignment to the next, or from one year to the next. This procedure can be an informal arrangement between students, but it can also be formalised and orchestrated by the lecturers themselves.

> When they [the students] have submitted their papers, I ask them [if it is all right that] the good answers get published. That I publish them in the [VLE] room so that the others can see the good answers. [Interview with a lecturer, Faculty for Dental Technician Education]

In our observations of the new feedback processes enabled by the VLE, we can identify at least two types of actors that gain momentum in the mentoring process. The first type of actor could be the draft answer that the students submit to the teachers and to their co-students ahead of the final delivery date. A second type of actor that seems to gain significance with the use of the VLE is the feedback that students receive from both their teachers and their co-students. In many cases, publishing the feedback on the VLE implies in practice that it will be available to others than the person it is originally intended for. This, in turn, gives a new "intentionality" to the feedback: not only is it meant to benefit the student who had composed the draft answer, but it is also expected to function as additional information for all the other students that have access to it on the VLE.

It can be noticed that neither the drafts nor the feedback are new actors in the process of mentoring. Indeed, students have always had the opportunity to present their drafts to their lecturers and co-students, also before the introduction of the VLE. However, the VLE makes those drafts more readily available to a much wider audience. Similarly, it was fully possible both for co-students and for lecturers to give feedback on drafts without using the VLE. Nevertheless, the increased accessibility of those drafts makes the process of providing feedback more straightforward for both co-students and teachers. In that sense, the changing nature of both drafts and feedback can turn them into "allies" in the new pedagogical processes embedded in the formalisation of formative assessment, as stipulated for example in the Norwegian Quality Reform (KUF, 2001; Nyborg, 2002).

Furthermore, writing feedback answers that are intelligible for others can be an opportunity for the students to reflect not only on the quality of the particular draft they give feedback on but also more generally on what is meant by quality. Interpreting comments that have been provided on sample work can also contribute to developing the students' conceptual understanding of the notion of quality. In particular, working with feedback may encourage students to reflect on what criteria should be used for assessment and how they relate to each other. This increased criteria awareness may also be a significant element in the process of acquisition of abstraction skills.

Other student activity in learning

From our data, we observe that VLEs can be used as facilitators for new forms of student activity, in particular in relation to tests and examinations. For example, at the Faculty of Nursing, students are required to develop multiple-choice questions for each other on the basis of the curriculum in some subject areas. One of the most interesting aspects of this new activity is that, although the lecturers check that the tests developed by the students are actually used, they do not carry out any type of quality assessment of the questions or the answers. The lecturers are very much involved, however, in the development of criteria that are to be used by the students in their "test development" assignment. In that respect we can identify criteria as a significant actor in both the teacher-student relationship and the student-curriculum relationship. It is also interesting to note that one of the course teachers considered that such a process could only be carried out on the VLE, because otherwise the students would not consider it "as much fun".

Another new form of student activity that bears similarities to the above process has emerged in another part of the College, namely at the Faculty of Business, Public Administration and Social Work. For some of the courses, students are required to develop examination questions. As one of the respondents mentions, when referring to the students' preparations for final exams:

> … this is supposed to be a voluntary effort in a sense, but there are a lot of good pedagogical reasons for you [the students] to make [the examination questions] yourself, and you learn a lot in doing so, and the whole curriculum becomes part of the agenda at the early stages of the academic year, instead of what used to happen before, that suddenly someone discovers some book or other at the beginning of June and unfortunately, it is sold out. [Interview with a lecturer, Faculty of Business, Public Administration and Social Work]

In the example where students create multiple-choice tests for each other, we can identify the multiple-choice function in the VLE as an actor, which seems to present particular properties that purportedly make the process of getting to

know the curriculum more exciting. Creating multiple-choice questions can be done without the help of the VLE, but this might require more work, and would no longer be considered a play activity.

Similarly, the participation of students in the creation of examination questions is not in itself dependent on the VLE. In theory, the students could write examination questions and hand them in to the lecturers who would use them as a basis for the finals. However, the questions would then remain "private" in the sense that only their authors and the lecturers would have access to them before the finals. Hence, they would only be part of a learning process for the students who write them and not for the others. In asking students to publish examination questions on the VLE, the lecturers encourage them to share their insights into the curriculum with each other. The purpose of such a scheme is to help students develop a more "direct" relationship with the curriculum while the lecturers become less visible in the process of conveying content from the curriculum.

In the example above, we see that the actor network constituting student learning may be changing shape. The online examination questions published by the students and the functions in VLE that support the publication process can become central actors in the learning network, which originally encompassed primarily lecturers, students and the curriculum. In a traditional teaching practice, lecturers have a quasi-monopoly on the process of interpreting the curriculum for the purpose of student assessment. In the example described above, however, lecturers relinquish part of their control over the way students are going to relate to the curriculum. Because they are taking an active part in deciding what parts of the curriculum will be taken up at the exam and in what way, the students may experience a more intimate connection with the curriculum, and this may contribute to a feeling of greater ownership of the learning process.

Such activities bring to the surface the importance of criteria development in the students' learning process. Through their participation in criteria development the students gain a new status as contributors to the academic discourse on professions. Here we would suggest that one can catch a glimpse of a paradigm shift in the learning network, where the traditional hierarchical relation between lecturer and student becomes blurred.

Dynamic planning and control

Data from the interviews indicate that VLEs allow for a greater transparency and for increased dynamic with regards to both the lecturer's work and student activity. One of the clearest examples found at OUC is the function allowing lecturers to publish and update online teaching schedules. Previously, the teaching schedule was handed out to the students at the beginning of the semester and was considered to be binding for both teachers and students. The general feeling was that publishing a new schedule and making sure that the students discard the previous plan was such a complicated process that lecturers would try their best to avoid having to do it. Only in situations requiring major modifications of the teaching schedule did the lecturers bother publishing a new plan. The VLE has made the process of updating a teaching plan so straightforward that such modifications are made all through the semester and lecturers have integrated this way of planning as a standard procedure. For example, the lecturers at the Faculty for Dental Technician Education insist on regular updates of the teaching schedule, so as to increase the students' confidence in the plan and teaching programme:

> [...] it [the teaching schedule] lies on top of everything else when it has just been updated, so that the students can just go in there and see: "OK,

> it hasn't been updated since the last time I was in, then it's fine". And if they then see that there is a change of date, they can go in and see what [has been modified]. [Interview with a lecturer, Faculty for Dental Technician Education]

Another element that may contribute to VLEs increasing the feeling of control is that many such systems have a "statistics" function that allows users with teacher and administrator rights to get information about student online activity, including who has delivered which assignments, who has accessed what lecture notes, etc. This observation can give insight into the developers' perception of the teacher-student relationship as hierarchical, based on power and control. This is in line with Beck's (2005) suggestion that VLEs give teachers a privileged status and cement a hierarchical understanding of the teaching and learning community. In ANT terms, this is a manifest example of VLEs being inscribed according to the developers' own understanding of the roles and functions of the "imagined" users. Although this contradicts the ideals promoted by much of the Higher Education world, for example through the Quality Reform in Norway (KUF, 2001; Nyborg, 2002), most of the respondents did not seem to find such control to be problematic or bound to corroborate a controlling approach to teaching.

> So for the students the smiling face means that now someone has looked at it [the assignment]. [...]. And if they see an angry face, then it means that it might not be so good. [Interview with a lecturer, Faculty for Dental Technician Education]

From the analysis above, we can identify a number of new actors, many of which are dependent on the VLE. First, the online teaching schedule acquires a dynamic aspect that was almost completely absent when teaching schedules were distributed on paper before the introduction of the VLE. The teaching schedule can therefore lose its former role as a "straight-jacket" to the teaching, and becomes more a support to a dynamic planning process, which is seen as more desirable by both the teachers and is more in line with the values promoted in Higher Education. In that sense, the teaching schedule is an actor that is constantly being translated by other actors, i.e. the teachers and administrators.

Another insight that can be gathered from the data is that publishing lecture notes online has a number of consequences for teaching and learning processes: it requires new preparation routines for the students as they are expected to access the online notes before the lecture. It also opens a window into the teacher's preparation process. In that respect, online content is an actor that affects both teachers and students. VLEs also render possible the creation of a new actor, namely the "statistics" function that provides teachers and administrators with quantitative information regarding student online activity. The existence of this new actor raises new concerns regarding not only privacy but also teaching ethics – as statistics related to how many times a student has accessed a document can give a distorted picture of how well that student is doing.

The lecture notes distributed by the teacher either on paper or online contribute to affecting learning. Distributing lecture notes before the class may give the teacher an opportunity to focus on supporting the students' understanding rather than spending time on conveying information ("dissemination"). The students who have made the effort to get acquainted with the material in advance may have acquired a better base for the formulation of relevant questions and the teacher may be able to discuss the material at a more advanced level. In other words, using VLEs to take care of the dissemination of information may liberate time to concentrate on other

learning activities. The change in essence that occurs when less lecture time is spent on dissemination can form the basis for a new understanding of the purpose of learning. By using lecture time to initiate discussions and debate, the teachers may be able to more easily convey the message that such activities are crucial in the learning process. Discussion-based learning activities might stimulate the students' questioning of the set of alternatives they are facing in the learning process.

Concluding remarks

In this paper, we have used data gathered from a number of sources in order to shed light on the processes of VLE use in an institution of Higher Education. Using ANT has helped us focus on the dynamic notion of the relation between the various human and non-human actors around the VLE. In particular, ANT has allowed us to uncover how the use of VLEs changes the roles of some of the existing actors in the networks formed in the teaching and learning processes, and how new actors might emerge as those networks are developed, cultivated and reconstructed. The most obvious new actor in the "teaching and learning" network at OUC is the VLE itself and it is apparent from the data that both teachers and students try and enrol the VLE so as to fit their interests. The data presented here indicates that teachers often use the VLE as a tool to render communication with students more efficient. Conversely, students might engage the VLE as an ally when trying to get the information they require for their courses (often as a substitute for the teacher).

A number of other actors also seem to have gone through a transformation process as a result of VLE use. Among those figure the assignment drafts that students publish on the VLE and the feedback they get from teachers and co-students. We have also identified a series of rather heterogeneous elements that undergo some transformations, including the curriculum, the criteria that are used to evaluate the quality of the students' work, the examination questions that the students create themselves and publish on the VLE, the statistical data that teachers can gather on student online activity, as well as the students' own study routines. Multiple-choice tests also change form and are said to acquire a more "entertaining" character when students use the dedicated function on the VLE. We have noticed how actors such as the teaching schedule change shape and become more dynamic as a result of VLE use. Moreover, the online lecture notes also become an actor which affects the teachers' routines and students' study techniques. We see thereby that the VLE has contributed to shaping the lecturers' teaching practices. However, there is little indication that the VLE has had any revolutionary effect on the existing learning network. It seems that the teaching and learning described in the case study are based on established practices that are not easily shaken.

This study reveals that the introduction of VLEs changes the actor network which brings about new teaching practices. This article is not a detailed account of how the different actors in the teaching and learning process interrelate, but a sketch of the situation at OUC that emerges from the data-gathering process. Further research might involve the collection of more extensive data from and about a larger array of actors so as to capture more closely the dynamics of the actor networks they constitute. This may help gain deeper insights into the processes of transformation, inscription and translation within the various actor networks that co-exist within an institution of Higher Education.

References

Akrich, M. (1992). The de-scription of technical objects. In W. E. Bijker & J. Law (Eds.), *Shaping technology / building society: studies in sociotechnical change* (pp. 205-224). Cambridge Ma: The MIT Press.

Beck. (2005). *Learning Management Systems: The Need for Critical Analyses*. Paper presented at the Critical Computing - Between Sense and Sensibilities. Fourth Decennial Aarhus Conference, Aarhus.

Berg, M. (1999). Accumulating and Coordinating: Occasions for Information Technologies in Medical Work. *Computer Supported Cooperative Work: The Journal of Collaborative Computing, 8*(4), 373-401.

Bird, L. (2001, 9-12 December 2001). *Virtual Learning in the Workplace: The Power of "Communities of Practice"*. Paper presented at the Meeting at the Crossroads 18th Annual conference of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE 2001), Melbourne, Australia.

Bjarnø, V., & Sandtrø, T. (2005). *Implementering av et nytt læringsmiljøsystem (LMS) ved Høgskolen i Oslo - Erfaringer etter et år med Classfronter*. Oslo: Oslo University College.

Broad, M., Matthews, M., & Mcdonald, A. (2004). Accounting Education Through an Online-Supported Virtual Learning Environment. *Active Learning in Higher Education, 5*(2), 135-151.

Brosveet, J. (2004). Translation Terrain and Pied Piper Detour: How Experts Eliminated a Norwegian Digital City Project. *Science, Technology & Human Values, 29*(2), 213-241.

Bruner, J. S. (1986). *Actual minds, possible worlds*. Cambridge, MA: Harvard University Press.

Bruner, J. S. (1990). *Acts of meaning*. Cambridge, MA: Harvard University Press.

Callon, M. (1986). Some elements of a sociology of translation: domestication of the scallops and the fishermen of St Brieuc Bay. In J. Law (Ed.), *Power, Action and Belief. A New Sociology of Knowledge?* (Vol. Sociological Review Monograph 32). London: Routledge & Keagan.

Doolin, B., & Lowe, A. (2002). To reveal is to critique: Actor Network Theory and critical information systems research. *Journal of Information Technology, 17*(2), 69-78.

Goldberg, H. R., & McKhann, G. M. (2000). Student Test Scores are Improved in a Virtual Learning Environment. *Advances in Physiology Education, 23*(1), 59-66.

Graham, S. (1998). The end of geography or the explosion of place? Conceptualizing space, place and information technology. *Progress in Human Geography, 22*(2), 165-185.

Habib, L. (2005a). Finding a place and a space for online learning environments in an institutional setting: issues of objectification. . *IPSI BgD Transactions on Internet Research 2005;1(2).*

Habib, L. (2005b). Domesticating learning technologies in a higher education institution: a tale of two virtual learning environments. In V. Bjarnø (Ed.), *New Teaching and Learning Practices: Experiences with eLearning Projects at Oslo University College 1998-2005* (pp. 79-87). Oslo, Norway: Oslo University College.

Handal, G., & Lauvås, P. (1983). *På egne vilkår [On your own terms]*. Oslo: Cappelen.

Hannemyr, G. (2003). The Internet as Hyperbole: A Critical Examination of Adoption Rates. *Information Society, 19*(2), 111-121.

Hanseth, O., & Braa, K. (2001). Hunting for the Treasure at the End of the Rainbow: Standardizing corporate IT Infrastructure. *Computer Supported Cooperative Work: The Journal of Collaborative Computing, 10*(3/4), 261-292.

KUF. (2001). *KUF (2001) Stortingsmelding nr 27 (2000-2001) Gjør din plikt - Krev din rett. Kvalitetsreform av høyere utdanning*. . Retrieved 13.02.06. from http://odin.dep.no/kd/norsk/dok/regpubl/stmeld/014001-040004/dok-bn.html accessed 13.02.06.

Langley, C. A., Marriott, J. F., Belcher, D., Wilson, K. A., & Lewis, P. (2004). The Attitudes of Students and Academic Staff Towards Electronic Course Support—are we Convergent? *Pharmacy Education, 4*(2), 57-61.

Latour, B. (1992). Where are the missing masses? The sociology of a few mundane artefacts. In W. E. Bijker & J. Law (Eds.), *Shaping technology / building society: studies in sociotechnical change* (pp. 225-258). Cambridge Ma: The MIT Press.

Latour, B. (1993). *We have never been modern*. Hemell Hempstead: Harvester Wheatsheaf.

Lee, J., Hong, N. L., & Ling, N. L. (2001). An analysis of Students' Preparation for the Virtual Learning Environment. *Internet and Higher Education, 4*(3.4), 231-242.

Løvlie, L. (1974). Pedagogisk filosofi for praktiserende lærere. *Pedagogoen, 22*(1), 19-36.

Nyborg, P. (2002). The Quality Reform of Higher Education in Norway. A national reflection of the Bologna Process. Retrieved 05.02.2006, from http://www.uhr.no/internasjonaltsamarbeid/utskrifter/BOL%20kvalitetsreformen%20refleksjoner.htm

Piccoli, G., Ahmad, R., & Ives, B. (2001). Web-Based Virtual Learning Environments: A Research Framework and a Preliminary Assessment of Effectiveness in Basic IT Skills Training. *MIS Quarterly, 0276-7783 December 1, 24*(4).

Vygotsky, L. (1962). *Thought and language*. Cambridge, MA: MIT Press.

Vygotsky, L. (1978). *Mind in society: the development of higher psychological processes*. Cambridge, MA,: Harvard University Press.

Wise, J. M. (1998). Intelligent Agency. *Cultural Studies, 12*(3), 410-428.

---

[1] For an overview of the reasons for system change, see Bjarnø & Sandtrø, 2005 and Habib, 2005a, 2005b.

[2] It is to be noted that this research focuses on VLE and not on teaching technology in a wider sense, i.e. we do not touch on the use of technological tools such as email or presentation programs if they are not specifically part of a VLE.