

The Role of Virtual Learning Environments in a Primary School Context: An Analysis of Inscription of Assessment Practices

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Abstract

Virtual Learning Environments (VLEs) appear to be one of the most widely used computer-based technologies for teaching and learning, and may emerge as a potential tool for e-assessment. However, little is known about how VLE tools are used in various forms of assessment and what kinds of teaching practice the use of such technologies brings about. Based on interviews and personal diaries, actor-network theory is applied to describe and understand emerging teaching practices with VLE tools, such as multiple choice tests, portfolios and collaborative writing tools. A tight relationship is found between the documentation of student attainment, the teacher-student-parent conference and the use of VLE tools, all constituting a network of aligned interests in assessment.

Introduction

Assessment is a vital part of educational practice (Ridgway, McCusker, & Pead, 2004) and a core dimension in shaping classroom practice and defining curriculum. According to Black, Harrison, Lee, Marshall, and Wiliam (2003), assessment is about making schools accountable, and providing students with certificates, as well as—and probably most importantly—creating assessment *for* learning. Traditionally, summative assessment has had a strong standing in assessment of learning. However, the notion of formative assessment has been the object of substantial attention and is considered to be the most powerful factor in promoting learning for the 21st century (Black, et al., 2003; Black & Wiliam, 1998a; Nicol & Macfarlane-Dick, 2006).

International tests on student attainment, such as Programme for International Student Assessment (PISA), Progress in International Reading Literacy Study (PIRLS) and Trends in International Mathematics and Science Study (TIMSS), focus on measuring learning. In that context it is interesting to investigate the potential of digital information and communication technologies as supporting tools for assessment practice. Virtual Learning Environments (VLEs), including a number of technologies such as Blackboard and Moodle, have emerged as a technology for teaching and learning (Becta ICT Research, 2004; Lazakidou & Retalis, 2010) and may become important tools for e-assessment. The area of e-assessment has recently been an object of discussion. For example, two scientific journals have dedicated special

issues to the topic (McFarlane, 2003; Whitelock, 2009). Consequently, a pertinent question to ask is *how teachers in primary school use VLEs in formative and summative assessment, in particular whether VLE tools for multiple-choice questions (MCQ), portfolio methods and collaborative writing, can and will be used for a range of assessment methods.*

In this article, research on e-assessment is presented from the viewpoint of the VLE as a system with a number of features, some of which can be of benefit to e-assessment. Actor-network theory (ANT) is presented as a conceptual framework and is used to describe and understand how primary school teachers talk about their teaching and assessment practices when using VLEs. Furthermore, the article presents an analysis of the data gathered through interviews and logging of teachers' self-reported teaching practices, and gives evidence of new and changing assessment practices.

Review of research on e-assessment

A major challenge for assessment in the 21st century is for the teacher to reconsider the traditional relationship between teacher and student (Black & Wiliam, 1998b; Gipps, 2002) and provide for practices that support reflective and self-monitoring learners. Formative assessment is suggested as a method for addressing this challenge and has become a major focus for educational research and development (Black & Wiliam, 1998a). While summative assessment (assessment *of* learning) aims to illustrate the student's level of knowledge at the end of training, formative assessment (assessment *for* learning) intends to promote learning, to develop student knowledge and give grounds for adapted education (Black, et al., 2003; Engh, Dobson, & Høihilder, 2007). A review of the literature on e-assessment indicates that most research is related to higher and further education. Three different perspectives on e-assessment have been identified in the literature (Erstad, 2009; McFarlane, 2003; Ridgway, et al., 2004), namely 1) assessment of traditional skills, 2) assessment of new educational goals and 3) and assessment of student's digital literacy.

Computer-based assessment tools can be used to assess *traditional skills*, and can build upon prior knowledge in assessment. Although such testing can be based on existing tests, new challenges emerge. There is evidence of under-performance among students with no or little computer skills when tests are conducted with computers, as well as under-performance among computer literate students when using written tests (Russell, Goldberg, & O'Connor, 2003). There are several studies on the effects of online assessment tools to enhance student learning in higher education. Marriott (2009) reports that having a number of phased online/paper-based assessments during the semester plays a significantly beneficial role in teaching and learning. Angus and Watson (2009) claim that high exposure to an online instrument leads to higher student learning, while Nicol (2007) reports that multiple-choice questions (MCQs) can be used to support the development of learner self-regulation. However, it is unknown whether those results are relevant for primary schools.

From the perspective of VLEs as a tool for assessment, the most interesting is probably the potential to assess *new educational goals* such as metacognition, creativity, project work and communication skills. Such higher order skills are difficult or even impossible to assess using traditional methods. For example, can computer-based systems make problem solving more realistic through simulation of real-life situations? These kinds of systems raise new problems in terms of assessment, such as how to assess the dynamic aspects of problem solving (Wirth & Klieme, 2003) and separating problem solving from related

knowledge (Bennett, Jenkins, Persky, & Weiss, 2003). In higher education there is also a growing interest in using MCQs as a means for deep learning (Draper, 2009; Nicol, 2007) and digital portfolios to support peer interaction (Barbera, 2009; Chang & Tseng, 2009), but this has yet to filter down to the school sector.

Finally, students' competency in *digital literacy* itself is a subject of interest for assessment. Computer skills are essential for much modern living, and need to be a target for assessment (Sieber, 2009). As this article is about teacher practice, however, this perspective is not elaborated on here.

Different forms of classroom teaching and assessment practice have different effects on achievement (Hattie, 2009). In a metastudy of typical influences on achievement, Hattie (2009) presents the effects of a range of teaching practices. The findings in this study indicate that practices such as feedback and self-report grading may be more effective for achievement than, for example, frequent testing and 'teaching for the test'. VLEs are, for one thing, a tool for computer mediated communication (Britain & Liber, 1999; Leese, 2009). Accordingly, VLEs employed for self-assessment and feedback should be the focus of further critical reflections.

The Norwegian context

About twice a year, students' achievements are presented in a face-to-face meeting between the teacher and the parents of each child. In Norwegian primary schools, summative assessment is mainly provided orally, typically as a part of the teacher-student-parent (TSP) conference, since there is no grading at this level. It is to be noted that the TSP conference in Norway has undergone a re-definition due to the active role of the student in these conferences and a greater focus on a 'written evaluation' without the use of grades. Due to new national regulation on assessment (Norwegian Education Act, 2006) emphasising the documentation of student achievement, several school districts have implemented mandatory written evaluation, i.e., a standardised form for qualitative evaluation of each student's achievement in each subject area. Accordingly, systems for measuring attainment are called for. Furthermore, the Norwegian curriculum reform of 2006 focuses on specific competence aims in subject areas, and requires mechanisms for measuring learning and achieving knowledge. In practice, such mechanisms are implemented through different kinds of documentation of attainment, e.g., 'target sheets', portfolios and 'knowledge ladders', i.e., different kinds of so-called KWL charts (Ogle, 1986), focussing on what the student already **K**nows, what the student **W**ants to know, and finally what the student has **L**earned. Nevertheless, there is a lack of systematic research on the effects of such practices.

The notion of VLE has multiple meanings (Weiss, Nolan, Hunsinger, & Trifonas, 2006), and embraces everything from e-learning to computer-based simulation. However, the term 'VLE' is more often related to certain software packages (Becta ICT Research, 2004; Pulford, 2011). VLEs have, during the last decade, been implemented in many higher education institutions worldwide. In Norwegian primary education the same kind of technology, Fronter and It's learning, has been implemented in almost all schools. Eighty-seven percent of Norwegian primary schools have implemented some kind of VLE (GSI, 2010-2011), but there is still a potential for using VLEs more as a tool for learning (Hatlevik, Tømte, Skaug, & Ottestad, 2011). The factual use of VLEs most often is within the capacity of 'web 1.0' technology, i.e., as a tool for information sharing. However, VLEs as software packages can be characterised as a web 2.0 technology that gives students, teachers and other stakeholders in education access to a common tool for co-producing information. In addition, most VLEs offer some kind of

dedicated pedagogical tools, such as multiple-choice tests, portfolios, collaborative writing, etc. In the case of a VLE for assessment, the advantages most often presented are those of automatic online assessment focusing on efficiency (Lonn & Teasley, 2009). This complex situation is therefore the backdrop for an exploration of how VLEs are used in assessment practice.

Conceptual framework

According to Nespore (1994), it is vital to trace the network structures of educational practice to understand learning and knowledge. From this perspective, the process of assessment and, in particular, the changes as a result of implementing technology in these practices, are multifaceted and influenced by a network of several stakeholders. The use of artefacts such as VLEs brings about new practices, including assessment practices. Some might inspire users to do things in new ways, others may extend established practices, and finally some might hinder current working practices. To understand and describe this complex network of *aligned interests*, some concepts from the actor network theory (ANT) are helpful. The theory puts a special emphasis on the processes of creation, modification and sometimes destruction of networks of human and non-human actors. It is a framework that 'allows us to look at identity and practice as functions of ongoing interaction with distant elements (animate and inanimate) of networks that have been mobilised along intersecting trajectories' (Nespore, 1994, p.13). So far, ANT is not commonly used for educational studies, and in particular not for empirical studies of assessment practices, even though Habib and Wittek (2007) have employed ANT to explore the role of the portfolio method in student learning, and Fenwick (2009) has examined ANT as a perspective for assessing professional learning. ANT provides a particular way of understanding the context of learning and teaching as an actor-network of material objects and social practices (Fox, 2009).

Among others, Latour questions the dominant position of the social in the theorisation of social systems, and presents the notion of the non-human actor and the principle of generalised symmetry (Callon, 1986; Callon, Law, & Rip, 1986; Latour, 1993). He suggests that both human and non-human actors should be treated alike, and introduces the concept of *actant* to describe both of them. Actants can be defined simply as 'entities that *do* things' (Latour, 1992, p. 241) or entities that bring about action. Latour proposes using the same analytical devices to study both human and non-human actants.

Two core ANT concepts are enrolment and negotiation. The process of *enrolment* plays a major role in the creation and establishment of networks. Actants will, either intentionally or by chance, enrol other actants into a 'network of aligned interest', i.e., a series of connections that will bring together the various actants involved in a common goal (Akrich, 1992; Callon & Law, 1982; Latour, 1999). A network is therefore the object of *negotiation* and re-negotiation and, as such, a dynamic entity. Its stability depends to a large degree on how cohesive the group of actants is. Conflicting or diverging goals among the actants may cause instability in the network and lead to a reorganising whereby powerful actants may dispense with actants that have become less powerful, due to unorthodox views, weak alliances etc.

Two other concepts of ANT are inscription and translation (Monteiro, 2000). *Inscription* refers to the work of designers of artefacts. When designing an object or a service, designers will have in mind a particular type of user and a particular type of use. These ideas about the user and the usage will be incorporated into the artefact they are developing. In this way, the artefact is 'inscribed' with a certain pattern of action (Latour, 1991), which later on will more or less influence and determine the actual use of

the artefact. *Translation* can be said to relate to the process of interpreting and transforming other actants, so that their goals and intentions align to one's own interests and needs. For example, a person lost in the dark may use his mobile phone as a flashlight and thereby 'translate' its purpose so as to best fit the need of the moment.

An ANT analysis pays special attention to the formation of networks of aligned interests in, for example, teaching and learning, whether human or non-human actants are involved. This provides the opportunity to understand and describe the role of VLEs in assessment. The VLE as a non-human actant is inscribed with certain features. In the analysis, all actants will, according to the principle of generalised symmetry, be dealt with in the same way as human actors. According to ANT, the introduction of new technology into assessment may disturb the existing network and provide a basis for processes of translation. Those processes are influenced by how strong the various allies of assessment practice are and how successfully new actants are enrolled into the network. Such actants can be VLEs, parents, students, teachers or school authorities.

Method

The approach of this study is broadly interpretive. The study has been designed as an explorative case study, i.e., a detailed examination of a particular context for teaching practices (Yin, 1989). The unit of analysis for this study is the teacher's reflection on teaching practice with VLEs.

Data collection and informants

In this case study, eight teachers at three primary schools were interviewed. The schools were strategically selected from a national project set up in order to strengthen the implementation of information and communication technology (ICT) in schools. All three schools are located in a county near a larger city, and staff can be characterised as having limited experience in the use of ICT in classrooms. The selection of study participants was based on purposive selection criteria (Miles & Huberman, 1994; Patton, 1990), by asking representatives of school management at each school to point out teachers of diverse ICT proficiency and engagement in VLEs as actual candidates for interviews. However, there is no substantial variation in ICT proficiency between the groups of teachers from the different schools. All teachers who were invited to participate in the study accepted, but one participant withdrew from the study after the initial interview, due to a heavy workload.

The study was conducted over a period of one school year. For each informant, data was gathered in three phases: In the first phase, an initial semi-structured interview, based on an interview guide, was conducted. The intention of this interview was to elicit their general thoughts and attitudes. Secondly, after the interviews, each informant wrote a personal log on their activities and practices with VLEs. The third phase consisted of follow-up interviews on the experiences documented from the logs and any changes that had occurred since the first phase. The two interviews and the logging of practices were typically collected within a time-span of 3-9 months, depending on the availability of the teacher for a second interview. Seven teachers from the third to fifth grade and one teacher with the overall responsibility for teaching ICT were interviewed. Among the eight teachers interviewed, seven were female, one was male. In addition, activities on the VLE at all three schools were observed. Altogether, 8 hours and 23 minutes of interviews were transcribed into 151 pages and 62 print screens.

Analysis

The transcriptions were coded with the computer-assisted qualitative data analysis software *HyperResearch*. A list of codes was developed with the analysis. Based on the original research question, codes on how the use of VLEs might initiate, support or hinder assessment practices emerged. In addition, ANT notions such as inscription, translation, enrolment and negotiation were used as codes, in order to conceptualise the roles of both human and non-human actants in assessment practices. To retrieve and categorise data, searches on the basis of these terms were carried out. The extracts from the interviews and the personal logs, located through those searches, formed the main basis of the analysis.

Findings

The findings from the data analysis are grouped into three themes: 1) VLE tools for assessment, 2) VLE as a collaborative tool for documenting achievement and 3) the use of VLE in TSP conferences. The themes emerged from what several of the informants talked about, yet in different ways. The themes also represent some kind of maturation in the teachers' use of VLEs. Representative extracts from each theme are presented and described below.

VLE tools for assessment

First of all, the teachers experimented with different kinds of VLE tools to meet the expectations for measuring attainment according to the new national regulation on assessment.

Extract 1. One of the schools in this study implemented written evaluations as instructed by their school district, while the other two schools acted on a more or less self-imposed demand for using written evaluation as a part of TSP conferences. In all of the schools, some kind of evaluation measuring, particular the use of student-portfolios, was implemented.

...here in U-county we are using something called [KWL charts]. That means that we check out each competence aim, what the student already can do and what the student is working towards. [Interview T8]

Teachers at all three schools used KWL charts for documenting students' attainment, and Extract 1 shows how the newly discovered functionality of the VLE was incorporated into the school's assessment practices. The VLE tools, such as MCQs and portfolios, were used to document attainment in a variety of KWL charts. One teacher told how he used ad-hoc MCQs to map students' knowledge in a subject area, while another told about her use of expanded MCQs to engage students in a new topic.

Extract 2. Digital portfolios were the most stimulating functionality for the informants. Whether schools had plans for using digital portfolios or only a single teacher used them, the VLE's digital portfolio tool was generally adopted and even inspired the teachers to explore new practices and broaden existing practices. One informant responded:

... digital portfolio. Less paper and folders to organise and even folders that students, parents and teachers can use together. [Interview T8]

In this excerpt the teacher says that the process of documenting attainment towards the TSP conference is as important an aspect of the new practices as the potential of the portfolio as a formative tool.

VLE as a collaborative tool for documenting achievement

Extract 3. Another concern among the teachers was the time consuming work of making written evaluations. On the basis of recorded student achievement, documented, for example, in KWL charts, the VLE accommodated new opportunities. The data show an emergent practice of collaboration between teachers when it comes to written assessment forms. Several informants explained how they used the VLE tool for collaborative writing. One informant put it in the following way:

...It is kind of making the work of the contact teacher easier. Because, earlier we [the contact teachers] got a sheet from one teacher and one from another, you know, and then you have to sit down and write it all down, or you have to collect them all [the sheets]. Now you have everything in one document. And the subject-area teachers have to fill it in themselves. [Interview T3]

The collaborative writing tool created a new mode of working and formed the basis for a new practice among the teachers in assessment documentation. First, it allowed them to work independently of time and place. Its administrative assistance was very much appreciated by the contact teacher, as it lightened the coordinating work burden of collection all the subject teachers' contributions. Students' written evaluation forms could be created by all involved teachers at home, at school or other places, without worrying about who was holding the latest version and without increasing the workload for each subject teacher.

The use of VLEs in TSP conferences

Extract 4. Finally, the teachers stated that the overall aim of all the documentation of achievement is to arrange for formative assessment. The measuring of student achievement and the documentation in a written form is a part of the feedback processes. In this context, the use of VLEs has brought about new practices, among which the portfolio plays a significant role. A work routine described in one teacher's personal logs illustrates this:

...students work with the [VLE] to do their evaluation of the first chapter in the [Norwegian] language book. It [the self-evaluation] is put into the working portfolio so later in the week they [the students] can write a reflection note and put it into the presentation portfolio, and then use it in the teacher-student-parent conference. [Personal log T5]

The data in this study indicate that teachers strive to fulfil the new assessment requirements and, in particular, the preparation for the TSP conference. This teacher used the digital portfolio to let the student reflect on his or her own learning in relation to the competence aims defined by the curriculum.

Extract 5. As a follow up to the statement in the personal log, the same informant said in an interview:

Then they have to go back, then, to the beginning and read goals, and then they have to evaluate themselves. [...] during the [student] conference, I said [to the students] that now we are going see what you stated in your self-evaluation, the one that is in the [VLE]. And they [the students] looked it up, and there they found that 'I know this, I know that, I have worked well on this'. [But] the [student's] test results in Norwegian language showed something totally different. I probably should have written that this is what you [the student] need to work on. I'm not sure about this. [Interview T5]

Above, the teacher elaborated on this practice when she described the role of the digital portfolio in a Norwegian language class. She mentioned how the VLE played a significant role in the tight relationship between the documentation of attainment and the preparation for the TSP conference when she talked about her new practice of using the digital portfolio. She also uses the VLE to let the student reflect on the relationship between self-evaluation from the portfolio and the teacher evaluation of the language test. Furthermore, we can see that she noticed a lack of attention when it comes to student self-assessment, and reflected on what she could have been done differently and better.

Extract 6. The same teacher referred to what happened later in the semester:

This [episode presented above] I used in the teacher-student-parent conference, and then the parents also got to know it, that some things do not match,[...] the evaluation together with the language test. So here we apparently have a subject you [the student] need to work more on. So let's say—write it as something to work on [...]on the evaluation form, and we will use it in the next teacher-student-parent conference. [Interview T5]

There is evidence of a mismatch between the student's self-assessment and the teacher's assessment of the same student's attainment in the test. This was noticeable both by the teacher and by the parents, and was used to set new goals for this student for the next period. It is interesting to note that the VLE and the portfolio tool served to engage both students and parents in the assessment process of the student. Experiences like this teacher's provided grounds for reflection on the way digital portfolios were used, and became a foundation for new assessment practices at this particular school.

General Discussion

In this section, the findings are organised by the research questions, using ANT terminology for elaboration of results. An emergent network of aligned interests in assessment will be presented, with a particular focus on the role of collaborative writing of evaluation forms and the TSP conference.

The findings revealed the seeds of new assessment practices, strongly influenced by the new regulations on assessment, the TSP conference, and by the VLE tools. The VLE brings new tools that are employed to support ongoing transformation into new assessment practices. The VLE tools have made it possible to improve the efficacy of assessment through collaborative writing of evaluation forms. VLE tools have also made it possible to systematise evaluation and to bring parents into the students' assessment process.

VLE in summative assessment

For the most part, it seems as if the teachers strove to assess *traditional skills* in new ways. In ANT terminology, the VLE is inscribed with features that are meant to support the teacher in storing and distributing forms for measuring knowledge attainment and making them accessible to colleagues, parents and students.

In a way the VLE also works as a translating force for the educational politics of documentation and evaluation. For example, the KWL charts, accessible from the VLE, became an important actant, in effect engaging both parents and students in the process of assessment. This practice is quite similar to what is commonly done without a VLE. However, as the VLE is inscribed with functionalities that make it easier to meet the requirements in terms of ‘written’ assessment, the system acts as a strong negotiation partner on behalf of documenting assessment. The time- and space-independent collaborative writing tool for making student assessments is regarded as an important allied, because it makes the teachers’ work with the evaluation forms more efficient, and in particular lightens the burden of the contact teachers’ responsibility for organising this work.

The VLE provides a particularly strong instrument for documentation of attainment, setting a focus on what seems to be summative assessment (such as grades and marked attainment in KWL charts). On the other hand, this practice also provides a picture of the ongoing negotiation between the teachers’ wish to reflect activities in the classroom and the need to ensure that what has been learned meets the overall standards of the national curriculum.

When implementing e-assessment systems, there is a constant danger that things that are easy to measure are valued more highly than things that are harder to assess (Ridgway, et al., 2004). Despite hopes that MCQs will support deep learning (Draper, 2009), there is no evidence of this in the data collected. As presented in Extract 1, the inclination to create online tests (MCQs) is apparent among the teachers interviewed in this study. Ad-hoc testing with MCQs is employed to give a snapshot of the current situation and subsequently design teaching from this point of departure, a practice that can be characterised as formative assessment at the group level. But, as a by-product, the teachers record scores as a documentation basis for the TSP conference, even though grading is not a part of primary school assessment practice. Accordingly, it seems as if the inscribed functionality of the VLE tools is to a lesser degree questioned or translated into a new practice of formative assessment.

VLE in formative assessment

From the data in this study there are some indicators of a changing practice that supports *new educational goals*. As Chang and Tseng (2009) argued, the use of web-based portfolios in junior high schools shows significantly positive influences on student performance. A similar kind of practice is to be found in Extracts 4-6, demonstrating processes of self-assessment and self-regulation. As indicated in the comments, this implies that the documentation of the results of a test in the Norwegian language, available in the schools’ VLE, forms the basis for the students’ individual reflections on the relationship between self-assessment and actual score on a language test. The lack of concordance between the self-assessment and the results from the test was brought up as a subject in the TSP conference. In this way, the teacher arranged for the students to use the results from both self-assessment and tests to reflect on their own

learning. The use of VLE tools thereby stimulates students to become self-regulated learners, as also proposed by Nicol (2007). Furthermore, these reflections form the basis for setting new individual goals for learning. In this process, the portfolio tools of the VLE enrol both teachers and students in a new practice where formative assessment is put to the fore, although it is interesting to note that the practice does not seem to be intentional. The teacher reflects on the ‘accidental’ effects of the documented student self-assessment, and wonders about what she could have done to exploit this in a better way. She is negotiating her own practice in relation to the new possibilities afforded by the VLE.

Although studies in higher education give evidence of VLE as a tool for peer assessment and student collaboration (Barbera, 2009; Chang & Tseng, 2009), the data from this study mainly revealed individual assessment practices in terms of teacher-made assessment and not processes of peer assessment and collaborative student work. This may be related to the functionality of the VLEs. Tools, like wikis, may be more conducive to processes of collaboration and may be more successfully employed in primary school. Yet the data suggest that the VLE plays a part in the enrolment of parents as new actants in the students’ learning, but without any evidence that they have an active role in the learning processes. To the extent that student self-reflection occurs, it is often adult-initiated, and related to the work with the written evaluation form. In sum, several stakeholders in the network of teaching and learning negotiate the written evaluation form.

Other influences of VLE

The practice of using written evaluation forms to document attainment and conducting TSP conferences as a part of student assessment are both related to the Norwegian curriculum reform and may be seen as central actants in the work of assessment.

However, the most interesting finding in this study is the tight relationship between the documentation of each student’s attainment, the VLE tools’ ability to support such documentation and its presentation, in the TSP conference. Altogether, they form a *teacher-student-parent network of student assessment*. In the process of meeting the demands of national regulation on assessment, the VLE not only offers some tools for measuring and documenting students’ attainment, but arranges to bring several partners into the assessment practice. Whether the result of this process favours a practice of formative assessment or a more traditional summative approach remains an open question. From the data in this study, it might seem that Norwegian schools are facing development in the direction of emphasising written evidence of attainment, strongly supported by the inscribed functionalities of VLEs.

As a part of this new assessment practice, we can identify several actants and processes of enrolment. Teachers appreciate the VLE as a tool for efficiency, as a tool that supports the home-school link and as a tool for student and teacher collaboration. In addition, the VLE is inscribed with a strong measuring system, in terms of tools for tests and documentation. When documenting the attainment of competence aims, teachers tend to lean on what the VLE offers in terms of support for creating assignments, maintaining documentation and distributing information. In cases where the VLE is inscribed with KWL charts, these are incorporated into teaching practice. In cases where systems for digital portfolios are inscribed into the VLE, these shape the practice of the teachers.

Summary and Conclusions

In the study reported, qualitative methods were used to investigate the role of VLEs in assessment practices. The most interesting finding is how the VLE enrolls parents, students and teachers into the network of assessment by means of the written evaluation form. The actors translate teaching practice and become aligned via the VLE, as each is presented with a *fait accompli* which serves their immediate or imagined interests. All of them, to a greater or lesser degree, support the new educational policies that are focussed on measurement and documentation, which might easily be adopted into a summative assessment tradition. We can thus identify the VLE as an actant that plays an active role in implementing educational reforms.

The VLE was used based on how traditional skills are taught, which examined processes of summative assessment. There is also evidence that VLE supports a teaching practice for new educational goals and innovative formative assessment methods, in particular the use of digital portfolios as a tool to support processes of self-assessment and self-regulation.

The findings of this study indicate a range of challenges for Norwegian educational assessment policy. It is in particular interesting to further investigate the role of VLE as an actant that may enroll teachers into an assessment practice that is primarily given by the technology and, to a lesser degree, negotiated as an independent actant in the network of assessment practice. A deeper insight into the potential of e-assessment for supporting new educational skills, in particular the pedagogical implications of widely implemented and accepted systems like VLEs, and how these influence the development of such skills, is crucial.

Several studies into e-assessment conclude that there is an urgent need for clarification of the role of technology in assessment (Shephard, 2009; Whitelock, 2009). Nicol and Milligan (2006) have proposed seven principles for technology-supported assessment practices that might indicate the first step towards a greater understanding of e-assessment. An implementation of such principles in VLEs, followed by further empirical studies on the role of VLEs in assessment practice, may be of particular interest, as it can elaborate the findings reported here, and serve as a direction for further research.

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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.
- Angus, S. D., & Watson, J. (2009). Does regular online testing enhance student learning in the numerical sciences? Robust evidence from a large data set. *British Journal of Educational Technology*, 40(2), 255-272.
- Barbera, E. (2009). Mutual feedback in e-portfolio assessment: an approach to the netfolio system. *British Journal of Educational Technology*, 40(2), 342-357.

- Becta ICT Research. (2004). What the research says about Virtual Learning Environments in teaching and learning, *British Educational Communications and Technology Agency*.
- Bennett, R. E., Jenkins, F., Persky, H., & Weiss, A. (2003). Assessing complex problem solving performances. *Assessment in Education: Principles, Policy & Practice*, 10, 347-359.
- Black, P. J., Harrison, C., Lee, C., Marshall, B., & Wiliam, D. (2003). *Assessment for learning: putting it into practice*. Maidenhead: Open University Press.
- Black, P. J., & Wiliam, D. (1998a). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice*, 5(1), 7-75.
- Black, P. J., & Wiliam, D. (1998b). *Inside the black box*. London: nferNelson.
- Britain, S., & Liber, O. (1999). *A framework for pedagogical evaluation of virtual learning environments* (No. 41): JISC Technology Application Programme.
- Callon, M. (1986). The sociology of an actor-network: the case of the electric vehicle. In M. Callon, J. Law & A. Rip (Eds.), *Mapping the dynamics of science and technology. Sociology of science in the real world* (pp. 19-34). Basingstoke: Macmillan.
- Callon, M., & Law, J. (1982). On interests and their transformation: Enrolment and counter-enrolment. *Social Studies of Science*, 12, 615-625.
- Callon, M., Law, J., & Rip, A. (1986). How to study the forece of science. In M. Callon, J. Law & A. Rip (Eds.), *Mapping the dynamics of science and technology. Sociology of science in the real world* (pp. 3-15). Basingstoke: Macmillan.
- Chang, C.-C., & Tseng, K.-H. (2009). Use and performances of web-based portfolio assessment. *British Journal of Educational Technology*, 40(2), 358-370.
- Draper, S. W. (2009). Catalytic assessment: understanding how MCQs and EVS can foster deep learning. *British Journal of Educational Technology*, 40(2), 285-293.
- Engh, R., Dobson, S., & Høihilder, E. K. (2007). *Vurdering for læring [Assessment for learning]*: Norwegian Academic Press.
- Erstad, O. (2009). Changing assessment practices and the role of IT. In J. Voogt & G. Knezek (Eds.), *International handbook of information technology in primary and secondary education* (pp. 181-194): Springer Publishing Company.
- Fenwick, T. (2009). Making to measure? Reconsidering assessment in professional continuing education. [Article]. *Studies in Continuing Education*, 31(3), 229-244.
- Fox, S. (2009). Contexts of teaching and learning. An actor-network view of the classroom. In R. Edwards, G. J. J. Biesta & M. Thorpe (Eds.), *Rethinking contexts for learning and teaching: communities, activities and networks* (pp. 31-43). London: Routledge.
- Gipps, C. (2002). Sociocultural perspective on assessment. In G. Wells & G. Claxton (Eds.), *Learning for Life in the 21st century* (pp. 73-83). Oxford, Malden MA: Blackwell Publishers.
- GSI. (2010-2011). Grunnskolen Informasjonssystem [Information system for primary and secondary schools]. Retrieved 19.09., 2011, from <https://www.wis.no/gsi/tallene>
- Habib, L., & Wittek, L. (2007). The portfolio as artifact and actor. *Mind, Culture and Activity*, 14(4), 266-282.
- Hatlevik, O. E., Tømte, K., Skaug, J. H., & Ottestad, G. (2011). *Monitor 2010. Samtaler om IKT i skolen [Dialog on information technology in schools]*: The Norwegian Centre for ICT in Education.
- Hattie, J. (2009). *Visible learning: a synthesis of over 800 meta-analyses relating to achievement*. London: Routledge.
- Latour, B. (1991). Technology is society made durable. In J. Law (Ed.), *A sociology of monsters* (pp. 103-131). London: Routledge.
- 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.
- Latour, B. (1999). On recalling ANT. In J. Law & J. Hassard (Eds.), *Actor network theory and after* (pp. 15-25): Blackwell.
- Lazakidou, G., & Retalis, S. (2010). Using computer supported collaborative learning strategies for helping students acquire self-regulated problem-solving skills in mathematics. *Computers & Education, 54*(1), 3-13.
- Leese, M. (2009). Out of class—out of mind? The use of a virtual learning environment to encourage student engagement in out of class activities. *British Journal of Educational Technology, 40*(1), 70-77.
- Lonn, S., & Teasley, S. D. (2009). Saving time or innovating practice: Investigating perceptions and uses of Learning Management Systems. *Computers & Education, 53*(3), 686-694.
- Marriott, P. (2009). Students' evaluation of the use of online summative assessment on an undergraduate financial accounting module. *British Journal of Educational Technology, 40*(2), 237-254.
- McFarlane, A. (2003). Assessment for the digital age. *Assessment in Education: Principles, Policy & Practice, 10*, 261-266.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). Thousand Oaks, CA: Sage.
- Monteiro, E. (2000). Actor-network theory and information infrastructure. In C. Ciborra (Ed.), *From control to drift. The dynamics of corporate information infrastructure* (pp. 71-83): Oxford university press.
- Nespor, J. (1994). *Knowledge in motion: space, time, and curriculum in undergraduate physics and management*. London: Falmer Press.
- Nicol, D. J. (2007). E-assessment by design: using multiple-choice tests to good effect. *Journal of Further and Higher Education, 31*(1), 53-64.
- Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: a model and seven principles of good feedback practice. *Studies in Higher Education, 31*(2), 199-218.
- Norwegian Education Act. (2006). Forskrift til opplæringslova [Education Act] , Chapter 3. Retrieved 01.02, 2012, from <http://www.lovdato.no/for/sf/kd/kd-20060623-0724.html>
- Ogle. (1986). K-W-L: A teaching model that develops active reading of expository text. *Reading Teacher, 39*, 564-570.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage.
- Pulford, B. D. (2011). The influence of advice in a virtual learning environment. *British Journal of Educational Technology, 42*(1), 31-39.
- Ridgway, J., McCusker, S., & Pead, D. (2004). *Liliterature review of e-assessment*. Bristol, England: Futurelab.
- Russell, M., Goldberg, A., & O'Connor, K. (2003). Computer-based testing and validity: a look back into the future. [Article]. *Assessment in Education: Principles, Policy & Practice, 10*, 279-293.
- Shephard, K. (2009). E is for exploration: Assessing hard-to-measure learning outcomes. *British Journal of Educational Technology, 40*(2), 386-398.
- Sieber, V. (2009). Diagnostic online assessment of basic IT skills in 1st-year undergraduates in the Medical Sciences Division, University of Oxford. *British Journal of Educational Technology, 40*(2), 215-226.
- Weiss, J., Nolan, J., Hunsinger, J., & Trifonas, P. (Eds.). (2006). *The international handbook of virtual learning environment*. Dordrecht: Springer.
- Whitelock, D. (2009). Editorial: e-assessment: developing new dialogues for the digital age. *British Journal of Educational Technology, 40*(2), 199-202.

- Wirth, J., & Klieme, E. (2003). Computer-based assessment of problem solving competence. [Article].
Assessment in Education: Principles, Policy & Practice, 10, 329-345.
- Yin, R. K. (1989). *Case study research: Design and methods*. Newbury Park: Sage.