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Application and validation of a techno-pedagogical lecturer training model using a virtual learning environment

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Abstract

This article presents a techno-pedagogical lecturer training model that was validated in an intensive hybrid-mode workshop/course for lecturers. The aim of the course was to train lecturers how to use the Moodle virtual learning environment (VLE) as a didactic support in their classrooms. A research-action method was applied to the study, and the instruments used were interviews, questionnaires, blogs and opinion surveys, together with the planning and development of an online course by each participant as the end-product. The course was then analysed to see how each of the 16 participants had gradually appropriated the technology, without overlooking the pedagogical aspects. Some progressed from beginner to intermediate level, and others from intermediate to advanced level, while those already at advanced level developed sophisticated courses and sought ways of improving them on their own. In addition, the researchers found that the role of the university institution had been fundamental to the proper running of the course, and that constant communication between the facilitator and the lecturers/learners had been important.

Keywords

higher education, lecturer training, educational technology, technology appropriation, hybrid mode, virtual learning environments

Aplicación y validación de un modelo tecnopedagógico de formación docente mediante una plataforma educativa virtual

Resumen

El artículo presenta un modelo de formación docente tecnopedagógico, validado dentro de un curso-taller intensivo en la modalidad híbrida, dirigido a docentes de educación superior. Este curso tiene como objetivo capacitar en el uso de la plataforma Moodle como apoyo didáctico en sus clases. El método utilizado en la investigación es de investigación-acción, los instrumentos usados fueron la entrevista, cuestionarios, bitácoras y sondeos de opinión, conjuntamente con la planeación y desarrollo de un curso en línea elaborado por cada uno de los participantes como producto final. El curso fue analizado después, para ver cómo cada uno de los dieciséis participantes se apropiaba gradualmente de la tecnología, sin descuidar el referente pedagógico. Algunos de ellos pasaron de ser principiantes a intermedios y algunos de estos a avanzados, mientras que los avanzados desarrollaron cursos más sofisticados y buscaron la forma de mejorarlos por sí solos. Además, los investigadores se percataron de que la institución universitaria desempeña un papel primordial para el buen desarrollo del curso, así como la importancia de una constante comunicación entre el facilitador con los docentes-aprendientes.

Palabras clave

educación superior, formación docente, tecnología educativa, apropiación tecnológica, modalidad híbrida, plataformas tecnológicas de aprendizaje

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1. Introduction

The world's educational systems are currently faced with the challenge of using information and communication technologies (ICTs) to provide their students with the necessary tools and knowledge for the 21st century. Consequently, the learning process is undergoing a number of substantial changes, the most important one being the role that teachers play (Álvarez, 2006). Various researchers (Castellano, 2010; Cebrián, 2003) have found that ICT use in the teaching-learning process is advantageous and, when training teachers to use ICTs, that it is possible to get them to use them as a support both inside and outside their classrooms.

Previous studies have underscored the problem of training university lecturers to use ICTs. Despite the fact that ICTs are used in education, there are concerns to find out why, if there are so many technological resources available to support the educational process, not all lecturers are using them. A lack of knowing how to incorporate them into the classroom is a possible explanation, and another is the scarce or non-existent training that institutions offer their lecturers in the pedagogical use of these technologies.

The integration of ICTs in the classroom depends on the teachers' ability to scaffold the learning environment by using effective ICT-based pedagogies (Shawki et al., 2008). However, numerous research reports have indicated a lack of technical and pedagogical training among teachers, which prevents them from setting criteria with regard to when and how to start using this technology (Kaput, 1992; García, Martínez, & Miraño, 2000; Adell, 2002; Veen, 1993; Jones, Cox, & Scrimshaw, 2004, cited in BECTA, 2004; Bautista, Borges, & Forés, 2012). It is for these reasons that institutions should train their lecturers not only to use technology, but also to make them understand why using technology is important and, above all, to ensure that they understand the different roles that technology plays in the teaching-learning process (Bates, 1997).

With the support of the Educational Development and Research Institute (IIDE) at the Autonomous University of Baja California (UABC), Mexico, the study was conducted at Xochicalco University, Mexico.[1] A techno-pedagogical lecturer training model was developed to meet the needs of training lecturers to use ICTs with pedagogical support and to get them to implement it in their own classrooms.

The aim of this article is to present a techno-pedagogical lecturer training model and its validation through the participation of lecturers from a private Mexican university. Combining pedagogy with technology is quite unusual and often non-existent in lecturer training. The results obtained from the research-action process used to develop and validate the model are described below.

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1. A private institution established over 30 years ago in the city of Ensenada, Baja California, Mexico, offering twelve bachelor's degree programmes and five master's degree programmes. It also has schools in Mexicali and Tijuana.

2. Method

The research-action method served to guide most of the intervention, as the task implied a simultaneous need to find things out and intervene, as well as the participation of those involved (lecturers and researchers). Every aspect was guided by the spiral form of the research-action process, that is to say, taking practice as the basis to detect, clarify and diagnose the problem, to formulate a plan to solve the problem or introduce change, to implement the plan and evaluate the results, and to give feedback, which then leads to a new diagnosis and a new spiral of reflection and action (Sandín, 2003). In this respect, the study was conducted in the four stages described below.

The first stage was fieldwork, which involved developing the techno-pedagogical model. In order to do that, the opinions of the university's lecturers and directors were collected by means of a questionnaire for lecturers and three interviews with lecturers. In addition, a review of the literature on existing models was performed; all the information was analysed and a model was created.

The second stage involved expressing the model as a didactic plan for face-to-face and online sessions in the Moodle virtual learning environment (VLE). In order to document the learning process, didactic material was created, as were instruments such as questionnaires, reading records, diagnostic tests, self-evaluation tests and blogs to foster reflection.

The third stage involved running the six-week course in September-October 2012 at the university. There were 16 lecturers/learners left at the end of the course.

The final stage involved analysing all the data collected from the activities undertaken by the participants throughout the training course, such as exercises, questionnaires, comments in forums and chats, blogs, e-mails and evaluations of the course and the facilitator.

3. Results

Model

The creation of the techno-pedagogical model was based on a study by Murillo et al. (2006) that examined seven Latin-American and European institutional teacher training models and identified five general features: innovative culture, contextualisation, innovative pedagogical proposal, theoretical framework and bottom-up approach. In addition, the study described innovative contributions to teacher training: competency development, theory-practice interrelation, research as a key factor, universities as learning organisations, and open offerings based on IT use (Murillo et al., 2006).

Likewise, recommendations contained in studies on the topic were analysed. Some of these were: teacher training should be supervised and considered as lifelong learning; the advantages of ICT use should be made explicit (Cox et al., 1999, cited in BECTA, 2004); both technical and pedagogical aspects should be included (Veen, 1993, cited in BECTA, 2004); it should explicitly meet the teachers' needs (Levy, 2000, cited in BECTA, 2003); and it should provide teachers with innovation and improvement opportunities in their teaching (Bautista et al., 2012).

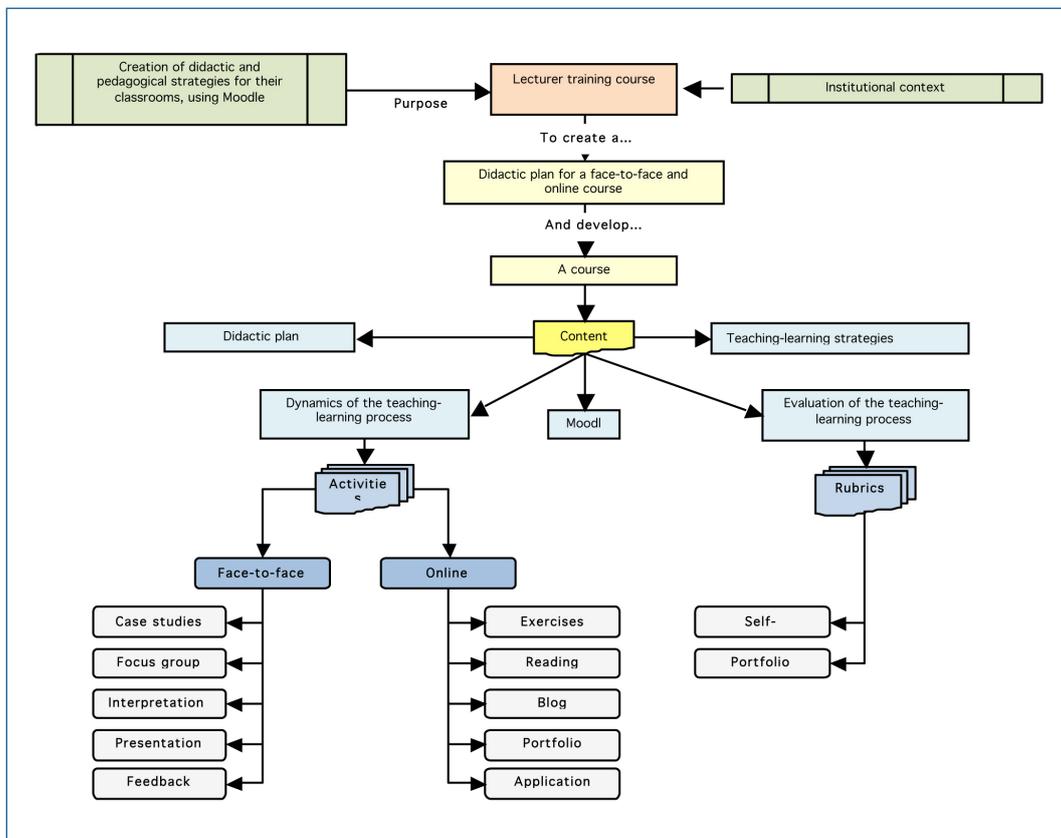The techno-pedagogical lecturer training model is shown in Figure 1 below:

Figure 1. Techno-pedagogical lecturer training model

The hybrid mode, which combines face-to-face with online sessions (Figure 2) was selected because of the quality of communication, both face-to-face and indirect, using communication media in the case of the latter (Lavigne et al., 2009). Another advantage of the hybrid mode is that it converges with the classification of explicit knowledge and tacit knowledge; explicit knowledge can be added at a specific location, storing objective forms, and be appropriated without the participation of the knowledgeable subject; tacit knowledge is contextual and personal, and cannot be added easily – taking full advantage of it requires the involvement and cooperation of the knowledgeable subject (Nonaka & Takeuchi, 1995). Taking into account the training objective, convergence warranted the use of the hybrid mode. In addition to the hybrid mode, the 'Castle Top' model proposed by Fink (2003) was selected.
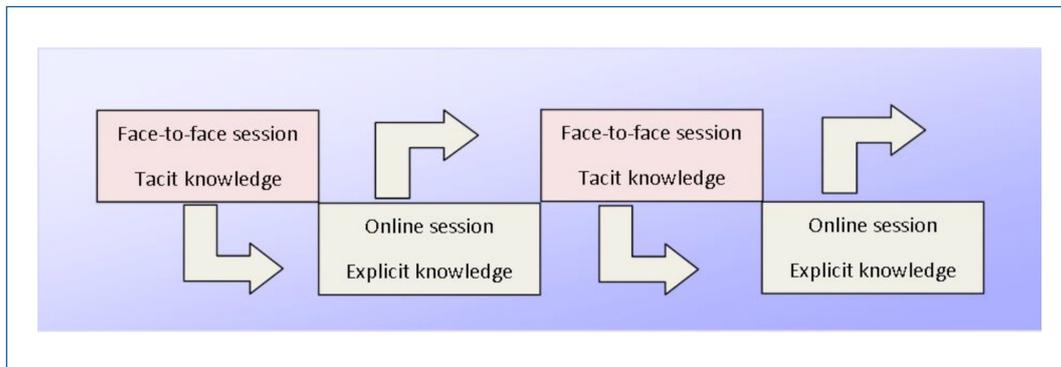
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Figure 2. Hybrid mode according to the 'Castle Top' model

Workshop/course

The university was asked for support to run the techno-pedagogical lecturer training course for those teaching on various undergraduate and graduate programmes. It should be noted that institutional support (Salinas, 2004) is an important factor that enables teachers to have the right training, the necessary infrastructure, and technical and human support (Murillo et al., 2006).

The course was designed with the idea of combining pedagogy with technology. To that end, short lectures, tasks and simple exercises were prepared on the one hand, and on the other, examples were given of how the lecturers could incorporate Moodle into their own courses in line with the strategy of learning-by-doing, the participation of experts in the topic area, and the use of various media such as chats, forums and e-mail to ensure a constant flow of communication with the lecturers/learners. Feedback was also given on each comment made.

Thirteen sessions were held; seven face-to-face and six online, using Moodle for the latter. The activities that had to be done for each session, including the face-to-face sessions, were put on Moodle. There was a selection of fundamental and practical content for the development of the lecturers' teaching and technological skills: didactic planning, teaching and learning strategies, Moodle use, and evaluation.

At the start of the course, a questionnaire was applied to ascertain the lecturers' levels of pedagogical and technological knowledge, which was divided into three sections: general data, Moodle use, and teaching and learning strategies. There were 14 questions, six multiple choice and eight open. Some of the results are detailed below.

Moodle use

Participating in the first session were 19 lecturers, 53% of whom taught in the School of Medicine and 32% in other schools or work areas.

Of the lecturers, 53% said that they had used Moodle already, but, as shown in Figures 3 and 4, the use was not very widespread or diverse. Regarding the activities/modules that Moodle offers, all the lecturers said that they always used online text, while 33% used upload a single file, offline activity, lesson, questionnaire and dialogue. As shown in Figure 3, very few ever used any of the other activities/modules.

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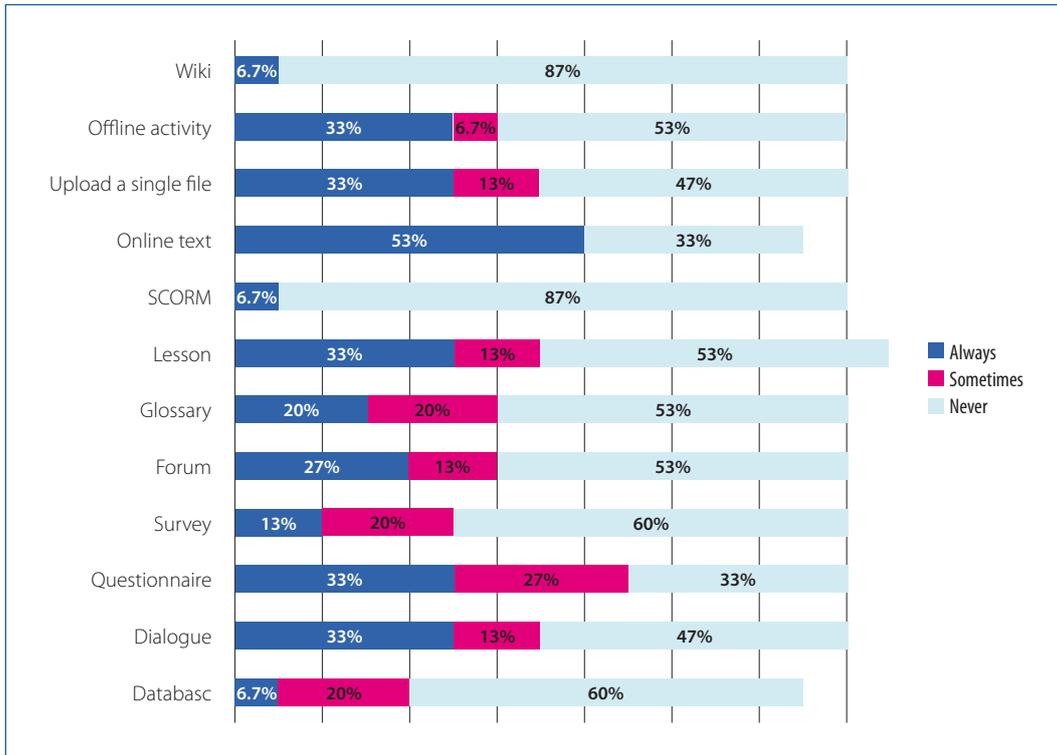
Figure 3. Moodle activities/modules that lecturers used in their courses

Regarding the resources that Moodle offers, Figure 4 shows that 27% of the lecturers used adding a label, while 27% sometimes used URL resource and very few ever used any of the other resources. In the course, the lecturers said that they had been unaware of them.
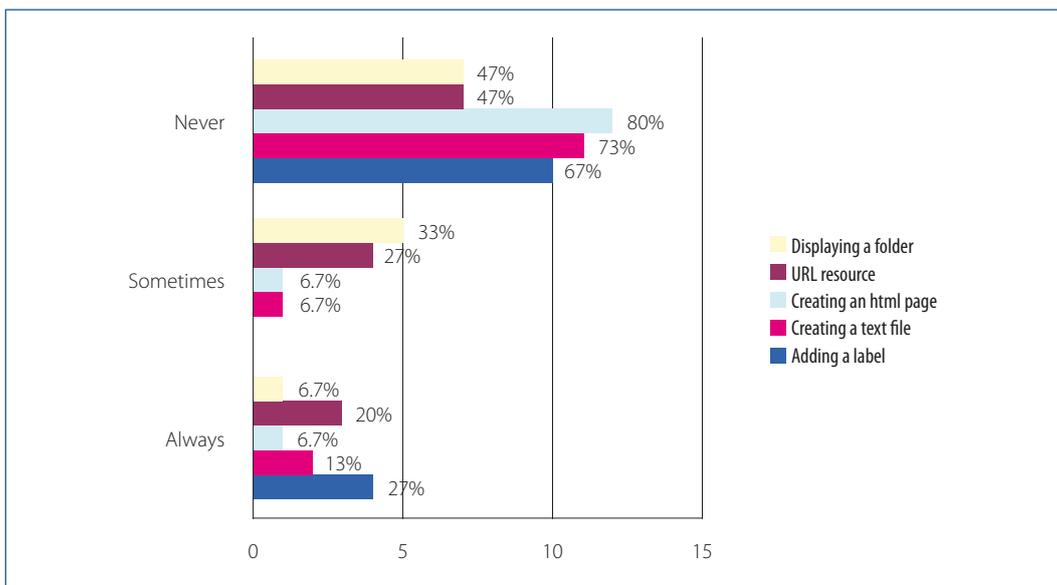

Figure 4. Moodle resources that lecturers used in their courses

It is important to point out that while 53% of the lecturers said that they had used Moodle, very few or none of them ever used any of the activities/modules or resources. When asked about

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the advantages and disadvantages of using Moodle, they said that the advantages were access to information 24/7 and a classroom complement, and the disadvantages were not knowing how to use it, which highlighted the lecturers' lack of preparation and dedication.

Teaching and learning strategies

In order to determine the participants' learning styles, they were asked to describe a day in the life of a class. They replied as follows:

Table 1. Description of a day in the life of a class.

Lecturer 1: Presenting a case/problem, assigning roles to the members and giving team answers to the different questions posed by the case/problem.
Lecturer 2: The topic is broached by performing a diagnosis of prior reading, I explain the topic to the students, and exercises are done.
Lecturer 3: I give a visual presentation of the topic and explain the issues that will be addressed, I encourage dialogue and reasoning among the students.
Lecturer 4: I present the idea, pose the problem, group solution, feedback.
Lecturer 5: I ask the students to do prior reading, a concept map of the topic is created, it is reviewed in PowerPoint, a summary is made.
Lecturer 6: 20% is theory coming from me; 60% teamwork, practicals, fieldwork; 20% questionnaires.
Lecturer 7: We can start with a presentation by the students, or a question that arouses their interest, or even a topic that introduces the importance of the issue to be addressed.
Lecturer 8: Lecture, slides, presentations, questions.

It should be noted that, when asked during the session, most of them said that the technique they most commonly used was expository; this can be considered a traditional teaching practice. In addition, they were asked to give their own definitions of teaching strategies. Some examples of their answers are shown below.

Table 2. Definitions of teaching strategies

The various procedures available to make the teaching and learning process more active.
The forms and ways that lecturers select to enable their students to gain competencies.
The various ways of effectively transmitting information to students, which facilitate understanding and learning.
Means that enable lecturers to provide students with knowledge.
Proven tools for conveying information to students and getting them to learn.
Strategies that facilitators can use to support the teaching process.
Tools that facilitate the transfer of knowledge to students.
Tools that enable learning-to-learn, or classes that are innovative, creative and interesting to students.
Mechanisms I use to make knowledge accessible.

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They were asked to give their own definitions of learning strategies. As shown in Table 3, some of the lecturers did not have a clear idea of what they were, and that is why examples of them were given on the course.

Table 3. Definitions of learning strategies

Methods that the students use to learn.
The conceptualisation of the issue.
For me, it is a teaching and learning strategy.
Means that enable students to construct concepts, skills and attitudes.
Tools that help us lecturers get students to learn.
Various strategies that anyone doing learning activities can use.
Behaviours that students adopt in order to learn.
What I am going to use to ensure that what I teach is learnt.
Mechanisms to fix knowledge in the students' minds.
Necessary tools that facilitate the acquisition of knowledge.
Tools that are used in accordance with the students' learning styles, though any tools that students are lacking can be acquired.
The specific way of how to guide students in order to strengthen their learning.

After going over the answers to the questionnaire, the sessions were restructured, the tasks were simplified, the teaching-learning strategies were reviewed and exercises were done on Moodle following the spiral structure of the research-action process.

Level of progress in technology use and appropriation

This section emerged from the data collected in the fieldwork and from the theory proposed by Hooper and Rieber (1995), who presented a model of the phases of technology appropriation (or 'adoption' in their words): familiarisation, utilisation, integration, reorientation and evolution. Thus, by compiling and analysing the blogs, questionnaires, each of the participants' courses, observations, session questions and e-mails sent to the facilitator, different types of lecturer/learner were identified. These were classified into three groups: beginner level (7), intermediate level (6) and advanced level (3).

Beginner level

Beginner-level lecturers were those that had never used Moodle and those that, by the third session, had not managed to get a basic grasp of Moodle.

For this group, the familiarisation phase of the model by Hooper and Rieber (1995) was considered. These authors defined it as a phase concerned with a teacher's "initial exposure to and experience with a technology."

Two beginner-level participants' comments are given below:

- *I still don't think I understand how and when the activities are done.*
- *For me, using the resources is always a challenge.*

It should be noted that one of the beginner-level lecturers asked for support to understand how Moodle worked and was given individual advice. This lecturer was a little afraid of pressing a button, though this was something that tended to ease off as Moodle was explained:

- *Today I tried to use Moodle, but I'm at a loss as to what we have to do, or rather how we are supposed to do it.*

Intermediate level

Intermediate-level lecturers were defined by the level of VLE-use knowledge and by taking into consideration the utilisation phase proposed by Hooper and Rieber (1995). According to these authors, this phase "occurs when the teacher tries out the technology or innovation in the classroom," although "the attitude of 'At least I gave it a try' will likely interfere with any enduring and long-term appropriation of the technology. Teachers who progress only to this phase will probably discard the technology at the first sign of trouble […]"

Intermediate-level lecturers were those that had used some type of VLE, whether Moodle or another (Blackboard, for example). Three intermediate-level participants' comments are given below:

- *I felt comfortable, in an environment that fostered learning about new aspects of Moodle that I hadn't used.*
- *The first time I used Moodle was a terrifying experience, as it was the first time I'd ever used it.*
- *I felt very good because I'd already used a similar program: Blackboard.*

Many of the intermediate-level lecturers managed to overcome some of the difficulties. Indeed, they commented on this in the blog specifically created for problems arising in the online sessions:

- *As far as the online session is concerned, I'm going to ask for more advice.*
- *The only difficulty was finding the functions, but in general I think it gets easier as you become more familiar with the VLE.*

Advanced level

Advanced-level lecturers were those that already had one or more courses on Moodle. According to Hooper and Rieber (1995), the integration phase "occurs when a teacher consciously decides to designate certain tasks and responsibilities to the technology, so, if the technology is suddenly

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removed or is unavailable, the teacher cannot proceed with the instruction as planned." Many lecturers would find it hard to give a lecture without a projector, for example. Hooper and Rieber (1995) went on to say that "For some teachers, the Integration phase marks the beginning of a professional 'metamorphosis' […]"

Four examples of advanced-level lecturers and their comments in the blogs are given below:

- *I've learnt a lot from the online course, but I've learnt a lot more from putting it into practice, even though I may have made some mistakes and spent a lot of time correcting things.*
- *I've gained more knowledge about the benefits of the VLE, I'm now more interested in working with it.*
- *I feel very confident, and am looking forward to learning about a few of the techniques that I need to perfect.*
- *I think the course is a good example in its own right of how to use it in practice.*

On completion of the course, their gradual progress in relation to technological skills was observed (see Table 4). This was the case for five of the lecturers/learners belonging to the beginner-level group, who had moved up to the intermediate-level group; two of the intermediate-level lecturers/learners had made enough progress to join the advanced-level group. Three lecturers already in the advanced-level group used Moodle tools that they had not used previously, they learnt to search for help on the Internet and via video tutorials, and to look for ways of improving them on their own. In addition, on completion of the training course, 12 out of the 16 lecturers/learners had their own courses on Moodle.

Table 4. Number of lecturers by level of technological knowledge

Training	Beginner level	Intermediate level	Advanced level
At the start	7	6	3
On completion	2	9	5

4. Discussion

Overdijk and Diggelen (2006) defined technology appropriation as "a process of social construction in which the actions and thoughts of the user are shaped by the technology, while the meaning and effects of the technology are shaped through the users' actions."

McAnally-Salas, Navarro, and Rodríguez (2006) defined technology appropriation as the changes occurring in lecturers as a consequence of technology use in their courses; in this respect, teaching turns into something different when technology is incorporated into it, either voluntarily or forcibly, because new knowledge and skills are integrated that become apparent in a lecturer's level of mastery and appropriation.

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As the authors have already mentioned, it was possible to observe changes in the lecturers' attitudes towards technology, as well as the gradual development of their skills. Some examples of their views are given below:

- *I need to keep practising, though I have gained more knowledge.*
- *All this stuff about learning with technology is never ending; there's always something else to learn.*
- *[…] there's a lot to learn. I suggest a second part; we're hooked, so let's carry on!*

During the sessions, it was found that the advanced-level lecturers had continued to use Moodle as a replica of what they would usually have done in the face-to-face classes (using Moodle as a blackboard). The beginner and intermediate-level lecturers/learners had also done the same. As they discovered Moodle tools, they realised the benefits that this VLE could offer them in terms of simplifying their classes, such as grades, questionnaires and dialogues.

- *Questionnaires make the lecturer's job much easier.*

Many of the lecturers preferred to use e-mail to send assignment instructions or to keep in touch with their students, but they valued the fact that they could do all of that in one place.

Hooper and Rieber (1995) proposed another two phases. One is reorientation, which, according to these authors, "requires that educators reconsider and reconceptualize the purpose and function of the classroom. […] The focus of the classroom is now centered on a student's learning […] the teacher's role is to establish a learning environment that supports and facilitates students as they construct and shape their own knowledge […] [teachers] are open to technologies […] [and] include technology in their classrooms."

Hooper and Rieber (1995) also stated that the evolution phase "serves as a reminder that the educational system must continue to evolve and adapt to remain effective. […] The classroom learning environment should constantly change to meet the challenge and potential provided by new understandings of how people learn." In the case of lecturers observed in the study presented in this article, only one reached this phase.

5. Conclusions and study limitations

From the results obtained, it was found that training the lecturers to use ICTs and guiding them to develop their own courses made them more likely to acquire technological skills. The lecturers managed to incorporate technology into their classrooms, and they gradually appropriated it, without overlooking the pedagogical aspects.

Their gradual progress in relation to technological skills was supervised. This was the case for five of the lecturers/learners belonging to the beginner-level group, who had moved up to the intermediate-level group, and for two of the lecturers/learners belonging to intermediate-level group

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who had moved up to the advanced-level group. In the advanced-level group, the lecturers/learners learnt to look for ways of improving their courses on their own Likewise, 12 out of the 16 participants had their own online courses as a classroom support. This meant that this techno-pedagogical lecturer training model was validated because it worked.

Regarding the limitations of this study, it should be noted that several lecturers dropped out of the course. Out of the 24 lecturers enrolled on it, only 16 completed it. Thus, if participation had been greater, better results could have been obtained. Moreover, it would have been interesting to have established why they dropped out.

Other important issues not addressed in the study were (a) getting the opinions of the students of the lecturers/learners on the course and (b) analysing the online activity logs to ascertain usage time and participation in each activity.

It should be underscored that constant communication with the lecturers is very important. Indeed, following completion of the course, some of the lecturers continued to ask for advice about revising their courses. This provided confirmation of the importance of institutional support.

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Application and validation of a techno-pedagogical lecturer training model...

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