2003

Online learning designs in the training sector

Ron Oliver
Edith Cowan University

Vivienne Blanksby

Oliver, R. & Blanksby, V. (2003). Online learning designs in the training sector. In G.Crisp, D. Thiele, I. Scholten, S. Barker & J. Baron (Eds.) *Interact, Integrate, Impact: Proceedings of the 20th Annual Conference of ASCILITE* (pp 364-374). Adelaide, ASCILITE.

ONLINE LEARNING DESIGNS IN THE TRAINING SECTOR

Ron Oliver,
Edith Cowan University, Western Australia,
r.oliver@ecu.edu.au

Vivienne Blanksby,
Office of Training and Tertiary Education, Victoria Australia
Blanksby.Vivienne.l@edumail.vic.gov.au

Abstract

This paper describes current activities within the vocational education training (VET) sector in Australia where traditional views of teaching and learning for training are being challenged. The paper showcases innovative and leading edge applications of technology in the National Flexible Toolbox Project and draws on the history of this project to demonstrate current thinking within the Australian VET sector in relation to student learning. The paper examines the learning designs and resources that have been developed across the past five years in the National Flexible Toolbox Project and uses the outcomes to argue and demonstrate its findings.

Keywords

Training, education, technology-based learning, online learning, learning designs, instructional design

Introduction

There are many models of education that currently guide the ways in which teachers develop and implement learning experiences for their students. Traditionally in classrooms and formal learning settings, teachers have assumed a leadership role and presented their learners with very directed learning experiences that reflect their position as content and pedagogy experts. The content in classroom-based learning has been typically based around learning objectives which promote knowledge and understanding of the planned curriculum. In recent years, accepted trends in school and university education have embraced the goal of developing self-sufficient and independent learners whose skills and expertise extend beyond the formal curriculum being presented.

In the workplace and industry, the education of workers typically involves forms of training. The purpose of training is to provide the workers with the skills needed to carry out their occupations efficiently and safely. It involves the acquisition of technology which permits employees to perform their present job to standards and it improves human performance on the job the employee is presently doing or is being hired to do (Brown, 1995). Traditionally, the outcomes from training have been measured in different ways to the outcomes of schooling. Workers are required to attain mastery of the process or content. If mastery is not achieved, the training is usually continued until the worker is able to demonstrate the

required competence. Assessment is based on criteria of performance and the training is intended to see that all participants are able to succeed.

For many years, there has been a significant difference in the delivery of programs in the education and training sectors. Teachers have assumed different roles, students have been given different responsibilities and the curricula have differed remarkably. But today we are seeing a diminution of the differences. Schooling is learning from training that it is important to set competencies and capabilities as criteria for success in learning. The training sector recognises that apart from the specific skills needed to operate a machine or to complete a task, it is important that workers can manage their work role, deal with contingencies and interact effectively in the workplace environment. There is more emphasis in training on underpinning knowledge for broader understanding, and on the ability to make decisions at the appropriate level of responsibility. Universities and TAFE institutions are now working more closely with shared and articulated programs. Within these areas of overlap and mutual benefits, we are now seeing high quality learning settings being developed in the VET sector which challenge the notions that teaching and learning in the training sector lags behind universities and schools. This paper describes a project which provides strong evidence of the advancements of teaching and learning in the VET sector in Australia.

Flexible Learning

The emergence of learning technologies as supports for all forms of education and training has seen their rapid uptake in both the education and training sectors. Contemporary patterns of use of technology in the delivery of programs provides a means to explore once again any differences that are apparent between the education and training sectors in their delivery of courses. Contemporary educational theory clearly demonstrates that the process of learning is not an activity that differs depending on the sector in which the learner is found. The theories of learning that appear to best predict and describe student learning of all ages and types are those based on constructivist principles (eg. Duffy & Cunningham, 1996). These principles posit that learning is achieved by the active construction of knowledge supported by various perspectives within meaningful contexts. In constructivist theories, social interactions are seen to play a critical role in the processes of learning and cognition (eg. Vygotsky, 1978). These settings also recognise the value of the experiences and previous learning that students bring to the setting.

The education literature abounds with descriptions and discussions of the forms of instructional settings that best support learners' needs. Many authors have attempted to describe what they perceive as the principal attributes of quality learning settings. Quality learning settings in this context are those which provide the greatest supports for student learning by such means as: promoting deep learning rather than surface learning; supporting knowledge construction; developing transferable learning; catering for individuals; and building on the experiences and expertise which learners bring with them.

Savery & Duffy (1995) argue that there are four principles that necessarily underpin learning in quality settings: learning is an active and engaged process; learning is a process of constructing knowledge; learners function at a metacognitive level; and learning involves social negotiation. The application of these ideas into the design of learning environments provides many challenges and uncertainties. In practice, however, there has been a tension between instructional design for programs of an academic form in schools and universities and those of a more practical form in training organisations. These tensions, are still often perpetuated by the views of many teachers and students in the training sector who continue to ascribe to very instructivist forms of program delivery.

This was the situation that faced the National Flexible Learning Toolbox project when it was first implemented by the Australian National Training Authority (ANTA) in 1998. A Toolbox is a collection of online training materials comprising learning activities, resources and user guides to support program delivery in vocational education and training. The learning resources are Web-based and designed in a manner which facilitates customisation and reuse to support programs in the National Training Framework, the basis of qualifications and accreditation in the Australian VET sector.

Since 2000, the Toolbox initiative has been part of the Australian Flexible Learning Framework for the National Vocational Education and Training System 2000-2004 (AFL Framework) and run by the Office of Training and Tertiary Education (OTTE) in Victoria, one of the partners to the Framework agreement. The Toolboxes and the AFL Framework were designed to support the accelerated take-up of flexible learning modes and position Australian VET as a world leader in applying new technologies to vocational education products and services (EdNA VET Advisory Group, 2000).

Flexible Learning in the VET sector

The promise of the new technologies in the mid 1990s prompted the Australian National Training Authority (ANTA) to consider strategies that could motivate and support registered training organisations (RTOs) to embrace modes of flexible delivery for their students. The Flexible Learning Toolbox Project was conceived around the development of sets of generic and customisable materials that could be applied widely throughout the training sector. The intention was to create efficiency and economies of scale though large scale production of learning materials capable of wide acceptance and use.

The Flexible Learning Toolbox Project has been carried out in a series of stages since it commenced in 1998. Developers annually bid for funding to build Toolboxes through the Flexible Learning Advisory Group (FLAG), a committee of state and commonwealth representatives with strong interest and expertise in flexible delivery in the VET sector. Teams and consortia work together to develop bids to build online learning resources for qualifications within the national Training Packages. Teams are required to demonstrate strong links with industry groups and to propose online materials that demonstrate evidence of sound contemporary learning designs and development processes that create materials with high levels of product utility. The following descriptions from the developers' guidelines (used from series 2 onwards) highlight these aspects of Toolbox design:

> *A fundamental requirement of Toolbox resources is the need to exhibit effective teaching and learning approaches. To support this requirement, proponents need to demonstrate their capacity to develop resources with the following features:*
> - *a firm basis in an educational model which recognises an active, constructive role for learners;*
> - *learning activities which engage the learner in active processing of the subject matter rather than mere knowledge acquisition;*
> - *learning settings and tasks that encourage meaningful online communication and interaction (between learners as well as between teachers and learners);*
> - *content resources which are visually attractive, motivating to use and organised logically for ease of navigation; and*
> - *representations of authentic and real life settings in preference to textual descriptions.*

Whereas one might expect online products from the training sector to demonstrate learning designs aligned closely to the traditional delivery formats, the nature of the learning designs inherent in the National Flexible Learning Toolboxes that have been produced, often comes as a surprise to many. These products have been planned and developed following carefully

organised guidelines and development processes. The designers and developers are provided with large amounts of supports and scaffolding to enable them to plan learning settings that reflect contemporary learning theories and to ground these theories into practical learning settings.

In a typical Toolbox Project series, developers are invited on an annual basis to submit an Expression of Interest (EOI) for developing a Toolbox to the Steering Committee appointed by FLAG, who select from among the 100 or so applications, approximately 40 projects for which an extended proposal is invited. The EOI process is used to ensure that the selection process leads to a strong blend of qualifications across a variety of Training Packages, and that the full-scale proposals are presented by teams with the capacity and capability to deliver quality learning products.

From the full-scale proposals, around 15 projects are selected for funding, for amounts of around $250,000. A comprehensive review process is used to select only the best proposals and successful teams are provided with comprehensive feedback indicating strengths and weaknesses within their plans. The process is overseen by the National Project Managers, a small team of specialists in online learning and flexible delivery within the Office of Training and Tertiary Education in Victoria.

A mentoring process also accompanies the design and development processes. Mentors are allocated by the National Project Managers to each team. A mentor is a critical friend with extensive experience in the design of effective online learning materials. The mentor works closely with the team throughout the nine months of the process. The process involves considerable discussion, especially around areas in which there have been conflicting preconceptions. A prominent issue has been the amount of structuring necessary in products designed for learners in lower level certificates, who are seen as unlikely to be naturally autonomous learners. It has been educative for both the VET practitioners (who know the student audience) and the mentors (who know the contemporary theory) to hear each others' views and negotiate solutions.

A proof of concept stage has been another critical element in the process. Developers submit a sample showing the intended interface and indicative learning activities and resources. The sample receives a thorough review from a panel of reviewers comprising online learning specialists and other stakeholders. Weaknesses identified are expected to be addressed before approval to proceed to full development is given.

At a number of stages throughout the production process, reviews are also sought from representatives of the industry concerned and typical users are asked to trial the products and provide their feedback to the team. The final stage includes a proofing check and a test by technical experts before the products are supplied to Australian Training Products, the company supporting their dissemination to Registered Training Organisations.

The Toolboxes are distributed on CD-ROM for a a nominal fee which provides a licence to use the products freely on local servers, an extensive Teachers' Guide to assist in use of the products and access to a free Help Desk to facilitate installation and use of the resources. As new rounds of the Toolbox series have progressed, feedback from all phases of the previous round are used to refine and guide subsequent activities. The high degree of reflexivity within the process has been an important element in the quality assurance process. The Toolbox products now include over 60 online courses. The products can be accessed and viewed at http://www.flexiblelearning.net.au/toolbox

The Learning Designs within Toolbox Products

The Toolbox products now stand as examples of online products within the Australian VET sector and provide some clear insights into the nature of the learning settings promoted and used within the delivery of training programs. The Toolbox products provide tangible evidence of the nature of teaching and learning, and a window into the philosophical and epistemological underpinnings of the sector. This opportunity provided the impetus for the study reported in this paper, which aimed to explore and document the learning quality of the various Toolbox products.

This paper explores the extent to which the online learning settings developed for the National Flexible Learning Toolboxes provide evidence of a capability to support quality learning experiences. To enable this discussion a study was conducted to answer the following questions:

- To what degree are quality learning experiences supported by the various Toolboxes?
- What patterns exists in the learning designs developed for the Toolbox products across the different levels of training qualifications?
- Is there a discernible pattern in the nature of the learning environments in the Toolbox products developed across the various series?

To answer these questions, it was necessary to develop a means to compare the depth and extent of the learning experiences supported by the various Toolbox products. There are few formalised means by which the learning quality of online, or any delivery form of, products can be quantified and compared. Most review tools enable the quality of products to be described but not necessarily measured for comparison purposes. In this study the potential learning depth of the individual Flexible Learning Toolboxes was determined through a review of the learning designs around which each had been built and a determination of the degree to which these online learning environments could provide support for learning experiences based on meaningful knowledge construction. Clearly different learning tools in the hands of different teachers can be used in a variety of ways. Those learning environments that have been designed to support knowledge construction will likely have the greatest potential for this form of use.

Methodology

For this study we chose to explore the potential learning depth of the Toolbox products through a detailed review of the constituent elements of the online designs as proposed by Oliver (1999):

- learning tasks, the contexts, problems, interactions used to engage the learners and on which learning is based;
- learning resources, the content, information and resources with which the learners interact and upon which learning is based; and
- learning supports, the scaffolds, structures, encouragements, motivations, assistances and connections used to support learners.

To provide some comparative measures between different products, it was necessary to find a way to quantify the potential of these attributes to support deep learning experiences. This was achieved through the development of a review process using a scale as described below.

a. Learning Tasks

The learning tasks in technology-based environments play a fundamental role in determining the depth of the learning outcomes (Wild & Quinn, 1997). They determine how the learners will engage with the course materials and the forms of knowledge construction that will take place. Learning tasks that promote engaging learning experiences need to be relevant and open to some degree. They need to provide learners with choices and decisions and to represent practical instantiations of the content and processes to be learned (eg. Herrington & Oliver, 2000). The learning tasks in an online setting sit across a continuum

which is described by the degree of learner autonomy and the open-endedness of the tasks upon which the learning is based. Figure 1 describes the continuum and discrete forms of design. Various forms of these learning designs sit between the descriptions given. At one end of the continuum, learning activities are very much dictated to the students by the setting and based on content delivery (content-centred), while at the other end, the learning tasks provide high degrees of learner autonomy and decision making in authentic settings (supporting knowledge construction). At the midpoint of the continuum, are learning tasks which are activity-based with degrees of structure and teacher direction.

1	2	3	4	5
content presentation and consolidation eg. sequenced content pages with interspersed activities		**activity-based learning sequences** eg. contextualised tasks and activities associated with content and information		**open-ended tasks** eg. a single authentic problem anchoring learning in a complete unit

Figure 1: Learning Task Continuum

b. Learning Resources

In environments that support deep learning experiences, learners are exposed to content that provides them with perspectives from a multitude of sources (eg. Herrington & Oliver, 1995). Many course materials contain content that is quite rigidly organised and presented to the learners in a strict sequence. Flexible learning experiences tend to provide more freedoms for learners who are able to access resources in a variety of ways (eg. Lebow, 1993). The learning resources within an online setting tend to be influenced to a large degree by the form of learning design implemented. In the cases where the learning is structured, the resources tend to be tied to the learning activities more so than in the open-ended problem type designs. In this continuum, one extreme describes learning resources in which the learning activities are embedded and where students have few choices and decisions. At the other extreme the resources are provided in authentic and relevant forms for learners to choose from and to use for specific purposes.

1	2	3	4	5
fixed content and knowledge spaces eg. Web pages, sequential information, instruction and information combined		**multiple content forms,** eg. media rich resources, interactive objects tutorials, dynamic resources with feedback elements,		**authentic content and information,** eg. discrete elements, library-based, multiple perspectives, authentic resources

Figure 2: Learning Resources Continuum

c. Learning Supports

Flexible and on-line learning environments that support deep learning experiences require learning supports to be designed as integral parts of the learning process. The support is necessary to guide learners and to provide a feedback mechanism which is responsive and sensitive to their individual needs (eg. McLoughlin & Oliver, 1998). The forms of learner support in online settings can be shown to sit across a continuum where the support is seen to move from structured feedback through to learning scaffolds. At one end of the continuum, the structured feedback describes settings where the technology has been designed to provide the forms of support needed by the students in stand-alone settings. At the other end, the learning supports take the form of scaffolds that provide the support and assistance students need, which are adaptive to the needs of the learners and can be faded

when appropriate. In the middle of this continuum are supports that provide a blend of computer-based feedbacks and human supports.

1	2	3	4	5
Web-based feedback eg. learning from the computer, programmed interactions and feedback		**planned human interactions** eg. bulletin boards, tutor roles, resource sharing		**learning scaffolds** eg. learning supports that vary according to needs, planned social interactions

Figure 3: Learning Supports Continuum

Using this grading scheme with online products yields three scores in the range 1-5 and a total score in the range 1-15. In this study, we chose to call this aggregated total, the learning depth indicator (LDI), and to make comparisons and judgments of the various products using this statistic. From a learning perspective, any product which scores the mid range, 3, in all areas would, by any standards, be considered a product supporting quality learning experiences. Further judgements of the potential depth of learning are made possible by considering the total figure of 9 as a benchmark. A combined total of 9 describes a learning setting characterised by learning processes which are activity-based with such attributes as contextualised tasks, and learning activities designed to consolidate content and information. Such a score is indicative of learning resources in multiple content forms, media rich, including some interactive objects and possibly tutorials and dynamic resources with feedback elements. The learning supports would include Web-based feedback as well as planned human interactions through bulletin boards, tutor roles, resource sharing etc. A score of nine is clearly a learning setting which would promote more opportunities for deep learning than a setting with a lower score.
Each of the Toolboxes was rated within the 3 continua, using a numerical score 1-5 for each scale. The individual scores were determined by the researchers after a close analysis of each Toolbox, and were informed by the various evaluations and reviews completed on each Toolbox across their development process and history. The LDI was then calculated for each Toolbox.

Results

Table 1 provides a summary of the Toolboxes in the various series and indicates the score on the continuum (1-5) for each of the elements in the learning framework. The LDI for each of the Toolboxes is also shown. Table 1 also shows the Australian Qualification Framework level of the Toolbox as a Roman numeral I – VI. This level provides some indication of the cognitive nature of the content in the Toolbox, with Level I courses usually being taken by students with low levels of literacy, learning simple skills and processes, while Level VI represents Advanced Diploma courses, many of which provide articulation into university courses.

Ser.	Toolbox	Level	Learning Tasks	Learning Resources	Learning Supports	LDI
1	**Metal and Engineering**	I-III	1	2	2	5
1	**Aged and Disability Care**	II-III	2	2	2	6
1	**Sustainable Agriculture**	IV	1	2	1	4
1	**IT - Client Support**	IV	1	2	1	4
1	**Workplace Assessor and Training**	IV	1	2	1	4
1	**Finance**	III	1	2	1	4
1	**Tourism**	III	1	2	2	5
1	**Printing and Graphic Arts**	II-III	3	3	2	8
1	**Rural Business Management**	V	4	5	2	11
1	**Utilities/Water**	II-IV	2	1	1	4
1	**Tourism & Hospitality**	II-III	2	2	1	5

Ser.	Toolbox	Level	Learning Tasks	Learning Resources	Learning Supports	LDI
2	**Chemical, Hydrocarbons & Oil Refining**	I-IV	2	2	2	6
2	**Information Technology**	IV	4	4	3	11
2	**Frontline Management**	IV	2	3	2	7
2	**Legal Administration**	III	4	4	4	12
2	**Warehousing**	II	2	3	2	7
2	**Alcohol and Other Drug Work**	II-IV	4	4	4	12
2	**Horticulture Package**	II-V	2	3	3	8
2	**Accounting**	V-VI	3	2	2	7
2	**Home and community care**	II-III	3	3	2	8
2	**Business Administration**	V	4	4	3	11
2	**Hospitality**	I-IV	3	3	2	8
2	**Systems analysis and design**	IV	4	3	2	9
2	**Retail Operations**	I-II	3	4	2	9
3	**Laboratory Operations**	V	2	3	3	8
3	**Library and Information Services**	IV	3	4	3	10
3	**Mining**	II-V	3	4	3	10
3	**Youth Work**	IV	4	4	4	12
3	**Plastic Rubber and cable making**	II-III	3	3	3	9
3	**Local Government**	V	4	3	4	11
3	**Aquaculture Farm Diversification**	II	3	3	2	8
3	**Horticulture**	II	3	4	3	10
3	**Network Engineering**	V	4	3	3	10
3	**Retail Operations**	II	3	4	3	10
3	**Call Centres III&IV**	III-IV	4	4	2	10
3	**Tourism**	V	5	3	4	12
3	**Call Centres II**	II	3	3	3	9
3	**Children's Services**	III	3	4	3	10
3	**Retail Management**	IV	3	2	2	7
3	**Multimedia Design**	II-VI	4	3	4	11

Table 1: Toolbox Series1-3 1998-2001

Table 1 demonstrates some interesting information and patterns. The first series of Toolboxes generated resources which were in the main electronic versions of paper-based products. The scores on the various continua demonstrate that the vast majority of the Series 1 Toolboxes had learning designs that focused on the content and were comprised principally of sequential Web pages carrying this content. The Toolboxes tended not to have any particular form of instructional design and were intended to be used as standalone resources. The predominantly low scores (1-3) across all scales for the Series 1 products reflects the content-centric approaches that were typically characteristic of this series and the potentially limiting learning experiences that learners might receive. Only one Toolbox in this series scored an LDI of nine or more.

Within the second series of Toolboxes, there is clear evidence of more focused learning designs. The more task-based approaches to the learning designs employed by a number of teams are reflected in the higher scores recorded for a number of the Toolboxes. The evaluation process from the first series provided some strong guidelines for designers and developers in the second series and the overall total demonstrates the positive outcomes from the application of these guidelines in the second series. Nearly half of the Toolboxes scored an LDI of 9 or more.

An examination of the scores for the products in the third series reveals a similar pattern in the development process for these products. Once again, the scores reveal a set of products supporting more learner-centred approaches and which use more of the opportunities of the online medium to provide enhanced learning settings for the students. The scores reveal products with typically task-based learning designs, employing rich media sources and accompanied by planned learning supports using the communications elements of the technology. Within the third series, quality experiences appeared to be the norm with only three Toolboxes being judged to have an LDI of less than nine. The learning experiences likely to be gained from use of the Series 2 and Series 3 products were clearly of a more engaging nature than those supported by the first series through the more deliberate use of task-based approaches, and planned support strategies.

Table 2 shows the scores received by the products in the fourth and fifth series. At this stage of writing this paper, the fifth series was still under development and the scores may need to be revised a little when all the products are finally complete and in production. But even with this qualification, it is apparent from the data, that the quality learning experiences planned for the early series is even more evident in products produced for the later series. The various learning tasks, resources and support schemes across the various products continue to sit for the majority of the projects at a level of 3 or more. Given the description of the various elements within the tasks, resources and supports, such scores are indicators of online learning environments capable of supporting quality learning outcomes. In Series Four, a number of Toolboxes have an LDI in excess of eleven, scores that are representative of learning designs that strongly support knowledge construction and engaged learning.

	Toolbox	Level	Learning Tasks	Learning Resources	Learning Supports	LDI
4	**Laboratory Operations**	V	3	3	2	8
4	**Turf Management**	I-III	3	4	2	9
4	**Kitchen Ops**	III	3	4	2	9
4	**Inland Aquaculture**	V	4	4	3	11
4	**Building and Construction**	III	3	3	3	9
4	**Animation**	III-IV	4	4	4	12
4	**Meat Safety**	III-IV	2	3	2	7
4	**Finance Retail**	III	3	3	3	9
4	**Policy, research and advocacy**	IV	4	4	3	11
4	**Disability and mental health**	IV	4	4	3	11
4	**Website Design**	IV	4	5	4	13
4	**Laboratory Management**	VI	3	4	3	10
4	**Hairdressing**	II-III	3	3	3	9
4	**Call Centres, Customer Contact**	II-IV	4	4	3	11
4	**Electrotechnology Servicing**	II	4	4	4	12
4	**Real Estate**	IV	4	5	4	13
4	**Call Centres, Faults Credit, Inquiries**	III	3	4	3	10
4	**IT Knowledge Management**	V	4	5	4	13
5	**Laboratory Technology**	V	3	3	3	9
5	**Music Technical Production**	IV	4	4	4	12
5	**Conservation and Land Management**	II	3	4	3	10
5	**Metals and Engineering**	II-IV	3	4	3	10
5	**Clothing Production**	I-III	3	4	3	10
5	**Vehicle Body - Panel Beating**	III	3	3	3	9
5	**Small Business Management**	IV	3	3	3	9

5	**Asset Security**	IV	3	3	3	9
5	**Business Services**	V	3	4	3	10
5	**Business Administration**	V	4	4	4	12
5	**Laboratory Operations**	VI	3	3	3	9
5	**Public Service**	IV	4	4	4	12
5	**Security Operations**	II	4	3	3	10
5	**Real Estate**	IV	4	5	4	13
5	**Maritime Operations**	II	3	3	3	9

Table 2: Toolbox Series 4,5 2002-2003

Learning designs and AQF levels

Most teachers tend to use very directed teaching modes when dealing with the lower AQF levels. The competencies sought at these levels usually concern the ability to complete relatively simple processes and acquire specific knowledge, associated usually with carrying out some practical tasks. The designers of the Toolboxes were cognisant of the needs of their learners and applied instructional design strategies that were sensitive to the students' needs. It was this issue that caused a number of animated discussions during the development process while interpretations of adequate structuring for the lower AQF level audience were debated. The levels of support required by less confident and less autonomous learners may well mean that designs at the highest end of the continua are questionable for this group. Some developers intentionally chose to use learning designs for these students that would have a lower rather than a higher LDI. On the other hand as the project has progressed, many teams have found ways to balance the need for guided learning, with the use of contextualised-activities and freedom of movement to select from a range of resources, thus scoring in the middle range of the LDI (Table 3).

The results show that in the main, the AQF level of the learning environment did play some part in the selection of the learning design with the higher AQF level subjects being those with the more task-based and student-centred approaches. What is evident from the data though, is the capability of many developers to produce task-based approaches supporting knowledge construction processes for the lower AQF level courses. There are a substantial number of products in the Toolbox project which provide deep learning experiences (eg. LDI of 8 – 12) for students in AQF levels 2 and 3. This appears as a very strong outcome from the project and an outcome which demonstrates the success of the project management and design and development processes.

LDI	4	5	6	7	8	9	10	11	12	13	Average LDI
AQF Level											
1		1	1		1	1	1				**7.6**
2	1	2	2	1	5	6	6	2	2		**8.6**
3	2	3	2	1	4	7	7	2	3		**8.5**
4	4		1	3	2	3	4	5	5	3	**9.3**
5				1	3	2	3	6	2	1	**10.1**
6				1		1	1	1			**9.2**

Table 3: LDI and AQF levels for Flexible Learning Toolboxes

Conclusions

The purpose of this paper was to explore the nature of the learning environments planned within the National Flexible Learning Toolbox projects through the following questions:

- To what degree are quality learning experiences supported by the various Toolboxes?

- What patterns exists in the learning designs developed for the Toolbox products across the different levels of training qualifications?
- Is there a discernible pattern in the nature of the learning environments in the Toolbox products developed across the various series?

The findings from the study provide strong evidence of high levels of success in the Toolbox project in producing online learning resources capable of supporting quality learning experiences. The findings suggest that the potential depth of the learning experiences supported by Toolbox products has increased in overall terms across the period of the project which provides evidence of the soundness of the project management and support which has accompanied the development of the products. The results provide strong support for the claims that many of these products represent examples of best practice in the design of online learning settings and the products demonstrate quality learning designs for all sectors of education. It will surprise many readers to find an abundance of such high quality learning products developed for a sector which has traditionally been regarded as one where the teaching and learning models are usually considered to be based on instructivist principles rather than those supporting knowledge construction. The results demonstrate the presence of strong learning models across the products designed for all AQF levels and provide strong cases for others looking to produce online learning materials for diverse student groups.

It would be a very interesting exercise to take similar products from the university and school sector and to apply a similar appraisal and grading scheme. Given the paucity of strong examples of quality online learning materials in any setting (eg. Mioduser et. al. 2000), the products from this project stand as exemplars for other project teams and organisations seeking to develop quality learning settings based on contemporary technologies and learning theories.

References

ANTA (1998) *A bridge to the future: Australia's National Strategy for Vocational Education and Training 1998-2000,*. Australian National Training Authority, Brisbane.

Australian Flexible Learning Framework (2001). http://www.flexiblelearning.net.au

EdNA VET Advisory Group. (1999) *Flexible Learning for the Information Economy: A Framework for National Collaboration in Vocational Education and Training 2000-2004*. Australian National Training Authority, Brisbane.

Barron, A. (1998). Designing Web-based training. *British Journal of Educational Technology, 29*(4), 355-371.

Berge, Z. (1998). Guiding principles in Web-based instructional design. *Education Media International, 35*(2), 72-76.

Clark, D. (1995). *Introduction to Instructional System Design*. Available online at: http://www.nwlink.com/~donclark/hrd/sat1.html#trainingsystem. Accessed July 2003.

Duffy, T., & Cunningham, D. (1996). Constructivism: Implications for the design and delivery of instruction, *Handbook of research for educational telecommunications and technology* (pp. 170-198). New York: MacMillan.

Flexible Learning Toolbox Project (2001). http://www.flexiblelearning.net.au/toolbox/

Grabinger, S. (1996). Rich environments for active lerning. In D. Jonassen (Ed.), *Handbook of research for educational telecommunications and technology* (pp. 665-692). New York: MacMillan.

Herrington, J . & Oliver, R. (1995) The critical elements of situated learning environments. In J. Pearce & A. Ellis (Eds) *Learning with Technology, ASCILITE'95 Conference Proceedings*, (pp 395-403). Melbourne: ASCILITE.

Jonassen, D., & Reeves, T. (1996). Learning with computers: Computers as cognitive tools. In D. Jonassen (Ed.), *Handbook of Research for Educational Communications and Technology* (pp. 693-719). New York: MacMillan Library Reference.

Lebow, D. (1993). Constructivist values for instructional systems design: Five principles toward a new mindset. *Educational Technology, Research and Development, 41*(3), 4-16.
McLoughlin, C. & Oliver, R. (1998). Scaffolding Higher Order Thinking In A Telelearning Environment. Ottmann, T. & Tomek, I. (Eds). *Proceedings of Ed-Media/Ed-Telecom 98 World Conference On Educational Multimedia And Hypermedia & World Conference On Educational Telecommunications.* Virginia: AACE. (pp 977-983).
Mioduser, D., Nachmias, R., Oren, A., & Lahav, O. (2000). Web-based learning environments (WBLE) - current technological and pedagogical state. *Journal of Research on Computing in Education, 33*(1), 55-76.
Oliver, R. (1999). Exploring strategies for on-line teaching and learning. *Distance Education, 20*(2), 240-254.
Savery, J. & Duffy, T. (1995). Problem-based learning: An instructional model and its constructivist framework. *Educational Technology, 35*(5), 31-38.
Wild, M. & Quinn, C. (1997). Implications of educational theory for the design of instructional multimedia. *British Journal of Educational Technology, 29*(1), 73-82.
Vygotsky, L. (1978). *Mind in Society*. Cambridge MA, Harvard University Press.