

Can Learning to Use Moodle Alter Teachers' Approaches to Teaching?

Brant Knutzen
American International School
Hong Kong
bknutzen@ais.edu.hk

David M. Kennedy
Division of Information and Technology Studies, Faculty of Education
University of Hong Kong, Hong Kong
dkennedy@hku.hk

Abstract: This study examines how social engagement in an online learning environment (OLE) can transform teachers' perceptions of their own pedagogical practices. Data was collected over a ten-month period, as a group of five teachers at an international school in Hong Kong were learning to use Moodle to create blended learning environments. Participants ranged from new teachers in their first year of work, to experienced teachers with over ten years on the job. The data examined in this paper came from an online semi-structured interview. The findings indicate that teachers with more teaching experience may have more confidence to use OLEs in a constructivist way. In this study, OLEs, especially with the use of Web 2.0 tools, were expected to provide a process for negotiation of student control and expression in a way that motivates students and supports learning.

Keywords: Moodle, pedagogy, social constructivism, professional development community

Current author contact details (as of May 1, 2013):

Brant Knutzen
Learning Designer, Faculty of Education
University of Hong Kong
brant@hku.hk
brant@knutzen.se

Background

The exponential growth in popularity of Online Learning Environments (OLEs) is driving change in many aspects of teaching and learning: course design, delivery methods, teacher–student interaction, design of student tasks and assessment (Bennett & Lockyer, 2004). A leading example of free and open source software (FOSS) in the OLE arena is Moodle, which was developed along social constructivist lines. The perspective of the developer viewed learning as a social activity, where knowledge is actively constructed by individuals while working together to investigate a context and perhaps solve a problem (Dougiamas & Taylor, 2003; Dougiamas, 2007). As this new OLE technology is incorporated by schools into their teaching and learning, teachers are expected to learn how to transfer some significant parts of their curricula into an online delivery format in order to take advantage of the affordances of the technology (e.g. improved feedback, collaboration in and outside the classroom). Although Moodle is designed around social constructivism pedagogy, how is this technology actually utilized by the teachers? The design of an effective learning environment that uses an OLE component is facilitated by the user-friendliness of the underlying OLE application chosen for this study, but not ensured by it. The question in this study is therefore; will the process of learning to use Moodle alter the teachers’ perception of their own pedagogical practice?

A Framework for Analyzing OLEs

The value of any OLE application can only be considered within the total context in which it is used. Incorporating an OLE is just one of the strategies effective teachers may use in designing a curriculum for their students. Even the most progressively designed OLE software may be used to develop an instructivist, teacher-oriented OLE. On the other hand, even mediocre OLE software can be used to develop OLEs which are highly effective in engaging students in their own learning. The design of the OLE component has many aspects, not least of which are the pedagogical and epistemological views of the teacher (Bain & McNaught, 2006). Reeves (1992) developed a pedagogical model of instructional design which is still applicable to the effective design of OLEs. Eight dimensions of Reeves’ model which apply to the work in this paper are shown in Figure 1.

Objectivism	←	Epistemology	→	Constructivism
Instructivist	←	Pedagogical Philosophy	→	Constructivist
Behavioral	←	Underlying Psychology	→	Cognitive
Unsupported	←	Cooperative Learning	→	Integral
Authoritarian & Didactic	←	Role of Instructor	→	Equalitarian & Facilitative
Extrinsic	←	Source of Motivation	→	Intrinsic
Reductionist	←	Instructional Sequencing	→	Constructivist
Non-existent (teacher-managed)	←	Learner Control	→	Unrestricted (student-managed)

Figure 1: Reeves’ pedagogical model of instructional design (after Reeves, 1992)

The implication of Reeves’ work is that OLEs designed from perspectives of teaching and learning represented by the right-hand list (a constructivist perspective) may lead to a more active learning environment for students. For instance, a constructivist OLE design should allow the student to access the material in the sequence and depth that best suits their needs and interests. Because the constructivist perspective means that knowledge is both socially and culturally constructed, OLE design must consider the cultural perspective on knowledge. Markedly different educational contexts require that both the design and implementation of an OLE be culturally inclusive. For example, in Hong Kong, where English is a foreign language (Littlewood and Liu (1996), online language support features (e.g. structured forums and interactive glossaries) are valued and appear to support learning (McNaught & Lam, 2005; McNaught, Cheng & Lam, 2006).

An OLE component of a blended learning environment can be designed to support the full spectrum of teaching roles, from the traditional expository style to the most egalitarian facilitator. Particularly in the early stages of OLE use, a component can be designed to support, reinforce and extend teacher presentations. As both the teacher and students become familiar with the interface and mechanics of working in an OLE, the teacher can step out of the spotlight, and become more of a moderator and observer. Ideally, the level of student engagement can become so fervent that the teacher essentially gets “out of the way”, allowing the students to take complete ownership of their learning. This progression was studied by the Cognition and Technology Group at Vanderbilt as early as 1992, describing a shift in the role of instructor “from authoritarian provider of knowledge to a resource who at times is consulted by students and at other times can become the student whom others teach” (CTGV, 1992, p. 73). Ramsden (1992) noted that the highest aim of good teaching is to achieve redundancy – to be a teacher about whom students say “We learned it all without you”.

Reeves’ pedagogical model is consistent with Biggs’ (1989) model of deep and surface learning, and has implications for teaching strategies which result in particular learning outcomes for students (Kennedy & McNaught, 1997). These strategies are represented in Figure 2. Biggs (1989) discussed how the motives and strategies adopted by students for a particular learning task may be seen as their ‘approach’ to learning. Students who adopt a surface approach focus on learning the course content and ‘regurgitating’ it accurately for assessment. Students with a deep approach tend to be intrinsically interested in the topic of study, strive to maximize their understanding by reading widely, discuss the concepts with peers and tutors, and reflect on how their new knowledge may be integrated with their previous conceptual models.

Teaching strategies linked to learning outcomes		
Transmission		Transformative
Knowledge transmitted from teacher to student	↔	Knowledge constructed by students
Teacher structures student learning	↔	Student learning facilitated by the teacher
Outcome: Surface learning	↔	Outcome: Deep learning

Figure 2: Implications for teaching and learning (after Kennedy & McNaught, 1997)

Teachers can be grouped according to the strategies they use. The *transmission* teaching strategy is based upon didactic/ reproducing/ expository methods, and results in surface learning. Biggs (e.g. 2003) termed this a quantitative teaching outlook, and likened it to the teacher dropping discrete chips of knowledge into the student bag. The student passively receives the information with very little cognitive processing. The focus is on reproducing the content later with a minimum of errors.

A *transformative* strategy is based upon a perception that learning is knowledge constructed by the student. The intent is to engage the students in a transformative/ conversational approach to learning in order to refine and assimilate understanding (Laurillard, 2002). This method is designed to engage students in actively constructing their own knowledge in order to develop a deeper understanding of concepts. Mezirow (1997) defined transformative learning theory as the process of effecting change in a frame of reference. Students transform their frames of reference through *critical reflection on the assumptions* upon which their interpretations, beliefs, and habits of mind or points of view are based. Educators can facilitate transformative learning by helping learners become aware and critical of their own and others’ assumptions. Learning activities should help students recognize frames of reference and use their imaginations to redefine problems from a different perspective. Finally, Mezirow stipulated that students need to be assisted to participate effectively in discourse.

Biggs (e.g. 2003) termed this teaching strategy the qualitative outlook, and described it as learners climbing a spiral staircase. The process of teaching is to help the learner undertake activities that involve progressively better understandings of the meanings, and content thus evolves cumulatively over the long term. Horizontal connections in the students’ mental model are formed with other topics and subjects, and vertical connections prior and subsequent learning in the same topic. Knowledge construction involves the refinement and deepening of the understanding of particular concepts, and then the richer understanding is applied to the construction of new interpretations of the content domain. Each of these two teaching strategies will design OLE components which incorporate different strategies or learning opportunities, and will engage the students in varying ways, thus resulting in different learning outcomes.

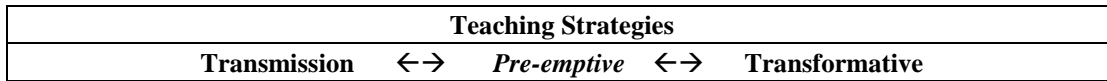


Figure 3: The pre-emptive teaching strategy (after Bain & McNaught, 1996)

Between the two polar opposite strategies shown in Figure 3 there is a third style: *pre-emptive*. Teachers who use pre-emptive strategies are sensitive to students' past difficulties and perceive that their role is to offer better explanations of difficult concepts (Bain & McNaught, 1996). When students encounter problematic concepts, the teacher pre-empts the knowledge construction process by providing hints or explanations. Although there is a genuine concern for student learning, the pre-emptive teacher takes control of the learning process and therefore constricts the students in taking responsibility for learning. When teachers using this style design an OLE component, they typically provide teacher-built glossaries, hints on locating resources, and embed example solutions in the problem discussions.

Although components of OLEs can be designed based on transmission, pre-emptive, or transformative strategies, an OLE is only part of the context in which teaching and learning occur (Laurillard, 2002; Wills & McNaught, 1996). When a teacher with a transmission or pre-emptive style uses a transformatively designed OLE component, they may simplify the intended use, and thus reduce the cognitive load on the students. Students are quick to recognize a less challenging task, and often become less engaged in the learning process. Conversely, a very simple OLE component such as a Word document upload assignment can be used in a highly interactive setting, where the activities (questions, problems, tasks) designed by the teacher for use with the software have the potential to actively engage students in transformative/ conversational dialogue, and thus facilitate the construction of new knowledge (Kennedy & McNaught, 1997).

Method

The context of the study is the American International School in Hong Kong (<http://www.ais.edu.hk/>). The aim of the study was to see how teachers might change their approaches to teaching if they had access to a reasonably flexible OLE. The authors were interested in the philosophical claims about Moodle (Dougiamis & Taylor, 2003; Dougiamas, 2007). The researchers gathered information from a group of five teachers over a ten-month time period. The teachers who volunteered for the study were experienced teachers but were novices in online learning in general and in Moodle in particular; indeed none had any prior experience using an OLE in their teaching. They were asked to incorporate the Moodle OLE into the delivery of their curricula. After several initial professional development sessions as a group, the teachers were supported individually by IT staff members as they encountered difficulties. The group of teachers included two teachers in their first year of teaching, and three teachers with ten or more years of teaching experience.

The data was collected through the development of a “Professional Development Community” (called PDC), using the Moodle OLE itself. There were seven areas set up in Moodle shown in Table 1. This paper is concerned with areas 5 to 7 (*italicized*).

Table 1: Areas in the Moodle PDC

	Title of resource area	Focus of the content
1.	Building educational partnerships through virtual IT	Exploration of a project on a videoconference link between American university professors and Hong Kong high school students in 2005
2.	Implementing an OLE at the American International School	History of Moodle at AIS
3.	e-Portfolios in a Web 2.0 environment	Exploration of research on use at AIS
4.	How effective is an online learning management system in improving the learning process?	Exploration of research on what AIS students think of Moodle
5.	<i>Design elements for effective OLE components</i>	<i>A framework for designing with Moodle components which stimulate social constructivism</i>
6.	<i>Teaching for enhanced learning</i>	<i>John Biggs’ model of curriculum alignment</i>
7.	<i>Can learning to use Moodle change my teaching practice?</i>	<i>Exploration of research into teacher reactions to implementing curriculum on Moodle at AIS</i>

The PDC offered a number of discussion forums with scope from general issues to specific types of online activities, online learning journals, and a small collection of pertinent research papers. The most directed data collection was a discussion forum which implemented a semi-structured interview with the five teachers. The interview focused on four areas of interest:

- existing traditionally delivered curriculum areas which need better solutions;
- new affordances being offered by the OLE being tried out;
- results from the new approaches; and
- reflection on their perception of change in pedagogy

The online interviews were conducted over the final three months of the study period, as the participating teachers approached the end of the school year. The five teachers contributed a total of 16 posts. While this seems minimal the total word count was 4,824 with an average length of 301 words. They were asked fairly detailed, multi-part questions in the four question/ response cycles noted above.

Three teachers completed the interview process all the way to the end. Answers were very thoughtful and detailed—often attaching rubric documents and description of examples of strategies they has tried, asking for advice from the first author, evidence of their developing understanding and discussing changes in pedagogy.

The interview data were collected from mid-May to end of July 2007. At this point the forum posts were collected and scrutinized in order to determine the number of themes which seemed key to understanding the teachers' experience and what shifts may have occurred in their pedagogical thinking. The process of reading and rereading the postings allowed the development of the following categories of description. These categories are not unique but do cover the central thrust of each post.

The analysis was principally based upon grounded theory (Glaser & Strauss, 1967; Lincoln & Guber, 1985). The essence of grounded theory is that the researchers do not impose preconceived frameworks or theories on the data; rather, theory emerges from the data, and so is grounded in it.

In doing this initial search for grounded themes, use was made of the constant comparative method (Strauss & Corbin, 1990) to ensure that emerging themes were consistent with the whole sense of the experience. Following the constant comparative method implies that the analyst makes continuing reference to the whole context rather than looking at isolated quotes. The result is that quotes selected as indicative of themes have their meaning referenced against the sense of the whole interview. The constant comparative method is, therefore, a guard against taking isolated comments out of context and a strategy for ensuring that the true underlying meaning of parts of an interview is identified.

Of course, we could not continue to read data until we reach saturation where no new categories or themes emerged. So this study is best termed 'quasi-grounded'. It is indeed a pilot for future work.

Findings

Four main themes emerged from the postings. They interact and intertwine but, taken together, they enable all the postings to be accommodated.

Theme 1: Teaching experience is a relevant factor in teachers' willingness to change. Experienced teachers have the confidence to 'let go' and cede control to students.

All of the teachers in this study reported significant changes in their perception of their own pedagogy. The new teachers were the most tentative in their adoption of more constructivist teaching methods, often reaching only the 'pre-emptive' mid-point. The more experienced teachers were the most progressive, incorporating the inherently collaborative Wiki activity into their teaching, and eagerly adopting the role of facilitator versus the didactic transmitter of knowledge.

Both of the new teachers prefaced their remarks by mentioning their lack of experience using an OLE:

"I graduated from teacher's college only last year, and therefore I had no prior experience with the courses I have taught this year, and cannot comment on how satisfactory or unsatisfactory I found things in the past. I can say that integrating IT into the classroom, including how to use a course website effectively, was a topic never covered in any of my teacher's college classes. My main objective this year was to explore the possibilities offered by a course website."

"I have to say as a new teacher, I didn't have long without using Moodle to compare. Using the basic features: posting files, sending group messages, very limited forum use, has certainly helped. Learning each new tool has taken some time, so I've been slowly testing the water and immersing myself in each new thing. I haven't used the quiz function yet, but certainly plan to come September."

The more experienced teachers wanted to solve existing curriculum problems in a better way:

"Using the old method, students have to place their work in a designated folder on the teacher's computer at the end of each session. If they fail to update their work or are careless with naming conventions, work can be lost or a superseded version may accidentally be used."

I have set up a basic structure of Wiki pages on Moodle. Each group will have its own Wiki page where they can work collaboratively on individual stories and the overall design of their page.

The on-line format will better facilitate collaboration because students, anywhere and anytime, can log in and make contributions. The time available for collaborative work will therefore increase because students don't have to be together physically to communicate with each other and work together. As outlined in my previous post, our current system is very cumbersome and lacks this truly "open" access. The Wiki format also seems really effective in terms of enabling changes to be tracked; students and the teacher can easily determine the "who, what and when" of contributions."

Theme 2: The relationship between content and collaboration became stronger. As students build content, teacher-developed content becomes less absolute. In this way the collaborative aspects (Web 2.0-like) of OLEs are important.

Another one of the experienced teachers also found the Wiki feature to be more collaborative than the previous method of building presentations:

"Presentations take a lot of time and in the past it has taken sometimes 3-4 weeks to see all presentations! (depending on class size). Time is a huge factor in this class, determining what activities I can and cannot do. Along came Moodle and the Wiki activity feature. This has enabled students to work collaboratively to create and present pieces of work which imparts knowledge to their class mates as intended but electronically rather than taking up lots of class time presenting. Students can now browse through the information created and also have an opportunity to find out more in depth information through links students have created on their pages. Having a glossary created by the students is a great tool for our second language learners (99% of the class)."

Note that this teacher also made use of the Moodle Glossary activity, where the students create definitions and then the system automatically creates links back to these definitions anytime the word is used.

The new teachers also began using some collaborative Moodle activities such as discussion forums.

This teacher also found that using Moodle facilitated having students create their own quiz questions:

“For the vocabulary aides, I actually used a Forum this year. This was because I was more familiar and comfortable with the Forum activity than the Glossary activity. This summer I plan to look at using the Glossary activity instead of the Forum activity.... Using the Forum/Glossary as a source for definition of terms is something I tried over traditional terms lists as this way allowed ALL terms for ALL units to be placed in one central location where they could not be lost by a student. I chose to use discussion forums because this allows students to see what everyone else has posted.”

This teacher also was aware of the value of the transformational teaching, where students take “ownership” of their own learning, and he rated the activity high on Bloom’s Taxonomy:

“When you make students create their own questions for a quiz, this forces them to work at the highest level of Bloom’s Taxonomy- Evaluation. Here the students must evaluate what has been taught as well as how to assess the level of knowledge students have with respect to what has been taught. This in turn makes students review the material more closely and in a different manner than if they had simply been asked to study for a test in a more traditional manner. Additionally, this method gives students an increased sense of “ownership” of their test, as they have now taken part in creating it.”

Another one of the new teachers was hesitant to give up the quality control of the teacher-centric approach, and was clearly musing about the possibilities as he posted his reply:

“I had some students making quizzes from the books. These are great because they’re designed as AP level questions, so they should be ideal for mock AP tests. Still, I need more questions up there to make enough quizzes. If kids made their own quizzes, I not sure enough about the quality. I suppose I’d have to check them all, but still, how many do you think I’d have?

I like the advantage of them learning while making questions, but it seems like valuable time, and possibly creating more problems to come when other students get them. I guess each student entering 5 of their own and 5 from a guide is best. Hmmmm.”

Theme 3: Motivating students results in higher engagement and better (perhaps higher?) cognitive performance.

One teacher found that the increased learner control of a constructivist approach was motivating students:

“I’m pleased that some students are more involved because of my using Moodle. A few students who aren’t participating much in class have participated more online, especially in discussing homework and exam and test revision. My guess is that this is a result of students learning in different ways. One more way of reaching kids and getting them involved means fewer kids slipping through the net. I do think more about using a variety of ways to deliver and assess because of the success of this.”

This finding is in line with previous studies with teacher education students in Hong Kong who found the Moodle environment preferable to other OLEs and were more engaged in their work (Kennedy, 2005a,b).

This teacher also found that the student collaboration was increasingly student-centric, although the instructor interactivity was still motivational:

“I found Moodle helpful for exam revision, as one student would post a question, and another would answer it before I even knew about it. I especially liked that these posts were then emailed to everyone, so it was harder to avoid revising. I would always give my views at the end. I found that many students appreciated my effort in being online to answer their questions after hours-it made me look good, my work was recorded! The more helpfully I answered, the more questions I got, which was encouraging. There also seemed to be less mockery in the responses (compared to laughing at questions in class), perhaps because their responses were recorded too.”

Theme 4: An OLE can provide a structure for shifting to student-centredness. There is thus a process for negotiation of control.

All of the teachers interviewed were quite responsive and candid about the change in their perception of their own pedagogy. Given the question:

Has this experience using an OLE made you more aware of social constructivism concepts now, such as:

- **student control of activity sequencing / pacing**
- **student-centered approach, over teacher-centered**
- **student discovery of new concepts, versus teacher transmitted**
- **social collaboration by students, working together to complete a learning activity**

One of the new teachers replied with:

“I would say yes to the second and last examples there, but in a limited way. I have had students posting and comparing explanations in fora and solving questions together, though I haven’t used that function much. Certainly I’ll do more of this next year... The pace and content of the courses I teach don’t lend themselves well to social constructivism online, but I’ll be experimenting more.”

The final section of the semi-structured interviews focused on their perceived change in pedagogy:

Has your experience using an Online Learning Environment (OLE) facilitated a move from a teacher-centric teaching method, to a more student-centric method? Can you give some examples?

In response, a new teacher recognized that his pedagogy was still somewhat teacher-centred:

“I feel that the way I used Moodle in the past year was more teacher-centred than student-centred. I mainly did this as I was only in my 1st year of teaching, and just becoming comfortable with the idea of giving more freedom to students in selecting their own path along a unit or course.”

Note that the interview process itself may have initiated an awareness in this teacher of “the idea” of giving more freedom to students in selecting their own path. This reflects the idea that the social interaction in the professional development community can help to change perception of pedagogy. Another question which directly addressed the issue of change in pedagogy was:

Has your experience using the Moodle OLE changed your teaching style?

Do you think an OLE better facilitates:

- **a teacher transmission of knowledge to the student**

OR

- **a student construction of knowledge with the teacher as a moderator / assistant?**

One of the new teachers replied:

“I feel the biggest way that using an OLE has affected my teaching is by offering a structured way for my students to do independent tasks and activities that complement the more traditional teaching methods (labs, lectures, notes, texts) with great, controlled access to the vast resources of the internet. I feel that the way I’ve used Moodle in the past year fell in between the two options you gave; I’m no longer directly transmitting knowledge to students, but I am still controlling the resources they are (at least initially) exposed to through the course website, making me perhaps a strong “foreman” during the students’ construction of knowledge than a coach”

This response clearly defines this teacher as using the pre-emptive teaching strategy as defined by Bain & McNaught (1996). He has moved more towards the transformative approach, but he still controls the resources, thus restricting the students’ responsibility for their own learning.

Another question in this pedagogy-oriented section of the interview was:

Does an OLE change the degree of learner control over instructional sequencing?

Have you found that using Moodle allows students to have more, or less, options as to the number of pathways students follow through the material? Examples?

In response one of the new teachers again expressed some hesitation at giving up control:

“In all of the times I used Moodle this year I did not allow students much control over instructional sequencing due to not being fully comfortable with the idea (I wanted to become more familiar with the ins and outs of using Moodle before trying more radical ideas).”

One of the experienced teachers was clearly aware that his use of a Wiki activity instead of a PowerPoint presentation facilitated his move away from traditional transmission methods:

"This has been a time saving tool which has served the same purpose as the presentations did. Which was, to research information and impart this to the class members, rather than have me stand doing the old "talk and chalk" routine."

An experienced teacher was asked about their use of Wikis in their Journalism class to put the school newspaper (The Eagle) online:

How do you think the increased collaboration that the online format offers has changed the way you will teach this activity? Will it be more difficult to manage? Will it facilitate more of a social workgroup activity than before?

Their response was clearly hopeful that the new method would be student-centric and give them more responsibility for their own learning and work product:

"I imagine that I will be able to give departments a lot more autonomy with this method because students won't have to continually come through me to see where the paper "is up to". I think I will have some real teething problems to begin with because it is so unlike anything that I have done before but I think that, in the long run, it will force students to collaborate a lot more than what they are doing at present."

The researcher followed up this line of questioning with this teacher:

You mentioned that using Moodle "takes a lot of control out of your hands, and this is a good thing". How does this less teacher-centric approach affect your perception of your pedagogy?

"In terms of my teaching pedagogy, putting The Eagle online will certainly mean that I will become more of a facilitator and that the students will be making a lot more of the decisions. I believe this is a very positive change and certainly reflects where I want my teaching to go."

This experienced teacher seemed to have the confidence to give up more control to the students, to step aside and let the software facilitate a more student-centric approach. The researcher continued exploring the future effects this change in pedagogy may entail:

Do you think that this experience may affect other teaching activities that you do? Will this change in pedagogy cause a "ripple effect" out onto other aspects of your teaching?

"I think there will definitely be a ripple effect in my other classes because already I am thinking of ways in which to apply Wiki technology to my literature classes, for example I plan to have my 12th grade English students create and share Wikis about Romantic poets."

<http://aishk.mrooms.org/mod/forum/discuss.php?d=7857 - 29035>

Conclusion

It is evident from this study and previous research that teachers' perception of their own pedagogical approach can be influenced by the experience of learning to use an OLE in a social environment. This change in pedagogy is mediated by the experience level of the teacher: first year teachers were far less ambitious in their approach to implementing curricula online, and therefore tended to make much smaller changes in their pedagogy. The comments of the inexperienced teachers also indicate that they are not receiving sufficient opportunities during their years of teacher training. This study provides specific examples of how teachers' experience level hindered or encouraged their embrace of constructivist ideals and feelings of efficacy. Findings indicate the need, in the first instance, for universities and teachers colleges to provide greater opportunities for pre-service teachers to gain first-hand practical experience in the development of curricula that are supported by OLEs. Once graduated, the school administration and educational technology support staff need to realize the limited ability of a first-year teacher to make large-scale changes in their pedagogical perspective involving the use of an OLE. Experience, in this study seems to promote more transformative teaching and learning strategies.

It is heartening to see that the Reeves model, postulated 15 years ago, has found a natural expression in Moodle. On all eight dimensions that we chose to consider – Epistemology, Pedagogical Philosophy, Underlying Psychology, Cooperative Learning, Role of Instructor, Source of Motivation, Instructional Sequencing, and Learner Control – there were clear shifts in our teachers' attitudes and practices.

Overall, our key themes are that:

- more experienced teachers can make these shifts with more confidence;
- Web 2.0 tools such as Wikis can facilitate the process;
- OLEs can be used to build students' motivation levels; and
- OLEs can provide a structure ('scaffold' in the language of cognitive apprentice theory; Brown, Collins & Duguid, 1989) for teachers and students to negotiate control and learning design.

This small naturalistic study needs replication and extension but it provides enough evidence for us to continue working in and researching on OLEs and Web 2.0 technologies. We are seeing glimpses that the pessimism of recent times (e.g. Zemsky & Massey, 2004) may not be enduring. The convergence of easier interfaces, a great variety of tools, and the increasing comfort that students and teachers have with online environments appears to be contributing to a brighter future for OLEs in education in schools.

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