A TOOL TO EVALUATE THE POTENTIAL FOR AN ICT-BASED LEARNING DESIGN TO FOSTER "HIGH-QUALITY LEARNING"

Shirley Agostinho
Digital Media Centre
University of Wollongong, AUSTRALIA
shirley_agostinho@uow.edu.au

Ron Oliver
School of Communications and Multimedia
Edith Cowan University, AUSTRALIA
r.oliver@cowan.edu.au

Barry Harper, John Hedberg & Sandra Wills [*]
Faculty of Education, [*]Centre for Educational Development & Interactive Resources
University of Wollongong, AUSTRALIA
barry_harper@uow.edu.au, john_hedberg@uow.edu.au, sandra_wills@uow.edu.au

Abstract

With the aim to facilitate sharing and uptake of high quality ICT-based learning designs amongst academics in higher education, the Australian Universities Teaching Committee funded project: Information and Communication Technologies (ICTs) and Their Role in Flexible Learning examined a number of existing high quality, ICT-based learning implementations to determine if the learning designs employed can be re-disseminated in the form of reusable guidelines, templates, and/or software tools. An evaluation instrument was developed to analyse the degree to which the learning designs have potential to foster high quality learning. This paper focuses on this instrument by describing how it was derived, how it was applied and the feedback received from evaluators about its usefulness. The paper concludes by providing implications for practice on how this tool could itself be reused as both a formative and summative instrument to gauge the potential for other ICT-based learning designs to foster high quality learning.

Keywords
Evaluation, high quality learning, ICT-based learning, learning design

Introduction

Funded by the Australian Universities Teaching Committee (AUTC), the project: *Information and Communication Technologies and Their Role in Flexible Learning,* aims to produce generic/reusable learning design resources to assist academics to create high quality, flexible learning experiences for students. This is to be achieved by:

- Identifying high quality learning designs used in higher education;
- Selecting those that are suitable to be redeveloped in the form of reusable software, templates and/or generic guidelines; and
- Developing these reusable resources and making them accessible from a central web site (hosted by the Commonwealth Department of Education, Science and Training).

The term "learning design" refers to a variety of ways of designing student learning experiences, that is, the sequence of types of activities and interactions. The scope of a learning design may be at the level of a subject/unit or components within a subject. This project is focusing on learning designs implemented with the use of ICT and how flexible learning opportunities for students can be afforded through the use of such technologies. The composition of a learning design, particularly when ICT mediated, has been informed by the work of Oliver (1999) and Oliver and Herrington (2001). Thus, for the scope of this project, a learning design, comprises three key elements: the *tasks* or activities learners are required to perform, the content or *resources* learners interact with, and the *support* mechanisms provided to assist learners to engage with the tasks and resources (see Figure 1).
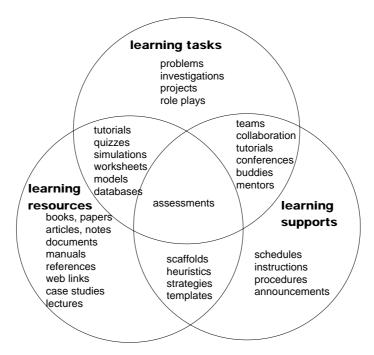

Figure 1: The key elements of a learning design

The project's significance is considerable benefit can be gained by sharing reusable learning design resources among institutions in the current higher education climate where there is pressure to operate at greater efficiency (Cunningham, 1998) yet there is an increased demand to offer flexible learning opportunities to students (Nicoll, 1998).

The following themes, evident in the literature, reinforce the need for this project.
- The study by Alexander and McKenzie (1998) found that a contributing factor to the achievement of successful learning outcomes for an ICT-based learning project was the learning design employed.
- The uptake of the use of ICT in higher education whilst encouraged (Baldwin, 1991) has been impeded by several factors. These include: insufficient ICT-based learning examples for academics to model (Tsichritzis, 1999); change barriers such as lack of time, support and training to change current practice (Collis, 1998); and a lack of "sharing", that is, low levels of dissemination of ICT-based learning projects beyond the originating institution (Alexander & McKenzie, 1998).
- There is a lack of instructional design models to guide practitioners in the use of ICT in teaching (Dijkstra, Collis, & Eseryel, 1999). However, a reason why a robust set of generic design principles in the use of ICT for educators is not forthcoming from the literature is due to the many ways ICT can be used in a learning environment. For example, various design principles presented in Khan (1997) are dependent on how the designers wish to employ ICT and their theoretical views about "learning" (see Harasim, Calvert, & Groeneboer, 1997; Kirkley and Duffy, 1997; McLennan, 1997; and Ritchie and Hoffman, 1997).

- Whilst much work is being conducted in the digital repository and "learning objects" arena (two examples include Merlot: http://taste.merlot.org/ and Academic Advanced Distributed Learning Co-Lab: http://www.ariadne.unil.ch/), there is little research being conducted in comparison in devising "containing frameworks" to place such digital resources (Koper, 2002).

Development of an Instrument to gauge the potential for "high quality learning"

Crucial to the project has been the development of an evaluation instrument, referred to as the *Evaluation and Redevelopment Framework (ERF),* to facilitate the following two objectives:
- The identification of learning designs (implemented with ICT) that foster high quality learning experiences; and
- To determine whether such learning designs have the potential for redevelopment in a generic/reusable form.

The need to develop this instrument is highlighted by the paucity of research focused on evaluating ICT-based learning projects in terms of their influence on student learning (Bain, 1999; Owston, 1997; Reeves & Reeves, 1997). The study by Alexander and McKenzie (1998) revealed a lack of effective evaluation being performed and Alexander (1999) concluded that this is a major impediment for change in higher education:

> The current lack of effective evaluation may be one reason why few CIT innovations are used outside the institution where they are developed…Few academics are likely to accept an innovation at face value or on anecdotal claims. Without effective, scholarly evaluation, even well designed innovations are unlikely to achieve wider dissemination, and the potential benefits of CIT for learning in higher education are unlikely to be realised. (p. 182)

Furthermore, there are few existing rubrics, frameworks, and instruments which can be somewhat easily applied to assist academics to conduct evaluations of ICT-based learning environment in terms of effectiveness on student learning (Oliver, McLoughlin, & Herrington, 2001).

The two main project activities conducted to develop the evaluation instrument included characterising High Quality Learning and developing the ERF instrumentation.

Characterising High Quality Learning

The project commissioned Professor David Boud and Associate Professor Michael Prosser for their expertise in learning in higher education to develop a discussion paper about what constitutes "high quality learning". Their ideas in conjunction with feedback from the project team led to the development of a set of principles for high quality student learning in higher education (Boud & Prosser, 2001). The principles describe characteristics of a high quality learning design in higher education from a learning perspective.

Boud and Prosser (2001) argue that a learning design needs to address the following four principles in order for the potential of high quality learning to be realised:
- *Engage learners:* Considering learners' prior knowledge and their desires and building on their expectations
- *Acknowledge the learning context:* Considering how the implementation of the learning design (be it a one class session, over the period of a few weeks, or the entire subject) is positioned within the broader program of study for the learner.
- *Challenge learners*: Seeking the active participation of learners, encouraging learners to be self-critical and supporting learners' ampliative skills.
- *Provide practice:* Encouraging learners to articulate and demonstrate to themselves and their peers what they are learning.

In different learning contexts some of these principles may be more prominent than others, however, all four principles are considered important in any higher education context. The principles are holistic in that they incorporate both learning outcomes and learning processes and are based on the premise that learning arises from what students experience from an

implementation of a learning design. Designers/educators need to examine their learning designs from the perspective of their impact on learning, that is, placing themselves in the "students' shoes" and thus examining their learning designs from the student perspective.

Developing the ERF instrumentation

The project team planned to generate an evaluation instrument that incorporated the four Boud and Prosser key principles via a series of questions. However, in order for the instrument to be applied successfully, the following issues needed consideration:
- The potential for a learning design to foster high quality learning could only be assessed by applying the Boud and Prosser principles to an actual *implementation* of a learning design. Thus, a form/questionnaire that requested all necessary information about a learning design implementation needed to be designed.
- There was need for a protocol to describe a learning design in a consistent and concise manner yet distill its essence.
- The process could only hope to evaluate the potential for an ICT-based learning design to foster high quality learning.
- There was a need to provide a mechanism to determine the suitability of a learning design for redevelopment in a generic/reusable form.

Two workshops were conducted early in the project to address how to incorporate these issues into the ERF and to formatively evaluate the revised instrument (Harper, Oliver & Agostinho, 2001). The ERF subsequently underwent further refinement by the project team based on feedback obtained from expert reviews and a further two formative evaluation exercises were conducted. To date, the ERF has undergone eight revisions.

The final ERF instrumentation comprised three main instruments: (accessible from the project web site: http://www.learningdesigns.uow.edu.au/Activities/evalinstrument.html)
- *Learning Design Submission Form*: completed by the designer(s)
- *Learning Design Evaluation Worksheet:* completed individually by two evaluators.
- *Learning Design Evaluation Form*: A team of two evaluators reach consensus and submit one evaluation report.

Information sought from the submission form included:
- A description of the learning design in terms of the tasks, resources, support mechanisms implemented; duration of the learning design, discipline used for, number of students catered for, and positioning within the broader program of study for the learners
- Planned learning outcomes
- Learner profile
- Assessment requirements
- Information technology requirements
- Delivery context
- Research findings about the learning design

In additional, all resources utilised by the learners were requested for submission.

The worksheet and evaluation form comprised eight questions. The worksheet explained how to complete the instrument and enabled the evaluators to make individual notes. The evaluation form (completed by both evaluators) served as the final evaluation report. A compressed version of the *ERF: Learning Design Evaluation Form* is provided as an appendix.

Implementation of the Evaluation Instrument

The project team identified over 50 potential ICT-based learning exemplars for examination and 28 ICT-based learning exemplars were selected for evaluation. Two evaluators were allocated to each learning design exemplar to conduct the evaluation. An international ERF team of over 60 experts comprising educational technology and/or pedagogy expertise was compiled.

The ERF was implemented as follows:
1. Designers of the learning design exemplars were contacted and invited to participate in the project. Those willing to participate completed the *ERF: Learning Design Submission Form.*
2. Completed *ERF: Learning Design Submission Forms* were checked for all required information and submission of resources.
3. The learning design exemplar materials were distributed to a team of two evaluators based on the following criteria:
   - Evaluation Team comprised content expertise relevant to learning design exemplar;
   - Evaluation Team and learning design exemplar represented different institutions;
   - Learning design exemplar resources provided online were allocated to evaluators overseas or teams that were geographically separated.

Evaluators were notified via email of their colleague with whom they were to collaborate and the learning design exemplar they were to evaluate. They were requested to complete the evaluation within a two to three-week time frame and the completed evaluation was to be submitted electronically to the project manager.

Each evaluation team was also requested to provide feedback about their experience in applying the ERF in terms of:
- The amount of time required to complete the evaluation;
- The collaborative process undertaken to reach consensus;
- Perceptions of the usefulness and/or limitations of the instrument; and
- Any difficulties experienced in applying the evaluation instrument.

Feedback about the Learning Design Evaluation Process

Of the 28 learning design exemplars that were evaluated, four were evaluated by project team members. Thus, 24 teams were requested to provide feedback and as a result, 22 teams provided feedback (via email).

The evaluation exercise was somewhat of a time intensive task for each evaluator. The time taken to complete each evaluation varied. For example, the breakdown of average time taken for each evaluator was as follows: 13 teams took on average 3 to 5 hours to complete the evaluation, 5 teams reported taking approximately 5.5 to 8 hours to complete the evaluation, and 4 teams reported that they spent on average more than 8 hours to complete the evaluation.

The majority of teams performed the evaluation by firstly working through the learning design exemplar materials and instrument independently, then discussing and negotiating their findings with their allocated colleague, and then compiling a combined typed report to submit to the project manager. The negotiation/discussion process occurred either face-to-face, via telephone and/or via email. A few teams chose to work through the materials and evaluation together face-to-face.

The comments made about perceptions of usefulness, limitations, and difficulties were analysed by: i. collating these comments, ii. reviewing the data several times, iii. identifying the main issues that surfaced, and iv. determining the frequency of these issues. If three or more comments referred to an issue, the issue was classified as a theme.

The themes that surfaced (in order of predominance) are as follows.

Some questions overlapped, some were ambiguous, some didn't seem to fit/match, and some issues could have been more explicitly catered for: Eleven teams made comments related to this theme. Some questions were considered ambiguous (particularly Questions 6 and 7 which referred to describing the learning design–the former in more detail than the later) and some questions were considered inappropriate or non-applicable to the exemplar being evaluated. A few teams commented that the instrument was repetitive as some questions overlapped, whilst, others highlighted issues that could have been given more emphasis in the instrument. These issues are outlined below as well as some suggestions on how the instrument could be improved:

"The choice of sections (learner engagement, context etc) was interesting – a section on collaboration would have been helpful. The 'challenge' section seemed to overlap with the 'engagement' section as they deal with similar concepts. Also the subheadings under each section did not always fit well with our ideas of what should be in that section. Assessment could have been in a section on its own. Also comments on technical features did not seem to have a place, and these do affect the design."

"My research shows that the structure of the application itself can impact on learning (interface design, navigation, communication design etc) - there wasn't an explicit section to address this aspect."

The instrument was useful as a structured guide to evaluate the high quality learning potential of a learning design: Ten teams explicitly stated that they found the instrument useful, although it required a lot of work. Two representative comments include:

"It seems an excellent and thorough process if one is looking for a formally documented QA procedure but fairly hard work as a way of reaching working judgements. I think the main reasons for the time it takes is the effort of reading oneself into the volume of material and the cross referencing one then has to do to track down the answers to questions."

"The instrument facilitated the collaborative completion of the task…It really focussed our thinking and made it easier to organise and my thoughts. Others might say the task took too long, the sheets were too long…I thought it was elegant, it maintained a student focus, and it helped us to analyse the complex material effectively."

Familiarity with the instrument is required in order to apply it well: Four teams experienced difficulty in applying the instrument based on their unfamiliarity with it. Illustrative comments include:

"Difficulty related to me converting my understanding to the language used - not a big deal but subtle enough. It would be easier a second time."

"As with all criteria designed by someone else, they were difficult to apply. If we had more ownership of the criteria, we may have understood them better and found them easier to apply."

"Team of two reviewers is a good idea, but at least one needs more understanding/experience of the instrument and/or project purpose – which raises the question whether the instrument should be considered stand-alone or whether training in using it is needed."

It is difficult to make a judgement about the potential for high quality learning in a learning design when not all the data is available: Three teams commented that it was difficult to make a judgement when key information about the learning design exemplar was lacking. Two indicative responses are:

"If we had been able to talk to the authors…we could have evaluated that properly…there was insufficient data and I think the opportunity to email or talk to the authors would have helped clarify issues."

"Weed out entries that don't provide evaluation evidence and/or access to all the necessary data (eg., in this course we were not able to see any of the key materials about the process – conferences, reflective diaries, etc). There are very good reasons for this in terms of ethics/confidentiality – but it does mean that making a valid judgement about the quality of the learning experience is almost impossible."

Implications for the reuse of the Evaluation Instrument

The feedback indicated that overall, the instrument was useful in facilitating the evaluation of a learning design, yet the structure and format of some of the questions could be reviewed. The issue about having access to the appropriate data gives way to the idea that the instrument could serve well as an evaluation tool by which designers/educators might be able to judge and assess the quality of their own learning designs in both a formative and summative manner.

To further examine the reliability of the ERF, two learning design exemplars were evaluated by separate teams to determine whether the evaluation produced similar results. The completed evaluations were compared and it was found that for both evaluations for each learning design

exemplar, a similar ranking in terms of each of the four Boud and Prosser principles was produced. Interestingly, the qualitative descriptions of the same learning designs varied in terms of both quantity and content. This suggested that whilst this instrument can gauge the potential for high quality learning, there was an element of interpretation and judgement required in its use that depended in some ways on the background and experience of the user. It was apparent that as a tool for evaluating the potential effectiveness of a learning design, the instrument was relatively reliable among different users even when their perceptions of various elements of the design differed. Factors that might improve reliability of the instrument could include:

- the provision of more detailed instructions in it use; and
- increased user familiarity with the elements of the instrument through use and experience.

Example of application as a formative evaluation tool

As a formative evaluation tool, designers/educators could apply this instrument before implementing a newly created learning design to gauge whether the learning design has the *potential* to facilitate high quality learning. In this application, the instrument could serve as a checklist to ensure the four Boud and Prosser (2001) principles are considered.

The instrument could be applied in the following way:

1. Complete the *ERF: Learning Design Submission Form* but disregard the request to submit evaluation findings.
2. Apply Questions 1 to 7 of the *ERF: Learning Design Evaluation Form* (refer to the appendix) and make assumptions about the learners, that is, walk in the "students' shoes". (Questions 6 and 7 may be considered optional if the instrument is applied by the designer as they refer to describing the learning design. This, however, could provide a reflective opportunity for the designer/educator to consider the key aspects of their learning design.)

Example of application as a summative evaluation tool

As a summative evaluation tool, designers/educators could apply this instrument after implementing their learning design to gauge whether it actually did facilitate high quality learning. Student feedback can be collected to serve as an input source. In fact, the advantage the designer has in applying this instrument over the evaluators in this project is that the designer/educator has direct access to student data. For example, the following comment, made by one evaluation team, reinforces this:

> "The range of areas covered was comprehensive, however it was a big ask for reviewers isolated from the context to really evaluate contexts. In other words, we had to make assumptions, guesses and speculations about a number of contextual issues….The approach seems to evaluate the "opportunity"…afforded by the design but the context in which it is being provided is not really able to be determined by this type of review approach and thus the possible effectiveness or transfer opportunity can't really be gauged in this way. If evaluation study data related to student use - from the learning design owners were provided that might help in the assessment of some dimensions of the ERF."

To serve the function of a summative evaluation tool, the instrument could be applied in the following way:

1. Complete the *ERF: Learning Design Submission Form.* In terms of evaluative findings, some form of student feedback must be collected and analysed.
2. Apply Questions 1 to 7 of the *ERF: Learning Design Evaluation Form* (refer to the appendix) and refer to the student feedback to answer the questions. (Questions 6 and 7 may be considered optional.)

Conclusion

As academics in higher education face the ongoing push to implement ICT in their teaching, not only is there a need for professional development to assist them to design and implement effective ICT-based learning environments, but there is also a pressing need to provide them with tools to assist them to assess whether their learning designs can be, or are indeed, effective. The use of the evaluation instrument described in this paper can provide such assistance. The ERF has been

designed to highlight the important elements in learning environments that contribute to high quality learning experiences. The ERF will continue to be an important element in our project and through its use and reuse, we expect to fine-tune its elements and application through our own formative evaluations. Teachers and researchers interested in applying the ERF in their own settings will find this tool to be a valuable resource. It provides a means not only to evaluate the potential success of existing learning settings but also to guide educators in the process of designing and planning learning settings.

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Additional Information

Appendix: ERF: Learning Design Evaluation Form

1a. How does the learning design support Learner Engagement?
- Identifies learner goals, intentions and expectations
- Uses prior experiences
- Enables accessing key concepts in many ways
- Opportunities for peer interaction and feedback
- Assessment supports engagement
- Supports reflection and consolidation
- Engages students affectively
- Allows learner control of learning

<fill in your comments here>

1b. How well does the learning design support Learner Engagement?
(Place an X on the following range)
Very poorly | _____| Very effectively

2a. How does the learning design acknowledge the learning context?
- Links to the field
- Links to broader context
- Accounts for students' circumstances
- Provides for application of concepts
- Enables links to other contexts
- Asks realistic knowledge demands
- Supports multiple cultures and diversity
- Matches assessment to outcomes

<fill in your comments here>

2b. How well does the learning design acknowledge the learning context?
(Place an X on the following range)
Very poorly | _____| Very effectively

3a. How does the learning design seek to challenge learners?
- Questions student's knowledge base
- Highlights limits in knowledge base
- Supports student ampliative skills
- Equips students to plan other learning activities
- Encourages self-criticism

<fill in your comments here>

3b. How well does the learning design challenge learners?
(Place an X on the following range)
Very poorly | _____| Very effectively

4a. How does the learning design provide practice?
- Encourages student communication and demonstration
- Provides feedback at key points
- Equips students to learn appropriately
- Models expected performance
- Encourages learner confidence and practice
- Aligns goals, tasks and assessment

<fill in your comments here>

4b. How well does the learning design provide practice?

(Place an X on the following range)
Very poorly | _____ | Very effectively

5. **Infrastructure and Technology assessment: How do the technologies employed, their supportive systems and particular implementation facilitate the learning design?**
   - Technology affordances
   - Scalability of design
   - Applicability in different contexts
   - Transferability to other knowledge domains
   - Requires special sets of skills
   - Costs of implementation in other contexts
   <fill in your comments here>

6. **Description of the Learning Design**
   Please provide a **generic** description of the learning design in terms of the following:
   - Planned learning outcomes
   - Activities/process that characterise the learning design
   - Resources that characterise the learning design
   - Support mechanisms that characterise the learning design
   <fill in your comments here>

7. **Summary description of the learning design**
   <fill in your comments here>

8. **Suitability for Redevelopment**
   a. Upon review of your answers for all the above questions, do you think this learning design has elements that could be redeveloped as a generic learning design?
   (Select/highlight your choice.)
   - Yes
   - Yes, but with the following changes/additions (gaps or deficiencies identified when answering questions).
   - No, please state why.

   b. What elements of the learning design should be considered/included in a redevelopment (refer to Question 6 for assistance).

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