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TEACHERS' PERSPECTIVES ON DESIGN FOR LEARNING USING COMPUTER BASED INFORMATION SYSTEMS: A Systematic Literature Review

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Abstract

The paper aims to explore and evaluate what has been done in the literature regarding teachers' perceptions, practices, and needs of learning design and learning design tools. To this end, the systematic literature review methodology is adopted. Under the light of this methodology and in line with the study's selection criteria, six papers are identified as relevant. Data extracted from these papers are analysed according to themes specified by the research questions of the study. The findings are used to produce desirable features for the next generation of learning design tools.

Keywords: Design for learning, Learning Design (LD) Tools, Information Systems in teaching, Computer-based, Teachers' perspectives

1.0   Introduction

Computer based information systems' modern applications in educational settings have driven further development and growth in the educational field. This provides opportunities to increase student learning, teachers productivity and enhance management capabilities of school administrators (Shelly & Vermaat, 2008). The idea of developing computer based information systems for teachers to connect them with each other with the aim of developing pedagogically informed designs for learning and engaging teachers with pedagogy and technology is one of the topics discussed among researchers globally. Many projects that aim to develop an information system platform to design for learning have been developed while there is still limited understanding of teachers' perceptions about these platforms, and of their design practices. Teachers' adoption is one of the unsolved challenges in the field of learning design. There have been limited studies to address this issue; thus it remains high in the research agenda in the field of learning design (Prieto et al., 2014; Mor et al., 2013).

In this paper, we performed a systematic review of the literature to identify and synthesize studies that are looking at the learning design platforms from the eyes of teachers, revealing teachers' perspectives, practices and needs with the aim of informing further research in this area. We sought answers to the following three research questions in this paper:

(1) What are university teachers' perceptions of use of Learning Design Tools in the learning design process? It is worth noticing that with respect to first research question, teachers' willingness towards use of learning technologies in education is essential. As they are primary users of these tools, their perspectives need to be revealed to further advance this field (Prieto et al., 2014).

(2) How do university teachers create their learning design either using Learning Design tools or without any tools? Regarding the second research question, university teachers' design practices enable us to identify what learning design facilities might be included in the learning design support tools. It is important to mention that even though, the third research question is related to question 2, there is a distinct difference.

(3) What are the needs of university teachers in Learning Design Tools? The third question specifically focuses on learning design tools and teachers' requirements on these tools. Eliciting teachers' desirable features or functions of these tools is essential to make these tools better serve to the teachers' needs.

A distinct feature of our research is that it combines sociomateriality (Johri, 2011) with design based research (Collective, 2002). According to sociomaterial theory, social structures and the relations of the material within the environment provides us an interpretive framework on what technology might be for us (Johri, 2011). By looking through the lens of sociomateriality, we have generated research question 2 and 3 in order to understand university teachers' design practices and their relations with learning design tools as the technological innovations built on the needs of society.

The rest of the paper is organized as follows. Section 2 provides an overview of the methodology. Section 3 presents the findings. A discussion and conclusion take place in Section 4.

2.0 Methodology

A systematic review methodology is adapted in this review. This methodology provides a systematic way to collect, identify and analyze relevant articles to the research questions. We combined various approaches in order to identify relevant papers: searching electronic databases, hand searching key conference proceedings, key word searching among journals, scanning reference list, and searching relevant other sources on the internet. We began the search with the major conferences and journals in this field; these are listed in Table 1 and Table 2, respectively.

Journals	Scientific Journal Rankings (SJR) Impact Factors (2014)
Computers and Education	2.57
Journal of Computer Assisted Learning	2.05
Research in Learning Technology	0.54
Technology, Pedagogy and Education	0.68
British Journal of Educational Technology	1.51
ACM Transactions on Computing Education	0.36
Journal of Educational Technology and Society	1.37
Distance Education	0.98

Table 1.   Journals included in the study.

Conferences
European Conference On Technology Enhanced Learning (EC-TEL)
Association for the Advancement of Computing in Education (AACE) Conference
International Conference on Advanced Learning Technologies and Technology-enhanced Learning (ICALT)

Table 2.   Conferences included in the study.

We also searched electronic databases including Science Direct, Google Scholar using relevant search terms. We finalized the literature search with hand search of the references of all articles included in our review.

By screening title and/or abstract, we rejected some of the papers identified. We retrieved the full-text of the remaining articles and applied eligibility criteria as described in Table 3. We excluded articles that do not meet these selection criteria.

Include	Exclude
Articles that	Articles that
• From 2010-2016;	• Studies older than 2010;
• Written in English;	• Focuses on teachers but not higher education teachers.
• Focuses on Higher Education Teachers.	

Table 3.   Selection criteria of papers.

Using the key terms of "Design for learning", "Learning Design Tools", "Computer-based", "Teachers' perceptions", "Information Systems in teaching", we identified 135 papers. Many of those focused on learning design but they were not teachers related. During the selection process, we gradually eliminated most of these papers as they did not meet our inclusion criteria as can be seen in flow-chart in Figure 1.

The group of categories for the analysis are classified by our research questions (RQ). Categories helped us grouping and synthesizing data from each articles. The categories used are presented below together with the research questions:

RQ1 – Teachers' perceptions: What are university teachers' perceptions on use of Learning Design Tools in learning design process?

RQ2 – Teachers' practices: How do university teachers create their learning design using Learning Design tools or not using these tools?

RQ3 – Teachers' needs: What are the needs of university teachers in Learning Design Tools?
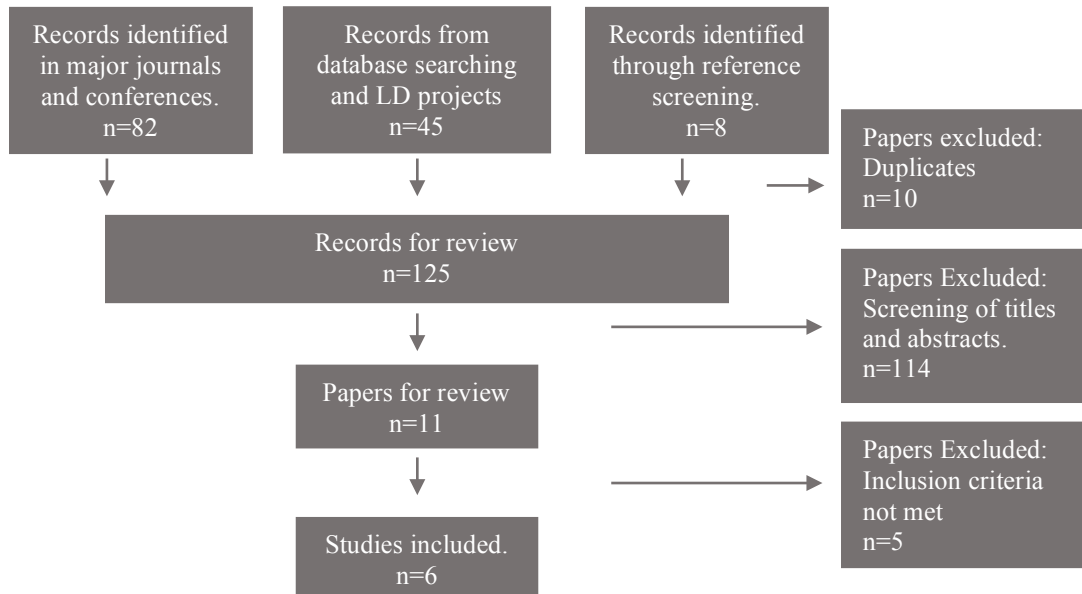
Figure 1. **Flow-chart illustrating the search strategy, and inclusion/exclusion criteria adapted in the narrative analysis and systematic review.**

The author developed a form for extracting data from the studies that suited the inclusion criteria. The variables of the data extraction included year of publication and study author(s), Scientific Journal Rankings impact point, Number of participants within the papers or methodologies the papers used, the aims of the papers, the learning design tool used in the study, and major findings of the papers.

We derived quality scores for the papers based on the impact factor of the journal, as shown in the Scientific Journal Rankings, that they have been published.

3.0   Findings

Our main search revealed 135 relevant papers from which we selected 125 for abstract review, after removing duplicates. By screening the title and abstract of these papers, 114 of them eliminated and 11 of them remained for full-text review. After full-text review, we identified 6 articles that met our inclusion criteria.

We summarized the findings extracted and synthesized from these papers using the form, as defined in the Methodology section. These are presented in Table 4. In total a hundred teachers' perspectives were revealed on eight different learning design tools.

The average impact point of included articles determined as 1.40. It is calculated according to Scientific Journal Rankings as mentioned in the Methodology section.

Study authors and date	SJR impact point	Participants' Numbers or methodology	Aim(s)	LD Tool(s) used	Major findings
Bennett et al, 2014	2.56	30	To present findings from a study of design practices of university teachers.	Not applicable.	Learning design tools have a potential to futher advance design decisions by engaging sharing practice, knowledge on students, extend beyond dicipline, pedagogy guidance systems, and flexibility.
Prieto et al, 2014	2.56	24	To explore if there is common obstacles teachers face in adoption, and tools features that might attarct to different teachers.	Web College, EDIT2	There is no single learning design tool that covers all needs of all teachers.
Laurillard et al, 2013	1.63	10	To describe the Learning Design Support Environment project, and its goals.	The Learning Designer	Teachers need a theory-driven way that will present characteristics of pedagogy, and help to discover how to utilize learning technologies.
Masterman et al, 2013	0.45	Review of three tools	To review three digital tools to reveal what kind of supports these tools have implemented.	Phoebe, the LAMS Activity Planner and The Learning Designer	In principle, the tools are acceptable. But, technological and socio-cultural challenges affect negatively the adoption of these tools by teachers and educational organizations.
Katsamani and Retalis, 2013	0.54	36	To give an overview of CADMOS and get insights of teachers on CADMOS.	CADMOS	CADMOS found to be user-friendly, allowing teachers to design learning activities flow.
Masterman and Manton, 2011	0.68	Summative Evaluation	To reveal value of learning deisgn tools by teachers.	Phoebe	Learning design support tools have an impact on teachers' practices.

Table 4.   **Summary of Six Studies Revealing the University Teachers' Perspectives, Practices and Needs on Learning Design and Learning Design Tools, Included in a Systematic Review of the English-language Literature Published in between 2010-2016.**

3.1 Teachers' Perceptions

Three of the studies have included teachers' perception on learning design tools. In general, teachers' inclination toward LD tools for designing learning experiences for their students was described as positive. In one study, it is determined that teachers value LD tools, they are receptive to new LD ideas, and they search for opportunities to improve their practices (Bennett et al., 2014). In another study, teachers are reported as being enthusiastic on learning from their peers and build on the work of other teachers (Laurillard et al., 2013).Yet, in one of the studies, it is pointed out that teachers are more likely to adopt materials that are easy to use and relevant to them (Laurillard et al., 2013). Especially, teachers like the ideas of having guidelines all in one place, reference system, support materials available to draw on, access to peers, and idea of building work of others (Masterman & Manton, 2011).

3.2 Teachers' Practices

Three of the reviewed papers report insights on teachers' LD tools practices. In one of these studies, it is cited that some of the teachers perceive their learning as planned based on their belief on learning influence, while other participants consider their learning design as underpinned by theoretical approaches (Bennett et al., 2014). It is pointed out that there are student-related, teachers-related and context-related key influences on teachers' design decisions (Bennett et al., 2014).

Students Related. Students characteristics is one of the important elements in the learning design decisions. The university teachers built up a profile of their students and they are refining their designs on the basis of students' experiences over time (Bennett et al., 2014).
Teachers Related. Teachers' belief about learning and teaching, prior learning design experiences, others' ideas from collegial discussion and literature, knowledge of learning theories affects their design for learning.
Context Related. The collegial context in which university teachers work is a strong influence of their LD decisions. Institutional policy and culture, attributes of unit that includes class size, timetable, and resources like staff, workload, time, and infrastructure have influences on learning design decision of teachers.

In another study, it is revealed that teachers LD strategy does not match with the structure current LD tools have (Masterman & Manton, 2011). Teachers tend to think of what they want to do, then look on the internet for relevant examples and finally assemble together.

3.3 Teachers' Needs

Five studies reported on teachers' needs in the process of learning design using supporting tools. The studies highlighted different needs of teachers in this process. For example, one of the study pointed out that learning design support tools should adopt learning analytics to improve teachers' understanding of their students, have guidance, supporting flexibility within a design, allow teachers be responsive to their students need and interest (Bennett et al., 2014). Flexibility, guidance, usefulness of reflection, and practices are main facilities highlighted by other study as being needed in learning design tools (Prieto et al., 2014). In another study, design requirements summarized as following: offer well-targeted,

recommend LD system, allow users to edit learning designs, support a design process step by step, provide flexibility (Laurillard et al., 2013). Usability, guidance, formalization, pedagogical neutrality, design flexibility, and ready-to-use design templates are indicated to be included in LD tools (Katsamani & Retalis, 2013). In final study, flexibility, guidance, and embracement of social-cultural context are stressed to be took place in learning design tools (Masterman & Manton, 2011).

Other minor functionalities of LD tools, which should not be disregarded are also emphasized in one studies. In this study, the abilities of LD tools' working offline, providing initial learning design templates, simplicity of use, and instantiation of resource automations are pointed out (Prieto et al., 2014).

4.0   Discussion and Conclusion

In this paper, we adopted a systematic review methodology to review the field of learning design tools from the perspectives of practitioners in order to reveal their perspectives, practices and needs of these tools. We defined relevant papers using this method, and we analyzed and present them according to themes driven by our research questions.

The data reveal that university teachers are very positive towards the use of support tools in their design for learning. The desire of teachers should inspire and provoke researchers to increase the number of studies within the field of learning design.

The review also established that higher education teachers do not follow a particular learning design methodology. The literature also provides evidence that current learning design tools do not match teachers' design strategy. It also showed that is more important for the development of improved LD tools in the near future to know how teachers design for learning. So, the next generation of LD tools should be developed with a clear focus on the teachers' needs rather than on researchers'.

Moreover, from the themes "teachers' practices" and "teachers' needs", we derived a list of key elements for learning design, which are shown in Figure 2. These can inform future research in the area and lead to the development of better learning design tools.
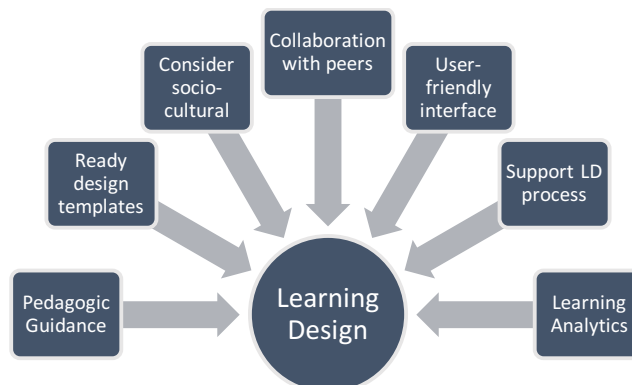

Figure 2.   **Desirable features of Learning Design Tools as derived from the study.**

This study has a methodological and conceptual limitation. The methodological limitation is bias. Even though we conducted a comprehensive literature search, it is possible to have missed some relevant papers. Also, as data extraction was done by an author, it is possible to have missed some important concepts in the papers examined. Conceptual limitation relates to limitations in the studies that were considered in this review.

Despite these limitations, the outcomes of this systematic review could inform future research to advance knowledge in this field. It is worth highlighting one of the outcomes about the limited number of studies on the LD tools adoption by teachers. Further studies and evaluation of LD tools are part of our research agenda in order to develop a comprehensive understanding of teachers' requirements and evaluate the potential adoption of the LD tools in educational organizations.

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