Comunicar, n. 45, v. XXIII, 2015 | Media Education Research Journal | ISSN: 1134-3478; e-ISSN: 1988-3293
www.revistacomunicar.com | www.comunicarjournal.com

University Teaching with Digital Technologies

Enseñar con tecnologías digitales en la Universidad

Dr. Carlos Marcelo is Full Professor at the Faculty of Sciences of Education at the University of Sevilla (Spain) (marcelo@us.es) (http://orcid.org/0000-0002-8547-367X).

Dr. Carmen Yot is Research Assistant at the Faculty of Sciences of Education at the University of Sevilla (Spain) (carmenyot@us.es) (http://orcid.org/0000-0001-9447-8993).

Dr. Cristina Mayor is Associate Professor at the Faculty of Sciences of Education at the University of Sevilla (Spain) (crismayr@us.es) (http://orcid.org/0000-0001-7101-044X).

ABSTRACT

This research aims to analyze the level of use of technology by university teachers. We are interested by the frequency of their use in designing the teaching-learning process. The research questions were: what types of learning activities which include are designed by university teachers? What types of technologies do teachers use in the design of their instruction? What is the level of use of digital technologies in the learning designs? To respond to these issues, we designed an inventory of activities of learning technologies at the university which was completed by 941 Andalusian teachers. We have identified the type and frequency of use of technology by university lecturers in their different fields at the same time as studying learning activities that predominate in their learning designs. The results, first of all, reveal a poor integration of ICT in the teaching-learning processes which are, essentially, the teacher-centered learning activities. Secondly, we have identified four profiles which differentiate between teachers depending on their level of use of ICT. The profile comprising an increased number of teachers makes reference to their rare use of technology. There are teachers who use technology sparingly, and this is a very small range.

RESUMEN

Esta investigación tiene por objetivo analizar el nivel de uso que de las tecnologías hace el profesorado universitario, interesándose tanto por la frecuencia de uso de ellas, como por el tipo de actividades de aprendizaje en las que se utilizan. Los problemas de investigación se centraron en: ¿qué tipos de actividades de aprendizaje con tecnologías diseñan los docentes universitarios?, ¿qué tipo de tecnologías utilizan los docentes en el diseño de su enseñanza?, ¿cuál es el nivel de uso de las tecnologías digitales en los diseños del aprendizaje del profesorado universitario? Hemos diseñado el Inventario de Actividades de Aprendizaje con Tecnologías en la Universidad que fue respondido por 941 docentes andaluces. A través de él hemos identificado el tipo y frecuencia de uso que de la tecnología hace el profesorado universitario en sus materias al tiempo que hemos estudiado las actividades de aprendizaje que predominan en sus diseños del aprendizaje. Los resultados revelan una pobre integración de tecnologías en los procesos de enseñanza-aprendizaje los cuales se constituyen, esencialmente, de actividades de aprendizaje centradas en el docente. Hemos identificado cuatro perfiles diferenciados de docentes en función del nivel de uso que hacen de las TIC. De los cuatro, el perfil que mayor número de docentes agrupa es el que hace referencia a un uso poco frecuente de la tecnología; son docentes que emplean escasamente la tecnología y esta es de una gama muy reducida.

KEYWORDS | PALABRAS CLAVE

Technology, learning design, higher education, inventory, university teaching, activities, learning, teachers.
Tecnología, diseño del aprendizaje, universidad, inventario, enseñanza universitaria, actividades, aprendizaje, profesores.

Received: 28-08-2014 | Reviewed: 19-10-2014 | Accepted: 17-01-2015 | Preprint: 15-04-2015 | Published: 01-07-2015
DOI http://dx.doi.org/10.3916/C45-2015-12 | Pages: 117-124

1. Introduction and state of the question

Universities in Spain have gone through a complex process to redesign standards and curricula, mandatory with the implementation of the European Higher Education Area (Guerra, González & García, 2010; Krücken, 2014). Changes introduced in European universities have revealed the need to prioritize a teaching model that is oriented to the students' learning, in which the incorporation of digital technology is ever more important as a support to facilitate the motivation process and students' independent learning. As such, a number of reports and recommendations from the European Union have indicated the need to promote empowerment and digital skills among students (Ferrari, Punie & Brecko, 2013).

However, the successful integration of technologies in the teaching-learning process arises when teachers focus their attention less on the technological resources, and more on the actual leaning experience they design using acceptable technology. In recent years, there has been increased concern about studying learning design (Laurillard, 2012). When we talk about learning design, we are referring to the planning exercise carried out by teachers (Dobozy, 2011). There has been extensive research into this topic; some have focused upon clarifying exactly which knowledge and skills are necessary for good design practice (MacLean & Scott, 2011). Others have centered on what cognitive resources are activated when teachers design their teaching (Goodyear & Markauskaite, 2009; Kali, Goodyear & Markauskaite, 2011).

Teachers are continually designing. It is part of their daily tasks. Sometimes, this learning design is explicit while on other occasions, it is implicit. Teachers are expected to incorporate digital technology, not only in their teaching design process, but also in the development of this design when in contact with their students (Jump, 2011).

The results of previous research reveal that there is no evidence that would lead us to the conclusion that in universities classrooms have successfully integrated a wide range of technologies to support the teaching-learning process (Hue & Jalil, 2013; Ng'ambi, 2013). Thus, Shelton (2014) differentiates between «core» and «marginal» technologies; in other words, frequently used technologies (such as PowerPoint) and hardly used technologies (including blogs, podcasts, e-portfolios, wikis or social networks). Kirkwood & Price (2014) analyzed how technology had been incorporated into the teaching practice within the university context after reviewing a wide range of scientific articles, published between 2005 and 2010. They found that in at least 50% of cases, technology had been used without changing the teaching method. For example, it was simply a matter of opening a new channel for the transmission of information. According to Hue & Jalil (2013), the frequency with which technology is used in the teaching-learning process is associated with attitudes regarding the integration of ICTs in the curriculum to improve teaching.

According to Hue & Jalil (2013), the frequency with which technology is used in the teaching-learning process is associated with the attitudes of teachers towards the integration of ICTs in the curriculum to improve teaching. It is all a matter of being able to explain why teachers decide to use or not to use technology; so we have taken into consideration the practical knowledge and beliefs that teachers develop.

To explain why lecturers decide to use technology, we must take into consideration their own practical knowledge and the beliefs that they develop. One relevant framework to understand lecturer knowledge was developed by Shulman (1986); it was later modified by Grossman (1990) among others. According to Shulman, a teacher's knowledge base is composed of his/her knowledge about the material (content knowledge or CK), knowledge of teaching strategies and classroom management (pedagogical knowledge or PK) and pedagogical content knowledge (PCK) which represents a combination of the first two. Based on the work of Shulman, Mishra & Koehler (2006) proposed a model to integrate technological knowledge as a new type of knowledge to be incorporated into those already mentioned. Thus, the knowledge types proposed by these authors are: technological knowledge (TK), techno-pedagogical knowledge (TPK), technological content knowledge (TCK) and techno-pedagogic content knowledge (TPACK). Based on this model, other authors such as Cox & Graham (2009) moved forward with the conceptualization of each construct and the limits of each. Doering, Veletsianos & Scharber (2009) and Hechter, Phyfe & Vermette (2012), on the other hand, helped us understand that TPACK may appear in a variety of ways, in various contextual conditions, given that there are fluctuations in the relevance of each type of knowledge throughout the teaching-learning process. Yeh, Hsu, Wu, Hwang & Lin (2014), believing that a model still needed to be developed that considers both knowledge and teaching practice, offer a representation (practical-TPACK) that focuses on the TPACK that professors apply practically when they understand the content of the material, design their study plans, teach or assess their students' progress.

However, although technological knowledge is necessary, it is not enough if teachers fail to consider themselves confident when using it (Ertmer & Ottenbreit-Leftwich, 2010). It is evident that lecturers' general beliefs as well as their pedagogical beliefs and attitudes greatly influence their use of ITCs in the classroom (Tejedor, Garcia-Valcarcel & Prada, 2009).

2. Material and method

This research analyzes how the various digital technologies are integrated into university classrooms in Andalusia (Southern Spain). We are interested in learning more about understanding the technological usage level, not as an isolated item, but how it is incorporated into the learning sequences which use it. The research problems in this work are: What type of learning activities using technology do university lecturers design? What technologies do lecturers use in their teaching design? What is the digital technology usage level in the learning designs of university lecturers?

> Technology alone does not change the learning environment. It requires a more intense intervention in which technology accompanies teaching and learning strategies that not only prioritize the acquisition of knowledge based on digital resources, but that are based on the appropriation processing of this knowledge by students through productive, experiential or communicative learning activities.

2.1. The Inventory of Learning Activities with Technologies at the University

To respond to these questions, we have designed an Inventory of Learning Activities with Technologies at the University. Other researchers analyzing TPACK have developed various instruments. Abbitt (2011) provides an extensive review of the instruments and methods being used to assess TPACK. To date, the instruments developed generally focus upon analyzing TPACK elements, thus leaving the didactic aspect, which represents the design of learning activities enriched with technologies, to one side.

The Inventory we designed includes initial questions to collect demographic information such as: sex, age, university, field of knowledge and professional category. Another 38 items are also included in the Inventory. Each of these items refers to a specific learning activity and various types: Assimilative, Information management, communicative, productive, experiential and evaluative (Conole, 2007; Marcelo, Yot & al., 2014). These activities may or may not appear in the classroom context; likewise, these may or may not require students' active participation, but in all cases, digital technologies are involved. Moreover, the items represent learning activities with varying levels of complexity (Aubusson, Burke, Schuck, Kearney & Frischknecht, 2014).

Each of the items had to score from 1 to 6 on a double Likert scale. One refers to the frequency with which it is used (usage level) while the other refers to the degree to which the teacher feels confident when using the activity (confidence level).

The inventory was subject to a validation process by experts. Sixteen university lecturers from various universities and fields of knowledge reviewed the inventory, expressing their level of agreement with each statement, and provided suggestions that should be considered. Regarding their answers, we calculated the Fleiss' kappa coefficient to learn the concordance among the expert assessors. In that analysis, Z obtained a value of 0.00667341 which corresponded to the value p=0.74250178 (greater than an alpha of 0.05). From there, we can state, with a confidence level of 95%, that there was statistically significant concordance among the values assigned to the various items by the 16 judges.

Once the final version was ready, the inventory was launched on the online survey service (http://goo.gl/ukpTme). It was distributed by email to practically all instructors at the various universities located in Andalusia. To measure the reliability of the inventory, the Cronbach's Alpha coefficient was calculated. The coefficient for the scale measuring the usage level of each item was 0.905.

2.2. Sample

The research population is university lecturers from ten universities in the Andalusian region of Spain: nine public and one private. The International University of Andalusia (Universidad Internacional de Andalucía) was excluded due to its specific characteristics. Based on a recent report regarding the 2011-2012 academic year, Andalusian universities had a population of 17,637 lecturers. From this population, which could have undergone slight modifications, the sample was constituted with the 941 university instructors who responded to the inventory. This represents approximately 5.4% of the entire population. Of these, 52.5% were men and 47.5% were women. 42.6% of the subjects were between 41 and 50 years of age, 28% were between 51 and 60 years of age, and 21% between 31 and 40. Lecturers under thirty accounted for 2.7% of the total while 5.8% of the teaching staff was over the age of 61. The percentage of women was greater in the age range under forty, while above that age, most of the respondents were men; this fact this disparity was greater in the over 61 year old group where 65.5% were men.

These university teachers were from various fields of knowledge: 38.4% were from social sciences, 21.4% were from science, 16.5% engineering and 11.6% health sciences while 11.2% were in the field of humanities. Regarding the professional category of these professors, 43.5% were tenured lecturers, 16.2% were contracted PhDs and 12.5% were tenured professors. Pre-doctorate interns, associate professors and substitute professors accounted for 14.4%. Lastly, regarding the universities where the various faculty members responding to the inventory worked, 27.3% were from the University of Seville, 24.9% from the Universidad of Granada, 9.6% from the University of Cadiz, 7.5% from the University of Huelva, 7.2% from the Universidad of Jaen, 6.9% from the University of Almeria and 6.8% from the University of Cordoba. Lesser percentages corresponded to those at the Pablo de Olavide University with 4.4%, the University of Malaga with 3.8% and 1.7% at the University of Loyola.

3. Results

The means obtained for each of the items in the inventory, as shown on Table 1, offer a usage profile of learning with technologies by Andalusian university lecturers, which could be catalogued as «teaching with limited integration of ICTs». The highest values, in mean terms, are those that hardly alternate their «traditional» teaching with technologies, those in which technologies are used for learning activities focusing on the instructor or those that allow limited student participation. Moreover, these are items that are implemented because they offer a basic level of difficulty. On the other hand, items with a very low mean value refer to activities in which the technology used is very advanced and specific; for sample, augmented reality or remote laboratories.

To analyze the various usage levels of the learning activities with technologies, we proceeded to calculate a mean of the general usage per participant according to the scores given for each of the various items of the inventory. Then we sought ranges using the visual grouping option provided by SPSS software. We established the grouping option using midpoint cutoffs and standard deviation +-1, based on the cases explored. With this, four groups were obtained, which allowed us to classify the instructors according the frequency that they used technology in learning activities.

The first of these groups includes lecturers who surpass the 3.694 points for mean general usage; in other words, these made very frequent use of technology in their learning activities. Table 1 shows the items that reached a greater mean level of usage in this group of lecturers.

16.7% of the respondents to the inventory were included in the elevated usage of technology group; this corresponded to 157 participants. These were either men (50.3%) or women (49.7%); most of these (105 people or 66.8%) were between the ages of 31 and 50. Furthermore, higher usage was seen among professors of Education (31.6%), followed by those in the field of Science (14.8%).

It is noteworthy that on the list of learning activities for which these instructors used technology, there were a variety of possibilities. Although the so called assimilative activities (technology as support for the lecturer's presentation) were used more frequently, we also found learning activities based on communication, information management, application as well as evaluative and productive. It could therefore be said that lecturers who used digital technology intensively, did so for a variety of learning activities for their students.

The second group of lecturers was those whose mean of general use of activities with technologies was between 3.694 and 2.805 points; these were titled average usage. This group constitutes 25.3% of the professors, 238 participants). Of these, 52.5% were men and 46.6% were women. 45% were between 41 and 50 years of age and 26.5% between 51 and 60 years of age. The average use of activities with tech-

nologies is especially outstanding among engineering lecturers (20.2%). These instructors, as shown on Table 1, frequently used technology in almost all learning activities we identified with regards to the previous group. However, there is one noteworthy difference with the previous group: limited use of technologies to develop evaluative learning activities.

Thirdly, we found that 44% of the lecturers fell

Table 1. Means and typical deviation of all items included in the inventory, and the mean scores of the items for the instructor profile with very frequent usage, medium usage, limited usage and minimal usage of technologies to design learning activities

ITEMS	Mean (Min. 1, Max. 6)	Standard Deviation	Very frequently used	Average Usage	Seldom Usage	Minimal Usage
1. Use presentations during a master class, created with some type of software.	5.47	1.10	5.75	5.63	5.49	4.79
9. Select text documents and upload them onto the virtual platform for students to read.	4.98	1.42	5.55	5.4	4.86	3.88
16. Develop online tutorials by means of various communication tools.	4.64	1.72	5.38	5.2	4.39	
6. Provide videos, demonstrations and simulations on the virtual platform.	4.38	1.73	5.31	5.13	4.08	
29. Use virtual platform tools to turn in homework/papers.	4.37	1.939	5.37	5.3	4.1	
3. Show simulations, demonstrations or examples based on digital resources during a master class.	4.23	1.53	5.21		3.99	
37. Promote and encourage respect for the intellectual work of other by providing copyright and intellectual property rights laws that are applicable to academic activities.	4.16	1.94	5.21	4.82	3.89	
10. Teach students to verify the truth behind the information sought out on the Internet.	3.93	1.84	5.15	4.78		
4. Use video segments taken from Internet during a master class.	3.72	1.77	4.99	4.36		
13. Design case-studies using digital resources so that students can apply the theory learned to practical cases.	3.64	2.01	4.76	4.56		
19. Organize activities in which some type of digital material must be produced.	3.60	1.94	4.88	4.24		
23. Promote creative presentation of papers using infographics, presentations…	3.20	2.05	4.53	4		
22. Propose complex problem solving activities using digital resources.	3.05	1.95	4.22			
12. Design quantitative or qualitative data analysis activities using specific software.	2.87	2.02				
32. Provide online, self-assessment exercises.	2.75	2.02	4.03			
15. Promote collaborative work using tools such as wikis, Google Drive, Dropbox, etc.	2.70	1.95	4.38	3.71		
38. Attend the terms of use for digital material with a Creative Commons license.	2.69	2.1	3.82			
14. Manage debates by means of online discussion forums	2.64	1.87	4.35			
28. Use online headings for assessment.	2.60	2.03	4.22			
31. Draft exams on the virtual platform.	2.46	1.93				
36. Evaluate the quality of interventions in forums, emails, chats, blogs, etc.	2.41	1.88	3.85			
35. Use anti-plagiarism software when assessing papers.	2.22	1.84				
27. Offer online courses, conferences and other open academic activities on the virtual platform.	2.15	1.71				
30. Use electronic portfolio for assessment. .	2.09	1.83				
18. Design activities in which students must provide comments by means of personal or group blogs.	1,96	1,64				
21. Distribute news, information, current events, etc. through social networks.	1.96	1.73				
26. Design simulated professional situations, whether virtual simulators or reproduced scenarios.	1.83	1.6				
20. Request reports, essays, articles, etc. using appointment management tools.	1.82	1.59		3.92		
17. Facilitate interaction outside the classroom by means of cell phone-based apps.	1.80	1.66				
7. Using a virtual platform, facilitate video or audio recordings made by the actual teacher.	1.77	1.61				
11. Use conceptual maps.	1.62	1.44				
8. Design online contents with authoring tools for his/her lecture.	1.58	1.36				
5. Use videoconference or webminar to present expositions by the actual teacher or other experts.	1.49	1.2				
2. Use an Interactive Whiteboard during a lecture/master class	1.38	1.04				
24. Design leaning activities using augmented reality.	1.27	0.95				
25. Organize practical practice session using remote labs.	1.16	0.75				
33. Undertake classroom surveys using cell-phone applications.	1.13	0.75				
34. Undertake classroom surveys using the interactive, white-board remote.	1.12	0.69				

within a range titled as seldom use technology as a teaching support. This category included the largest number of lecturers, with 418 respondents, of which 50.7% were and 49.3% women. 73.4% were between 41 and 60 years of age.

This group of instructors only rarely uses technology, and the type that they use –as shown on table 1– is even more limited. These include multimedia presentations to support master class expositions, email and other communication tools to attend students and a virtual platform to provide texts, videos and other support resources. Students could also access learning tasks using these same resources.

Lecturers whose average scores for general usage was lower than 1.916 made up the fourth group. These corresponded to minimal usage of technology in the teaching-learning process and grouped together 13.6% of the respondents. For the most part, this profile appeared among science lecturers (31%). In this case, the instructors only used two types of leaning activities with technology more frequently: they used presentations created with some type of software during a master's class and selected text documents and made them available on the virtual platform for reading.

Of these lecturers, 59.8% were men and 69.5% fell within the 41-60 year age group. Lastly, if the four usage profiles were reduced to two, these would be medium-high and low. We found that lecturers from the field of law, labor science and science in general, tended to fall within the lowest profile identified, with 73.6% and 69%, respectively.

4. Discussion and conclusions

The results presented contribute to the debate between stability and change in teachers' beliefs, attitudes towards and knowledge of technology and its uses in the classroom. Research that has been undertaken to date about the process of change among teachers (with or without technologies) draws attention to the need to learn implicit theories and practical knowledge which teachers have when it comes to explaining why some changes are accepted with ease while others are not. Processes of change in teachers, motivated by technology, show that instructors are oriented toward change within stability. That is to say, they introduce those technologies that are coherent with their teaching methodology, specifically with those activities they usually carry out. This principle of coherence is backed by the results of this research. We found that instructors intensively use those technologies that support teaching and learning strategies in which the main player is the content and its transmission using various media (audio, video, documents and demonstrations).

Processes of change in teachers, motivated by technology, show that instructors are oriented toward change within stability. That is to say, they introduce those technologies that are coherent with their teaching methodology, specifically with those activities they usually carry out. This principle of coherence is backed by the results of this research. We found that instructors intensively use those technologies that support teaching and learning strategies in which the main player is the content and its transmission using various media (audio, video, documents and demonstrations).

This result confirms the idea that among lecturers, change does not take place by simply placing them in contact with technology. In other words, technology alone does not change the learning environment. It requires a more intense intervention in which technology accompanies teaching and learning strategies that not only prioritize the acquisition of knowledge based on digital resources, but that are based on the appropriation processing of this knowledge by students through productive, experiential or communicative learning activities (Marcelo, Yot & Mayor, 2011).

Thus, the predominance of assimilative learning activities is commonplace among all instructors, independent of their age or technological usage level. Only

with those lecturers who use technology frequently or very frequently do we see learning activities that favor the implementation of what students have learned by solving problems or cases, peer collaboration for team tasks or a more authentic assessment with self-evaluation exercises or headings. Nevertheless, even in the teaching-learning practice of these instructors, there is limited presence of learning activities based on 2.0 technology (Hamid, Chang & Kurnia, 2009) even when students are willing to use them (Roblyer, McDaniel, Webb, Herman & Witty, 2010), and at the same time, other technologies, mentioned in the Horizon report, as in the case of emerging resources such as cell phone applications (Cochrane & Bateman, 2009) or more experiential technologies such as augmented reality, also remain unused.

In this research, we found that there were various groups of instructors with regards to the digital technology usage level in the design of their teaching. The fact remains that there is a significant group (16.7%) of lecturers who have been able to integrate technology as a support to develop a more ample variety of learning activities for their students. Lecturers have promoted changes in their teaching practice and no doubt, in their knowledge and beliefs. More specific studies would require a more detailed analysis of these instructors to learn how these processes have taken place and what measures have influenced the intrinsic (motivation, perception of self-efficiency) or extrinsic variables. Likewise, it would also require an in depth study about why we failed to find –as it would have been expected– a more intensive usage of digital technologies amongst younger lecturers. There seems to be a difference in the usage of technology for personal communication and learning and the use of these same resources in the professional and teaching sphere.

Acknowledgements

This research has been financed by the Andalusian Regional Ministry of Innovation, Science, Business and Employment (Consejería de Innovación, Ciencia, Empresa y Empleo de la Junta de Andalucía). Project for Excellence: P10-HUM-6677.

References

Abbitt, J.T. (2011). Measuring Technological Pedagogical Content Knowledge in Preservice Teacher Education: A Review of Current Methods and Instruments. *Journal of Research on Technology in Education*, *43*(4), 281-300. DOI: http://dx.doi.org/10.1080/15391523.2010.10782551

Aubussson, P., Burke, P., Schuck, S., Kearney, M., & Frischknecht, B. (2014). Teacher Choosing Rich Tasks: the Moderating Impact of Technology on Student Learning, Enjoyment and Preparation. *Educational Researcher*, *43*(5), 219-229. DOI: http://dx.doi.org/10.3102/0013189X14537115

Cochrane, T., & Bateman, R. (2009). Smartphones Give You Wings: Pedagogical Affordances of Mobile Web 2.0. *The Ascilite*, Auckland.

Conole, G. (2007). Describing Learning Activities. Tools and Resources to Guide Practice. In H. Beetham, & R. Sharpe (Eds.), *Rethinking Pedagogy for a Digital Age: Designing and Delivering E-learning*. (pp. 81-91). Oxon: Routledge.

Cox, S., & Graham, C.R. (2009). Diagramming TPACK in Practice: Using an Elaborated Model of the TPACK Framework to Analyze and Depict Teacher Knowledge. *TechTrends*, *53*(5), 60-69. DOI: http://dx.doi.org/10.1007/s11528-009-0327-1

Dobozy, E. (2011). *Typologies of Learning Design and the Introduction of a 'LD-Type 2' Case Example*. eLearning Papers, 27(27).

Doering, A., Veletsianos, G., & Scharber, C. (2009). Using the Technological, Pedagogical and Content Knowledge Framework in Professional Development. *Annual Meeting of the American Educational Research Association (AERA)*, San Diego.

Ertmer, P.A., & Ottenbreit Leftwich, A.T. (2010). Teacher Technology Change: How Knowledge, Confidence, Beliefs, and Culture Intersect. *Journal of Research on Technology in Education*, *42*(3), 255-284. DOI: http://dx.doi.org/10.1080/15391523.2010.10782551

Ferrari, A., Punie, Y., & Brecko, B. (2013). *DIGCOMP a Framework for Developing and Understanding Digital Competence in Europe*. Joint Research Centre & Institute for Prospective Technological Studies. (http://goo.gl/neGyk8) (23-01-2015).

Goodyear, P., & Markauskaite, L. (2009). *Teachers' Design Knowledge, Epistemic Fluency and Reflections on Students' Experiences*. 32nd HERDSA Annual Conference, Darwin.

Grossman, P. (1990). *The Making of a Teacher. Teacher Knowledge and Teacher Education*. Chicago: Teacher College Press.

Hamid, S., Chang, S., & Kurnia, S. (2009). Identifying the Use of Online Social Networking in Higher Education. *The Ascilite*, Auckland.

Hechter, R.P., Phyfe, L.D., & Vermette, L.A. (2012). Integrating Technology in Education: Moving the TPCK Framework towards Practical Applications. *Education Research and Perspectives*, *39*(1), 136-152.

Hue, L.T., & Jalil, H.A. (2013). Attitudes towards ICT Integration into Curriculum and Usage among University Lecturers in Vietnam. *International Journal of Instruction*, *6*(2), 53-66.

Jump, L. (2011). Why University Lecturers Enhance their Teaching through the Use of Technology: A Systematic Review. *Learning, Media and Technology*, *36*(1), 55-68. DOI: http://dx.doi.org/10.1080/17439884.2010.521509

Kali, Y., Goodyear, P., & Markauskaite, L. (2011). Researching Design Practices and Design Cognition: Contexts, Experiences and Pedagogical Knowledge-in-pieces. *Learning, Media and Technology*, *36*(2), 129-149. DOI: http://dx.doi.org/10.1080/17439884.2011.553621

Kirkwood, A., & Price, L. (2014). Technology-enhanced Learning and Teaching in Higher education: what is 'enhanced' and how do we know? A Critical Literature Review. *Learning, Media and Technology*, *39*(1), 6-36. DOI: http://dx.doi.org/10.1080/17439884.2013.770404

Krücken, G. (2014). Higher Education Reforms and Unintended Consequences: A Research Agenda. *Studies in Higher Education*, *39*(8), 1439-1450. DOI: http://dx.doi.org/10.1080/03075079.2014.949539

Laurillard, D. (2012). *Teaching as a Design Science. Building Pedagogical Patterns for Learning and Technology*. London: Routledge.

MacLean, P., & Scott, B. (2011). Competencies for Learning Design: A Review of the Literature and a Proposed Framework. *British Journal of Educational Technology*, *42*(4), 557-572. DOI: http://-

dx.doi.org/10.1111/j.1467-8535.2010.01090.x

Marcelo, C., Yot, C., & Mayor, C. (2011). Alacena, an Open Learning Design Repository for University Teaching. *Comunicar*, *37*(XIX), 37-44. DOI: http://dx.doi.org/10.3916/C37-2011-02-03

Marcelo, C., Yot, C., Mayor, C., Sánchez, M., Murillo, P., Sánchez, J., & Pardo, A. (2014). Las actividades de aprendizaje en la enseñanza universitaria: ¿Hacia un aprendizaje autónomo de los alumnos? *Revista de Educación*, *363*, 334-359. DOI: http://dx.doi.org/10.4438/1988-592X-RE-2012-363-191

Mishra, P., & Koehler, M. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record*, *108*(6), 1017-1054.

Ng'ambi, D. (2013). Effective and Ineffective Uses of Emerging Technologies: Towards a Transformative Pedagogical Model. *British Journal of Educational Technology*, *44*(4), 652-661. DOI: http://dx.doi.org/10.1111/bjet.12053

Roblyer, M.D., Mcdaniel, M., Webb, M., Herman, J., & Witty, J.V. (2010). Findings on Facebook in Higher Education: A Comparison of College Faculty and Student Uses and Perceptions of Social Networking Sites. *Internet and Higher Education*, *13*(3), 134-140. DOI: http://dx.doi.org/10.1016/j.iheduc.2010.03.002

Shelton, C. (2014). Virtually Mandatory: A Survey of How Discipline and Institutional Commitment Shape University Lecturers' Perceptions of Technology. *British Journal of Educational Technology*, *45*(4), 748-759. DOI: http://dx.doi.org/10.1111/bjet.12051

Shulman, L. (1986). Those who Understand: Knowledge Growth in Teaching. *Educational Researcher*, *15*(2), 4-14.

Tejedor, F.J., García-Valcárcel, A., & Prada, S. (2009). Medida de actitudes del profesorado universitario hacia la integración de las TIC. *Comunicar*, *33*, 115-124. DOI: http://dx.doi.org/10.3916/c33-2009-03-002

Yeh, Y.F., Hsu, Y.S., Wu, H.K., Hwang, F.K., & Lin, T.C. (2014). Developing and Validating Technological Pedagogical Content Knowledge-practical (TPACK-practical) through the Delphi Survey Technique. *British Journal of Educational Technology*, *45(*4), 707-722. DOI: http://dx.doi.org/10.1111/bjet.12078