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Abstract

This chapter builds on and brings up to date the work described in Chapter 6. The authors report on a decade of empirical work with teaching practitioners which has led them to conclude that learning designs (by which they mean a specific form of graphical representation and explanatory text) are usable by university teachers. Designs are referred to for guidance and inspiration, in what the authors see as an example of case-based professional learning. Having a classification system seems to support this, even though it is not directly related to subject area. An important finding is that learning designs from the AUTC project can support the integration of pedagogy, technology and content knowledge in practitioners' design thinking.

Keywords

design, practices, teachers, support, learning, stimulus, designs

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Chapter 7

LEARNING DESIGNS AS A STIMULUS AND SUPPORT FOR TEACHERS' DESIGN PRACTICES

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EDITORS' INTRODUCTION

This chapter builds on and brings up to date the work described in Chapter 6. The authors report on a decade of empirical work with teaching practitioners which has led them to conclude that learning designs (by which they mean a specific form of graphical representation and explanatory text) are usable by university teachers. Designs are referred to for guidance and inspiration, in what the authors see as an example of case-based professional learning. Having a classification system seems to support this, even though it is not directly related to subject area. An important finding is that learning designs from the AUTC project can support the integration of pedagogy, technology and content knowledge in practitioners' design thinking.

INTRODUCTION

In the global higher education sector, university teachers are being challenged to improve student learning by effectively integrating new pedagogies and technologies. Quality teaching and educational experiences are considered critical to equip a diverse range of students with the lifelong learning skills essential for full participation in contemporary society.

Educational design has emerged as an important issue with research and development work focused on ways in which university teachers can be supported to design learning experiences for students. A key challenge in this area of inquiry has been the representation of effective designs in forms that can be easily understood by teaching practitioners and thus reusable. This has led to the term 'learning design' being applied to various means for documenting teaching and learning practice to facilitate sharing and reuse by teachers.

Some significant investments have been made to build repositories and/or tools that allow university teachers to document, model, implement, share and adapt educational design ideas, so as to build on good design practice. One of the first large scale projects in Australian higher education was the 'Information and Communication Technologies (ICT) and Their Role in Flexible Learning' project (<http://www.learningdesigns.uow.edu.au>), commissioned by the former Australian Universities Teaching Committee (AUTC) in 2000. This project involved the identification, evaluation, documentation and dissemination of high quality education examples that involved the use of ICT. The outcome of the project, hereafter referred to as the Learning Designs (LD) Project, was a repository of contextualized examples and generic guides called Learning Designs. These Learning Designs were units of study that were described through a graphical representation comprising the sequence of learning activities, supports and resources of the education experience (hereafter referred to as the Learning Design Visual Sequence (LDVS)) and descriptive text. The textual description provided a summary statement and design team details, detailed the tasks, resources and supports, explained the implementation context and provided

a reflective comment by the original designers in terms of the pedagogy employed and any evaluative research conducted. Figure 7.1 shows an example of a LDVS from the LD Project. Similar in format to Figure 6.2 from the previous chapter, this depicts a contextualized learning design.

Insert Figure 7.1 around here

Chapter 6 explained the LD Project in terms of the project team's initial thinking about a taxonomy to classify the different learning foci of the collated Learning Designs. Harper and Oliver (2009) have detailed the project's final implemented taxonomy: see also Agostinho *et al.* (2008) for an explanation of how the LDVS was derived. This pioneering work led to a series of research studies and projects conducted by the authors spanning the past 10 years. This body of work provides important insights about strategies that allow teachers to publish, search for and comment on learning and teaching ideas (irrespective of ICT integration), as well as developing tools to support aspects of the educational design process.

This chapter synthesizes our research work and explains it within the context of international research on learning designs. The chapter is structured based the following key research questions that have guided our research, particularly within the Australian higher education context:

1. How can learning designs from the LD Project be reused by teachers?

2. Can a learning design be consistently and clearly represented?
3. How can learning designs support university teachers in designing quality learning experiences?
4. How can learning designs be used as a stimulus for teacher design thinking?

The chapter concludes by summarising our work and suggesting future research directions.

REUSING AND ADAPTING LEARNING DESIGNS

Building directly on the LD Project through qualitative studies of how teachers engage with learning designs, we are developing a deeper understanding of the role learning designs can play in supporting teachers' design processes. This line of research began in 2004 with a study investigating four members of a teaching team who redesigned a large first year pre-service teacher subject (Bennett, Lockyer & Agostinho 2004; Bennett, Agostinho & Lockyer 2005).

The teaching team's aim was to adopt a problem-based approach customized to meet the needs of students from the different course specialisations (Primary, Early Childhood, and Physical and Health Education). All were experienced teachers from the Faculty of Education, but had not previously used learning designs. Participants were observed and interviewed during a design workshop in which they selected and adapted a problem-based learning design (selected from the LD Project) to suit their context. A key finding from this study was that participants preferred the contextualized examples, which described the design as implemented in its original context, in preference to a more generic 'guide' (Bennett *et al.* 2004). Similar findings

have been reported in later studies (e.g. Falconer *et al.* 2007). Furthermore, participants used the graphical representation, the LDVS, and textual description to become familiar with the design, but thereafter relied on the LDVS to develop their ideas further.

A larger study commencing in 2007 used a multiple case study approach to investigate the design processes of eight university teachers over six to twelve months as they selected and adapted a learning design from the LD Project, and then implemented and reflected on this learning design (see Jones, Bennett & Lockyer 2009, 2011). The university teachers were recruited via Australian professional associations focused on teaching and learning, and were drawn from four universities and represented a range of disciplines and teaching experience. Data was collected during the pre-design, design, implementation and reflection phases of the design, and comprised interviews, unit of work documents and web sites, researcher observations and field notes.

The research was guided by two questions:

1. How do university teachers design a unit of work using a learning design?
2. How does the use of a learning design impact on university teachers' development of technological, pedagogical and content knowledge?

Three main findings from the study are explained below.

1. Learning designs could be readily understood and reused

Participants of all experience levels were able to effectively select, apply and adapt previously documented learning designs according to their own needs. Specifically, the participants selected learning designs that aligned with their pedagogical goals, and in seven out of eight cases participants worked from contextualized examples rather than the generic guides. Interestingly, they did not limit themselves to designs from their own discipline. The finding that participants were able to understand and apply contextualized designs originating from disciplines other than their own suggests that the practice of ‘translating’ learning designs into more generic forms, which was one objective of the LD Project, may be unnecessary. This finding plus the similar finding in the Bennett et al (2004) study suggests that the contextual detail included in a learning design adds to its reusability.

2. Learning designs were used for design ideas and benchmarking

The learning designs were mainly used for design ideas. Participants initially selected learning designs that had aligned with their pedagogical goals and then creatively adapted the details to suit their needs. Thus, for most participants the learning design was a source of ideas, rather than a model to replicate. In fact, early in the study a number of participants expressed an aversion to being ‘restricted’ by a prescribed design template. Participants also used the learning design LDVS and text in a variety of ways, specifically:

- ⤴ As an outline of the pedagogical process (text and LDVS)
- ⤴ To focus their design steps and activities (text and LDVS)
- ⤴ For clarification of detail (text)

- ⤴ As a checklist for resources, tasks, supports and their connections (LDVS)
- ⤴ In one case, to document and map design thinking (LDVS).

In addition to design ideas and guidance, most participants (7 of 8) used the learning designs as benchmarks or models of good practice with which to compare their previous design thinking and work. Comparing the design ideas of their work against their chosen learning design provided participants with an indication of ‘quality’ of their designs and some participants reported this comparison gave them more confidence in their abilities and knowledge as a designer.

3. Learning designs supported integration of technology, pedagogy and content

One of the significant outcomes of using learning designs was the observed and reported impact on participants’ integration of technology, pedagogy and content. The study drew on the notion of pedagogical content knowledge (PCK) (Shulman 1986), which attempts to describe the thinking a teacher undertakes when deciding how to teach a particular concept effectively, that is how they combine their knowledge of content with their knowledge of pedagogy. This idea has been extended to incorporate technology; thus the concept of Technological Pedagogical Content Knowledge (TPCK) (Mishra & Koehler 2006). TPCK refers to the thinking required of a teacher to determine how technology should be integrated with effective pedagogy to teach a particular concept. The study found:

1. Designing with a learning design was reported to impact on PCK and/or TPCK in six of the eight cases.

2. Participants designing new units of work or completely redesigning a unit of work tended to report an impact on PCK rather than TPCK.
3. Participants working on smaller changes to more established learning designs reported an impact on their TPCK.

The difference in impact for participants working on new designs compared with participants refining more established designs suggests that, for university teachers designing units of work that will not be fully online, the design goals and thinking occur in two stages: firstly, there is a focus on PCK, which is followed by integration of technology. This is not to say that these participants did not use technology or did not have future plans for greater technology use. However, the goals expressed by the participants suggested, even among experienced technology users, that they saw the development and integration of technology as a longer-term goal to develop over multiple iterations. This is supported by the finding that participants revising more established learning designs reported focusing more on the re-organisation and refinement of existing content in relation to the pedagogical sequence and then on how this refinement of existing content could be integrated within the online environment. This is an area of interest for future research.

The results of these two studies, which address research question one: *How can learning designs from the LD Project be reused by teachers?* provide important insights into the utility of learning designs, in terms of how they are represented, how they are used for different purposes and in different design contexts, and the outcomes that might be achieved. Overall these two studies have shown that the learning designs from the LD Project can be reused by teachers as the participants from these

two studies were able to select, understand and then adapt learning designs to implement in their contexts. Furthermore, the contextualized description was deemed as a useful support in the design process and perhaps preferable to the more generic learning design ‘guide’. Learning designs can be seen as a way to generate and inspire ideas rather than serve as a ‘prescriptive pedagogy’ and provide models of good practice against which university teachers can compare their own design thinking and work.

It is pertinent to note that research studies as the two explained here follow design activities conducted over a sustained period. Data collection is thus intensive and time-consuming, thereby limiting the number of participants that can be included in a study. Further research to investigate emerging questions about the role of discipline, teaching expertise and context are necessary extension of this work.

REPRESENTING AND DESCRIBING LEARNING DESIGNS

As stated in the previous chapter, the learning design representation derived from the LD project, that is, the LDVS and accompanying text, provided the opportunity for further investigation about how learning designs could be described and represented. Below is a summary of two studies that address research question two: *Can a learning design be consistently and clearly represented?* The first study focused on the perceived usefulness of the learning design representation format of the LD Project. The second study examined whether the actual learning design descriptions provided in the LD Project repository described a learning design sufficiently so that it can be easily understood. The findings are explained below.

Study 1: Perceived usefulness of the LDVS to support university teachers' practice

This study, reported in Agostinho (2011), explored how university educational designers and teachers used the LDVS in their own teaching practice and how it supported their design processes. Eleven participants were interviewed. Most of them had used the LDVS to produce their own visual representation of their own teaching (8 of 11) or had adopted the *tasks, resources, supports*, framework in a tabular written form to document their teaching ideas (2 of 11). Some of the eight participants made their own particular modifications to the visual sequence to suit their needs, such as substituting symbols in the visual representation, ie., using a 'cloud' image instead of a triangle to represent resources; adding an extra support column to represent how teachers could be supported when implementing the learning design, and representing the visual sequence in a horizontal rather than a vertical orientation.

Of the 10 participants that had either created their own LDVS or applied the tasks, resources, supports framework, the purpose for doing so was: to document their own teaching ideas, or use it as a design tool to discuss teaching ideas with colleagues, or use their LDVS as an analysis tool to reflect on their learning design to check their understanding and see if anything (such as tasks, resources or support) was missing.

Overall, all participants thought that the LDVS was useful in their teaching as the visual aspect provided an overall summary of the learning design, the structure of tasks, resources and supports, helped participants better understand their learning designs, it was simple to use and they could adapt the visual format to suit their needs. This study provides some evidence for the LDVS being a useful tool to support a university teachers' design process. The study's limitations were that use of LDVS

was based on participants self-reporting retrospectively, and that it did not investigate how the LDVS formalism could be used as a way to encourage reuse of other people's designs. A richer insight would be to observe teachers whilst engaging in design to gain a deeper understanding of how tools such as LDVS could be used to support the design process. The study by Jones, explained above, addressed these limitations by monitoring the design processes of university teachers' use of learning designs from the LD Project.

There is evidence of further uptake of the LDVS as a mechanism to document learning designs – interestingly from practitioners with no direct involvement in the original LD Project (for example, see Cooner 2010; and Elliott *et al.* 2010).

Study 2: Determining what constitutes an 'effective' learning design description

Since completion of the LD Project an international agenda has contributed to further understanding about how learning designs can be represented to facilitate sharing and reuse, the definition of a 'learning design' has evolved, several learning design presentations have emerged and significant technical developments have been made in terms of interoperability (see Falconer *et al.* 2007; Lockyer *et al.* 2009; Masterman 2006; and Tattersall & Koper 2005). Thus this second study arose from the need to revisit the literature and examine more recent thinking about what constituted an 'effective' learning design description and compare that with the learning design representation and descriptions in the LD Project.

This literature review (reported in Agostinho *et al.* 2009), which included international research from 2004-2008 about practitioners' perceptions of different

learning design representations, found that an ‘effective’ learning design description should provide the following:

- Clear and explicit description of the pedagogy of the learning design,
- Some form of ‘quality’ rating about the learning design, eg., evaluative findings, and
- Explicit guidance/advice about how the learning design could be reused.

An instrument was developed based on these characteristics to analyse the 32 contextual examples in the LD Project. Six learning design descriptions were considered effective descriptions (refer to Agostinho *et al.* 2009) and formed the basis for the research team to further develop and refine to serve as input into a larger study, explained below.

LEARNING DESIGNS AS SUPPORTS FOR UNIVERSITY TEACHERS

A larger scale study, funded by the Australian Research Council, began in 2007 to examine a missing piece evident in the learning designs literature, that is: how teachers actually design; the extent to which they have freedom to innovate with their designs; and the lack of practical, relevant and flexible supports and tools to help university teachers as they design. This investigation provides some answers to the third research question: *How can learning designs support university teachers in designing quality learning experiences?*

The research study consisted of three phases (illustrated in Figure 7.2).

Insert Figure 7.2 around here

The first phase of the research focused on investigating how teachers design learning experiences as a basis for considering what role design support tools might play. Despite the significant body of research into university teachers' conceptions of teaching and substantial funding invested in learning design approaches and tools, surprisingly little is known about how teachers actually design. Thirty Australian university teachers were recruited from three broad disciplinary groupings: the Sciences, the Arts, and the Professions (see Bennett *et al.* 2011 for the discipline grouping rationale). Participants were interviewed about their design practices. The semi-structured protocol posed questions about the contexts in which teachers worked, their conceptions of teaching and learning, their disciplinary background, their usual practices when designing a unit for the first time and when revising a unit they had previously taught, the key influences on their design decisions and the supports they used. Key findings from this phase of the study are presented below (see Bennett *et al.* 2011 for a detailed account).

Australian university teachers can exercise a high degree of autonomy in terms of design, and this suggests there may be opportunities for teachers to consider using reusable learning designs. Specifically, 40% of participants taught in a context in which there was no set curriculum, thus allowing them the freedom to design units according to their own preferences and the needs of their students. More than half of the participants (60%) taught within a set curriculum for which there were pre-set guidelines to follow, such as predetermined learning outcomes and required content to cover. Yet, the majority of these teachers explained that there was still flexibility

within this structure for them to decide how the units should be designed. All but two participants cited institutional structures as having some impact on their design decisions. Specifically, planning processes determined how often major changes could be made to units, assessment policies provided broad guidelines on the types of strategies that could be used and in what combination, and class schedules determined what teaching and learning contexts were available. Two participants stated the institutional policies did not restrict their design decisions in any way.

Participants were regularly involved in both the design and redesign of new units. Most had been involved in designing a unit from scratch (83%) and a majority described revising a unit each time they taught it to continually improve it (73%). This suggests that participants experienced both continuity and variation in their teaching commitments. Eighteen (60%) explained that they tended to teach the same units each year, and this was particularly so for those involved in large, core units. However there were also opportunities to teach new units, often on more specialized topics with smaller cohorts. Only seven (23%) worked alone when designing a unit, while the remainder engaged in both team and individual design. Group design usually occurred when undertaking overall planning of a degree program or specialisation, and in the case of large subjects involving a team of teaching staff. Smaller units, such as advanced level electives, were usually designed by one teacher, though often in consultation with colleagues.

Overall, these findings suggest that the Australian university context has some of the necessary pre-conditions for adoption of learning design and design support tools, as teachers have scope to make key decisions about how and what they teach. While

helpful in providing insights into teachers' design practices, data from 30 Australian participants limits the ability to derive general conclusions. The research team is now undertaking further interviews with a view to developing an online survey to collect data across an international context.

Phases 2 and 3 of this study investigated how learning designs could serve as online support for teachers within an online learning management system (LMS). The rationale for this investigation was that the lack of embedded design support limits existing approaches because a teacher must either start with an empty shell or use a pre-existing contextualized unit of work. Neither of these options offer guidance *in situ* about opportunities for different teaching and learning strategies or when and why certain tools might facilitate those strategies when adapted to different contexts. The idea of embedding design support within the online environment of a learning management system is an entirely new strategy to supporting online design. None of the major learning management systems currently embed specific supports for designing for effective learning. All provide functions to help teachers create and arrange content, and add communications tools. All provide technical support manuals. Recent developments have focused on expanding the range of teaching and learning tools available within a learning management system or developing visual interfaces to help teachers create 'digital lesson plans' external to the LMS that can be stored and used by others (Conole & Fill 2005; Dalziel 2007; Masterman & Manton 2011), but none offer guidance within the LMS about how the tools might be used to promote high quality learning.

The first step (Phase 2) was to assess the learning designs developed for the LD Project according to a more rigorous set of criteria to determine their quality, relevance and adaptability. An evaluation framework developed and applied to the LD Project repository resulted in six of the original set of 32 exemplars being appropriate for further development (this study is explained above and reported in Agostinho *et al.* 2009). The research team then refined these six learning designs to simplify the pedagogical expression and developed a proof of concept in the in the form of supports through embedded learning designs and design tools in the LMS, Janison Toolbox (www.janison.com.au).

Phase 3 of the research investigated the use of international standards for sharing educational designs and integrating digital resources. These had been the focus of intense technical research, but with little practical application in education. One priority was the IMS Learning Design (IMS-LD) specification, which provides a standardized computer language developed specifically for describing educational processes (Koper & Tattersall 2005). The underpinning concept was that a single lesson or whole course could be saved as an IMS-LD document and then read into any LMS compliant with the standard (illustrated in Figure 7.3).

Insert Figure 7.3 around here

After creating a lesson or course in an LMS and saving it as in IMS-LD document, a teacher could share it within a teaching team, institution or digital library, allow it to

be edited in any other LMS that complies with the standard, and the new version could be saved as a new IMS-LD document. This approach would not only make particular lessons or courses sharable so that they can be reused and adapted by others, but the learning designs on which they are based could also be shared and reused. Work conducted on this aspect of the project to date demonstrated that while technically feasible, production of a fully operating system involved complexity beyond the scope of the grant. Work did not continue beyond this point because despite being the only specification available for interoperability of online learning, IMS-LD has not been incorporated into learning management systems and support tools. As to the reason for this, perceptions of complexity have been considered a main barrier to adoption yet there is continuing debate about the lack of adoption of IMS-LD (Derntl *et al.* 2012).

Overall, the main insights from this research study are:

- Within the Australian context, the uses of learning designs as supports for university teachers is feasible and beneficial.
- Learning design descriptions that provide contextual detail, offer advice on how to reuse, and provide evaluative data can be deemed effective descriptions.
- Incorporating learning designs within a LMS in the form of design guidance is worthy of further exploration.
- Technical interoperability whilst technically feasible, is not a fruitful research direction unless there is widespread adoption of IMS-LD by LMS designers and the sector generally.

CAN LEARNING DESIGNS BE A STIMULUS FOR TEACHER DESIGN THINKING?

A key goal for the LD Project was one of reusability, that is, providing examples of good education and technology integration practice for teachers to apply to their own context. This focus was consistent with other projects concurrently undertaken worldwide which were interested in practical and technical aspects of creating design collections (e.g. Conole *et al.* 2005). Since then, some related work has considered socio-cultural aspects of sharing such types of designs among teachers (e.g. Dalziel 2007; Margaryan & Littlejohn 2008).

The research reported in this chapter has gone beyond the original LD Project to better understand the context in which Australian university teachers design and have a sense of how learning designs might support them in their design activities.

However, the limitations of this work and related research internationally make room for a more focused theoretical exploration of how learning designs can be of influence on an individual cognitive level.

In essence, learning designs are cases of teaching practice. They describe an instructional solution to educational problems (what to teach, how to teach, for which learners). As such, the use of learning designs can be theoretically linked to case-based reasoning. Capturing such problems and solutions as a case in the form of a learning design removes some, but not all, context-specific information, allows for understanding and sharing, and the process of adapting the design to an individual's teaching text allows for the development of a new understanding of the case and/or

new cases. These are key characteristics of materials that support case-based reasoning (Kolodner, Owensby & Guzdial 2004).

The future agenda for this research team is to investigate the theoretical basis for learning designs in terms of their effectiveness in stimulating design thinking.

Specifically, the research direction is to ask our fourth research question posed in this chapter: *How can learning designs be used as a stimulus for teacher design thinking?*

The aim is to test how case-based reasoning might occur as an individual teacher engages with the process of selecting, interpreting, adapting and implementing a learning design. From an individual cognitive perspective, the methodological challenge is to investigate this largely unobservable process. Preliminary work has been undertaken with school teachers to investigate the efficacy of the Learning Design graphical representation in the K-12 education context in terms of supporting the design thinking process. Initial findings suggest learning designs may be a useful way to communicate the thinking that can guide the design of a multi-lesson, cross-disciplinary unit of work.

CONCLUSION

This chapter has presented a decade of research inspired from the LD Project. Our research work has provided insight into usability of learning designs and their efficacy in generating teaching ideas. Overall we have shown that learning designs (i.e., the graphical representation and the accompanying text) are usable by university teachers irrespective of both the discipline of the original design and the discipline of the teacher using the design and thus can promote reuse. University teachers report that

learning designs are useful in providing a point of inspiration or reference for their own design ideas in their own teaching context.

Our research has also provided a richer understanding of the Australian higher education teaching context and thus the parameters in which university teacher's design. This understanding, in future, can be compared to other contexts in other countries. It also provides a basis for further research in the area of teacher design thinking. The practical outcomes for the work reported here and future research can lead to further development of tools and supports to aid teachers in their process of design.

REFERENCES

- Agostinho, S. (2011) 'The use of a visual learning design representation to support the design process of teaching in higher education', *Australasian Journal of Educational Technology*, 27(6): 961-978.
- Agostinho, S. Bennett, S., Lockyer, L., Kosta, L., Jones, J. & Harper, B. (2009) 'An examination of learning design descriptions in an existing learning design repository', in *Same places, different spaces, Proceedings ASCILITE Auckland* (pp. 11- 19). Online. Available HTTP_ <http://www.ascilite.org.au/conferences/auckland09/procs/>
- Agostinho, S., Harper, B. M., Oliver, R., Wills, S. & Hedberg, J. (2008) 'A Visual Learning Design Representation to facilitate dissemination and reuse of innovative pedagogical strategies in University Teaching', in L. Botturi & S. Stubbs (eds), *Handbook of Visual Languages for Instructional Design: Theories and Practices* (pp. 380-393). Hershey, PA: Information Science Reference.

- Bennett, S. (2002) *Real live cases in multimedia*. Online. Available HTTP
<<http://www.learningdesigns.uow.edu.au/exemplars/info/LD1/index.html>>
- Bennett, S. Agostinho, S. and Lockyer, L. (2005) 'Reusable learning designs in university education', in T. C. Montgomerie and J. R. Parker (eds), *Proceedings of the IASTED International Conference on Education and Technology* (pp.102-106). Anaheim, CA: ACTA Press.
- Bennett, S., Lockyer, L. & Agostinho, S. (2004) 'Investigating how learning designs can be used as a framework to incorporate learning objects', in R. Atkinson, C. McBeath, D. Jonas-Dwyer and R. Phillips (eds), *Beyond the comfort zone: Proceedings of the 21st ASCILITE Conference* (pp. 116-122). Perth, 5-8 December. Online. Available HTTP
<<http://www.ascilite.org.au/conferences/perth04/procs/bennett.html>> (accessed 31 July 2010).
- Bennett, S., Thomas, L., Agostinho, S., Lockyer, L., Jones, J. & Harper, B. (2011) 'Understanding the design context for Australian university teachers: implications for the future of learning design', *Learning, Media and Technology*, 36(2): 151-167.
- Conole, G. & Fill, K. (2005) 'A learning design toolkit to create pedagogically effective learning activities', *Journal of Interactive Media in Education*, 8.
- Cooner, T. S. (2010) 'Creating opportunities for students in large cohorts to reflect in and on practice: Lessons learnt from a formative evaluation of students' experiences of a technology-enhanced blended learning design', *British Journal of Educational Technology*, 41(2): 271-286.
- Dalziel, J. (2007) 'Building communities of designers', in H. Beetham & R. Sharpe (eds.), *Rethinking pedagogy for a digital age: designing and delivering e-learning*

- (pp. 193-206). New York: Routledge.
- Derntl, M., Neumann, S., Griffiths, D. & Oberhuemer, P. (2012) 'The conceptual structure of IMS Learning Design does not impede its use for authoring', *IEEE Transactions on Learning Technologies*, 5(1): 74-86. Online. Available HTTP <<http://dx.doi.org/10.1109/TLT.2011.25>> (accessed 31 July 2010).
- Elliott, K., Boin, A., Irving, H., Johnson, E. & Galea, V. (2010) *Teaching scientific inquiry skills: A handbook for bioscience educators in Australian universities*. Online. Available HTTP <<http://www.altc.edu.au/resource-teaching-scientific-inquiry-skills-melbourne-2010>> (accessed 31 July 2010).
- Falconer, I., Beetham, H., Oliver, R., Lockyer, L. & Littlejohn, A. (2007) *Mod4L Final Report: Representing Learning Designs*. Online. Available HTTP <<http://www.academy.gcal.ac.uk/mod4l/>> (accessed 31 July 2010).
- Harper, B. & Oliver, R. (2009) 'Developing a taxonomy for learning designs', in L. Lockyer, S. Bennett, S. Agostinho & B. Harper (eds.). *Handbook of Research on Learning Design and Learning Objects: Issues, Applications and Technologies* (pp. 228-242). Hershey, New York: IGI Global.
- Jones, J., Bennett, S. & Lockyer, L. (2011) 'Applying a learning design to the design of a university unit: A single case study', in T. Bastiaens and M. Ebner (Eds.), *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications* (pp. 3340-3349). Chesapeake, VA: AACE. Online. Available HTTP <<http://www.editlib.org/p/38334>> (accessed 31 July 2010).
- Jones, J., Bennett, S. & Lockyer, L. (2009) 'Investigating lecturers' use of learning designs to support technology enhanced course design', in T. Bastiaens et al. (Eds.), *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education* (pp. 2719-2725). Chesapeake,

- VA: AACE. Online. Available <<http://www.editlib.org/p/32870>> (accessed 31 July 2010).
- Kolodner, J. L., Owensby, J. N. & Guzdial, M. (2004) 'Case-based learning aids', in D. H. Jonassen (Ed.), *Handbook of research on educational communications and technology* (pp. 829–861). Mahwah, NJ: L. Erlbaum Associates.
- Koper, R. & Tattersall, C. (2005) (Eds.) *Learning Design: A handbook on modelling and delivering networked education and training*. Berlin: Springer.
- Lockyer, L., Bennett, S., Agostinho, S. & Harper, B. M. (Eds.) (2009) *Handbook of Research of Learning Design and Learning Objects: Issues, Applications, and Technologies*. Hershey, New York: IGI Global.
- Margaryan, A. & Littlejohn, A. (2008) 'Repositories and communities at cross-purposes: Issues in sharing and reuse of digital learning resources', *Journal of Computer Assisted Learning*, 24(4): 333-347.
- Masterman, L. (2006) *The Learning Design Tools Project: An Evaluation of Generic Tools Used in Design for Learning*. JISC. Online. Available HTTP <http://www.jisc.ac.uk/uploaded_documents/LD_Tools_Report_v1.1.pdf> (accessed 31 July 2010).
- Masterman, E. & Manton, M. (2011) 'Teachers' perspectives on digital tools for pedagogic planning and design', *Technology, Pedagogy and Education*, 20(2): 227-246.
- Mishra, P. and Koehler, M. (2006) 'Technological pedagogical content knowledge: A framework for teacher knowledge', *Teachers college record*, 108(6): 1017–1054.
- Shulman, L. (1986) 'Those who understand: Knowledge growth in teaching', *Educational Researcher*, 15(2): 4-14.
- Tattersall, C. and Koper, R. (2005) 'Advances in Learning Design', *Journal of*

Interactive Media in Education, 1.

