

# TE WHAKATŪ KŌRERO WORKING PAPERS

*Instructional Design: Theory and Practice*

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# Introduction

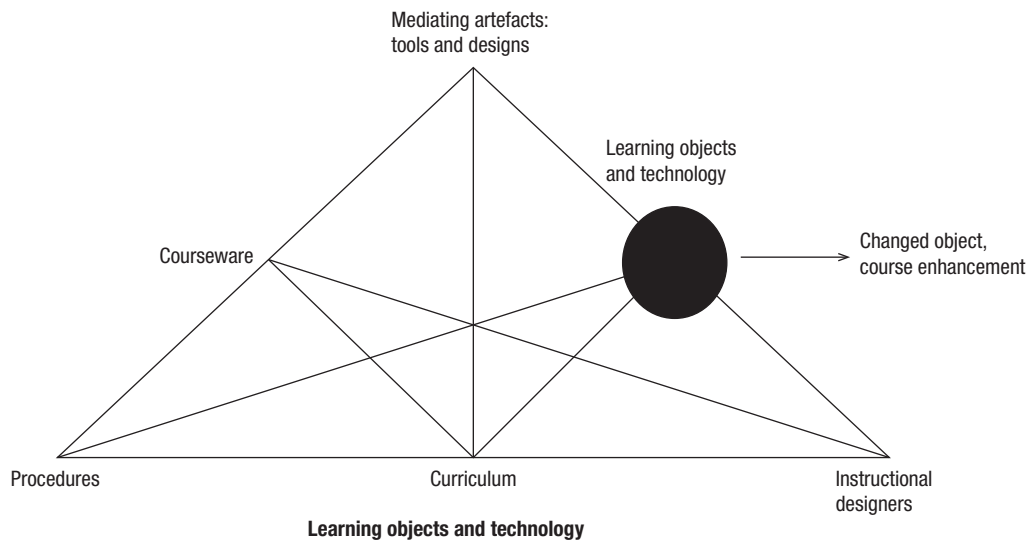
The purpose of this paper is to describe, using a pedagogical focus, the principles of instructional design in distance learning teaching. The paper comprises five sections. The first section provides definitions and describes concepts of instructional design. In the second section the authors investigate the nature of instructional design. The third section concerns the integration of teaching pedagogy with instructional design. The fourth section describes elements of project management and instructional design. A mini case study that discusses the embedding of literacy and numeracy in an Open Polytechnic Level 2 Horticulture course is included. The fifth section discusses e-learning pedagogy and instructional design.

## Definitions and concepts of instructional design

Arguably, curriculum-centred instructional design began as a form of 'instructionism', a teacher-centric mode of learning in which teachers lecture and students learn: 'The experts (teachers) "hold" the knowledge and "tell" the students, who in turn "hold" the knowledge' (Bridges, Baily, Hiatt, Timmerman, & Gibson, 2002, p. 210). Instructional design enables the teacher's knowledge to be related to the student within courseware. A leading definition of instructional design describes it as 'a systematic process that is employed to develop education and training programs in a consistent and reliable fashion' (Gustafson & Branch, 2007, p. 11). As Caplan suggests, 'In the ideal world, instructional media developers – those who will actually create the planned instructional materials with which the student will interact – are included in the course development process from the beginning, to consult with and advise course team members on development-related topics as they arise' (2004, p. 175).

Instructional designers thus develop procedures to effect changes to courseware and curricula based on the mediating artefacts of tools and signs. Examples of signs used in instructional design include flowchart symbols, workflow shapes and audit flowchart shapes. Designers also use learning objects and technology to produce a changed object (that is, one with altered content, and possibly a changed objective), and develop or enhance courseware. Common issues for the creation of courseware include analysis, design, development, implementation and evaluation (Prasolova-Førland, 2011, p. 7). The main strategy of curriculum composition in virtual-assisted learning is to set a series

of goals and objectives and consider how these can be best supported by online learning materials. Figure 1 (after Engeström, 1987, p. 78) shows the relationship between courseware, curriculum delivery and instructional design. There is also a similar triangular relationship between instructional designers, their procedures, and the mediating artefacts of tools and signs. The circle signifies the product of the instructional design process as a changed learning object, course enhancement, or technological improvement. The potential movement of the circle along the vectors of the diagram indicates the point of focus of pedagogical engagement with the instructional design process.



*Fig. 1 Relationship between courseware, curriculum delivery and instructional design*

## What is instructional design about?

Instructional design is about the thinking behind the courseware teachers use in their lessons. It is thus a complex process that is 'creative, active and iterative' (Gustafson & Branch, 2007, p. 11). Instructional designers are interested in questions such as:

- What are the main constants (for example, the main learning objectives) and how are they accomplished most efficiently in every lesson?
- What makes one lesson better than another?
- How can lessons be designed for maximum or minimum impact?
- What lessons give one organisation an advantage over another?
- Can students be taught skills embedded within skills?
- Would some skills be useful for all time?

In distance education, the importance of structure in developing text materials is designed to compensate for the geographical remoteness of the lessons and the temporal shifts that distance students enjoy (Lee & Rha, 2009, p. 373). This is a shared responsibility between content developers, teachers and instructional designers. In distance education instructional design development intrinsically includes questions of technological use (Evans & Lockee, 2008, p. 12). Contemporary educators and instructional designers are concerned with questions such as:

- What technologies are available?
- How easy are these technologies to use?
- What are the uses that the technologies can be put to – what is it possible, probable, improbable or impossible to do?

However, as Rothwell and Kazanas (2004, p. 3) suggest:

Instructional design means more than literally creating instruction. It is associated with the broader concept of analysing human performance problems systematically, identifying the root causes of those problems, considering various solutions to address the root causes, and implementing the solutions in ways designed to minimise the unintended consequences of corrective action.

In teaching pedagogy and instructional design, structure is mainly contrasted with dialogical learning (that is, learning characterised by concepts such as transactional distance between teacher and learner). Structure refers to elements of the course design (such as learning objectives, activities, assignments, content and evaluation), whereas dialogical learning occurs in the interaction between the instructor and learners (Moore, 1993; Moore & Kearsley, 2005). Instructional designers accomplish the former, whereas teachers and educators carry out the latter, although there may be some overlap between the two.

Anderson and Dron (2011) refer to the metaphor of the 'dance' to define the interrelationship between pedagogy and technologies in instructional design. However, they suggest that the 'availability of technologies to support different models of learning strongly influences what kind of model can be developed'.

Instructional design seeks to analyse the basic components of a learning problem as an open system and to remediate and integrate learning solutions to produce knowledge outputs. It is the 'linking science' (Tennyson, 2010, p. 1) that 'applies logic and scientific methods to the problems involved in designing and developing instruction' (Brown & Green, 2006, p. 24).

# Instructional design and teaching in distance education

In distance education, one of the main factors of course design and development is the alignment of the course design with the way it is going to be used (Evans & Lockee, 2008, p. 12). Although both teachers and designers would like to have full control over the tools, media, or mode of course delivery, often choices may be limited by what is available. However, these limitations must themselves solve the design parameters of the learner's needs. Media, delivery and content are thus important.

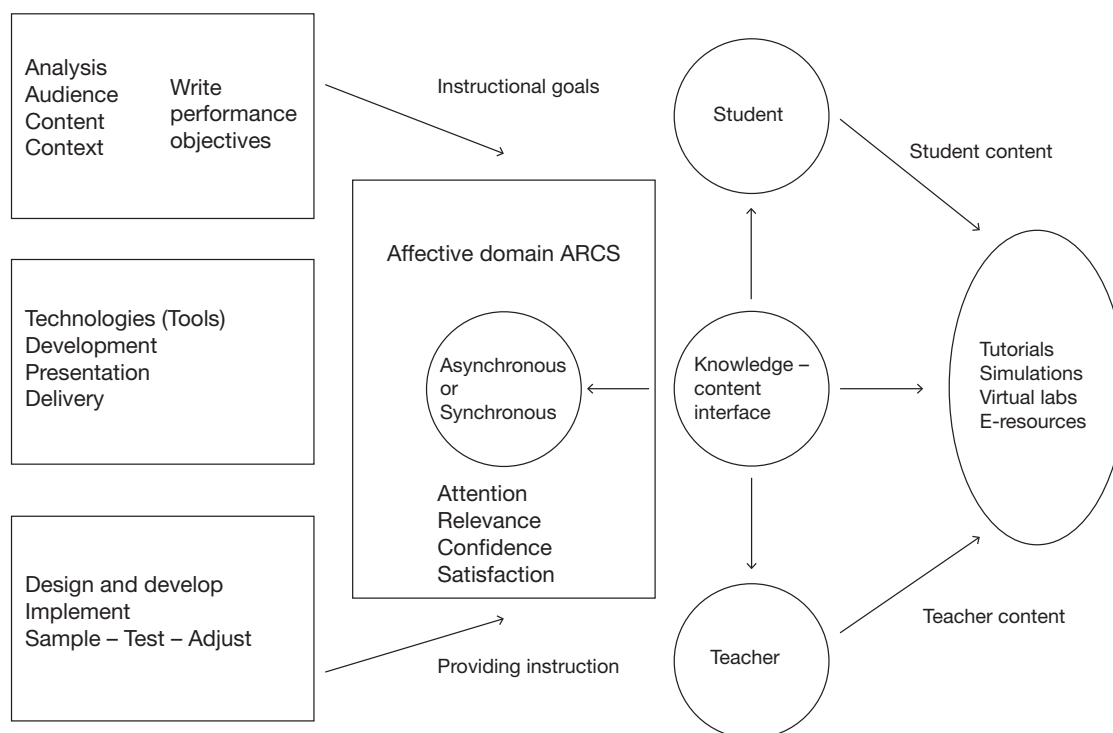
Alongside these considerations are the more deeply embedded questions of pedagogical integration into the 'teaching units' or modules of courseware. According to Moore and Kearsley (2005), the following points need to be considered in instructional design for distance education:

- What is the content?
- How should the material be sequenced?
- What are the best media to present the material?
- What teaching strategies need to be used?
- How can the students' learning be effectively measured?
- What systems for feedback are available?
- What methods should be used to create the learning materials?

The effectiveness with which these issues are addressed enables the instructor to maximise student engagement with the courseware. This in turn enhances the faculty teaching role. As Holmberg (1995, p. 66) states, the interaction of course materials and teacher in distance education aims to:

- arouse attention and motivate; present objectives that are reachable
- make students aware of the expected outcomes of the study
- provide links to prior and future knowledge bases and interests
- present the material to be learnt
- guide and structure, offering learning guidance
- activate, inspire (providing manageable learning tasks)
- provide feedback
- promote transfer
- facilitate retention.

Figure 2 outlines the key components of the interface of instructional design and teaching in distance learning (after Evans & Lockee, 2008; Anderson, 2004; Zheng & Smaldino, 2003; Keller, 1984). In this diagram the instructional design stages lead directly to the teacher–student interface through the instructionally designed courseware. The stages of courseware development – analysis, technologies, design and development – lead via instructional goals to the affective teaching domain and knowledge–content interface (courseware or learning management system). Through the learning management system and knowledge–content interface, the teacher and student interact through learning modules and teaching instruction – tutorials, simulations, virtual labs and e-resources.



*Fig. 2 Instructional design and the distance learning interface*

As shown in Fig. 2, the design and development of courseware, the decisions as to what technologies to use, and the analyses used to enhance course capabilities are informed by instructional goals. Cognitive and affective considerations that aim to captivate the student in the learning process are shown in the diagram as ARCS – attention, relevance, confidence and satisfaction. The teacher/instructor and student interact at the knowledge–content interface in tutorials or virtual learning exchanges.

At the basis of instructional design is an interest in and understanding of research on thinking and learning. Considerations of ‘learner characteristics’ are thus important as a factor of design (Zheng & Smaldino, 2003, p. 157), as

is 'student satisfaction' (Zheng & Smaldino, 2003, p. 159). Good instructional designs conform not only to the requirements of the discipline, but also strategic evaluations concerning the learning efficacy of the design and any possible improvements. In distance education, instructional designers and faculty instructional planners need to be mindful of both the place and time-shifting aspects of distance learning (Herring & Smaldino, 1998). Strategies for overcoming these factors include (Willis, 2000, p. 199):

- diversifying and pacing course activities
- using both locally and universally relevant examples
- conciseness
- participation and retention activities
- a relaxed mode of delivery.

Courseware that integrates these components is more likely to be successful than courseware that does not. Furthermore, Elias has identified eight universal instructional design principles that apply to distance education (2010, pp. 111–112):

1. Equitable use – useful and accessible design for people of diverse abilities and geographical habitats.
2. Flexible use – the learning design is suitable for a wide range of abilities, schedules and levels of accessibility.
3. Simple and intuitive – easily understood regardless of experience.
4. Perceptible information – design features are easily communicated.
5. Tolerance for error – ambiguity of use is minimised.
6. Low physical and technical effort – the design can be used easily.
7. Community of learners and support – interaction among users is achieved easily.
8. Instructional climate – feedback comments are welcoming and inclusive.

The design of courseware needs to satisfy the above qualities to create learning efficiency and a course that is easily and efficiently delivered and taught by the lecturer. But how is this achieved by the instructional designer? The 'ADDIE' adage is a popular mnemonic that abbreviates the key instructional design components of: analyse, design, develop, implement and evaluate (Brown & Greene, 2006, p. 8). The instructional designer, educator, content specialist, teacher and editor must work together to map the larger concept of the courseware. The various learning objectives should be organised into identifiable units, components and modules. General 'rules of thumb' have been



identified by Reigeluth and Carr-Chellman, including values with subgoals constituting learning objectives, priorities and methods. Other considerations include content, and recognition of the learner, the learning environment and instructional development constraints (2009, p. 33).

Despite these influencing factors, there are no definitive constituent parts and there is no definitive operational procedure for a universal theory of instructional design practice, other than the pragmatic application of learning pedagogy to specific examples of course, curriculum or subject development:

Instructional designers tend to look at thinking from a pragmatic viewpoint – that is, what is important to know about thinking and the studies done on thinking that will help them develop efficient and effective structural interventions. Thus, instructional designers are considered to be eclectic – they borrow from different perspectives and use what works for a given situation to produce the desired results. (Brown & Green, 2006, p. 38)

However, instructional design requires both specific cognitive abilities characterised as knowledge and skills, and executive abilities, which are needed to plan and anticipate future needs, set priorities and self-regulate. Instructional design also involves ‘metacognition’ – the practice of ‘thinking about thinking’ – and the ability to control mentalistic process. In this, Bloom’s taxonomy of the cognitive domain is relevant. The taxonomy includes six levels: knowledge, comprehension, application, analysis, synthesis and evaluation (Bloom, Engelhart, Frost, Hill, & Krathwohl, 1956). This can be distinguished from, but is nevertheless related to, students’ cognitive achievements. Educators, instructional designers, content specialists and teachers must also design courses with students’ cognitive achievements clearly incorporated in learning outcomes. These cognitive outcomes are generally of two kinds: first, ‘receptive learning’, which consists of ‘declarative knowledge, information, concepts, or theories’; and second, ‘critical thinking learning’, which may contain controversial issues requiring critique, argument and discussion (Lee & Rha, 2009, p. 378). However, as Fisher, Chipinduku, and Maathuis-Smith suggest (2010, p. 7):

. . . e-learning design needs to address the needs of a diverse body of stakeholders. The overall result is potential conflict between the competing needs of the designer, content specialist, delivery agent, and student. One size certainly does not fit all, and it may be necessary to disentangle the needs and desires of the organisation seeking to implement e-learning solutions from the actual needs of the end user.

Thus the teacher and designer both need to play an integral role in the process of courseware development, keeping in mind the needs of the end-user – the student. This necessitates a consultation process that reflects a value chain of learning from identification of learning needs to delivery of course instruction.

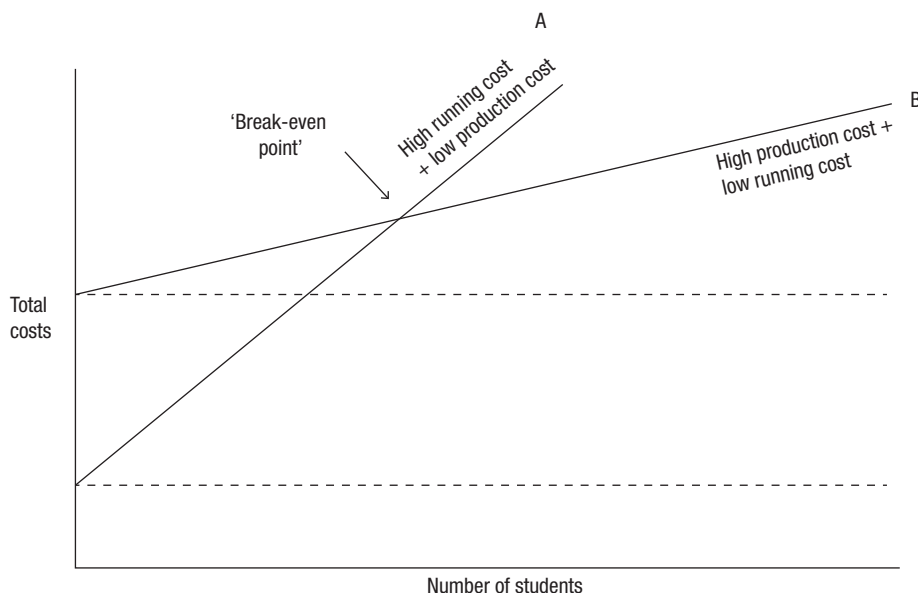
# Project management and course design

As well as the design of courseware, instructional designers are also involved with the project management of course design. Although many of the day-to-day tasks of instructional designers are concerned with course development, they may also be concerned with curriculum portfolio review – making decisions about what courses to develop and which courses to revise or discontinue in any given programme. These decisions need to be made in close consultation with the various stakeholders in the courses, while balancing student, academic and management requirements. This involves academic and economic analysis, as well as project management. A basic formula to use when analysing the cost-benefits of course development was identified by Gilbert (1967):

$$P = \frac{VN}{C}$$

Where P = Priority  
V = Value of solution  
N = Number of people  
C = Cost of solution

From an economic viewpoint, courses can be assigned a priority quotient by multiplying the value of the solution (in units) by the number of learners as customers, divided by the cost of the solution. Decisions about course implementation, continuation or retirement may be informed by a 'break-even' chart. Figure 3 compares the break-even point between two alternative course scenarios (after Romiszowski, 1981, p. 160).



*Fig. 3 Break-even point between two alternative courses*

With low usage, course A (print-based course delivered by teacher – low production cost/high running cost) is cheaper. However, with greater student numbers the break-even point is passed and course B, the online course (high production cost/low running cost), is the more economical alternative.

Project managers also carry out performance analysis, which enables them to effectively design the work-implementation process. A typical instructional design project plan is given below (after Gaither (1980); Rothwell & Kazanas (2004)):

**Table 1:** Instructional design project plan

<b>Functions</b>	<b>Plan</b>	<b>Schedule</b>	<b>Control</b>
Activities	Identify resources and times when needed	Prepare guidelines for each resource	Establish means to monitor and evaluate resource utilisation
Methods of accomplishment	Monitor expenditures Monitor use of human resources Monitor time Plan and monitor project milestones	Charts People Budget Equipment Facility use Milestone dates	Budget reports Activity reports Time reports

Monitoring these various performance indicators enables project managers to retain control of the course development process. Furthermore, course design goals must be set for defining the courseware to be taught. One of the leading instructional design plan formulations is that of Kemp, Morrison and Ross. It has nine main features (cited in Brown & Green, 2006, p. 11):

1. Identify instructional problems and specify goals for designing instruction.
2. Examine learner characteristics that influence instructional decisions.
3. Identify subject content and analyse task components.
4. Specify instructional objectives.
5. Sequence content within each instructional unit for logical learning.
6. Design instructional strategies so that each learner can master the objectives.
7. Plan the instructional message and develop the instruction.
8. Develop evaluation instruments to assess the objectives.
9. Select resources to support the learning activities.

Instructional designers thus develop procedures to affect changes to courseware and curriculum based on the mediating artefacts of tools and signs. They also use learning objects and technology to produce a changed object, or develop or enhance courseware. It is generally recognised that there are five levels of technological adoption: familiarisation, utilisation, integration, reorientation and evolution (Bridges et al., 2002, p. 221).

In the next section a mini case study is presented that demonstrates the embedding of literacy and numeracy with instructional design principles in an Open Polytechnic Level 2 Horticulture course.

# Case-study: Embedding literacy and numeracy in Level 2 Horticulture

## Authors

Name: Anne Mason.

Position: Literacy and numeracy advisor.

Job function: To provide expertise, support and practical advice on embedding literacy and numeracy.

Name: Richard Drummond.

Position: Instructional designer.

Job function: To provide advice and consultancy services on the design, development and revision of learning materials and on the appropriate use of educational technology.

## Problem

The 2006 Adult Literacy and Life Skills survey indicated that many New Zealand learners in entry-level tertiary education programmes had low levels of literacy and numeracy. As a result, the *Tertiary Education Strategy 2010–2015* (Ministry of Education, 2010) aims to improve literacy, language and numeracy skills, and the outcomes of learners enrolled in study at Levels 1 to 3 of the National Qualifications Framework.

Because the Open Polytechnic is an open and distance education provider, the principal mode of learning at Levels 1 to 3 is through the written word. It is thus essential to embed into our learning materials literacy-enhancing strategies and supports, as well as providing, as far as possible within often technical contexts, a plain style of English appropriate to the literacy levels of the learners.

The Open Polytechnic prioritised the National Certificate in Horticulture (Introductory, Level 2) qualification as an appropriate programme to embed literacy and numeracy in an endeavour to raise the literacy and numeracy skills of learners who were just starting out in the horticulture industry.

## Reflection on problem

When enrolled in these courses, learners can gain credits at Levels 2 and 3 of the National Qualifications Framework.

Anne's role as literacy and numeracy advisor was to support course writers and advise them how to embed literacy and numeracy in 15 Horticulture courses. In particular, the level of vocabulary was too high for many learners, so added vocabulary support was a main focus in the revision.

Richard's role as instructional designer was to ensure the coherence of the learning materials, to ensure that best current practice in embedding literacy and numeracy aids was incorporated into the courses, and to further increase accessibility for learners at Levels 2 and 3.

An unresolved issue is that while the Tertiary Education Commission (TEC) has provided a number of useful guidelines for embedding of literacy and numeracy, there are no published criteria as to what is an 'acceptable' level of literacy and numeracy embedment, particularly in open and distance learning materials. This is perhaps because of the need to judge learning materials on a case-by-case basis, but it has caused problems in the past. The risk is that without criteria the acceptability of literacy and numeracy embedding becomes a matter of subjective judgement. The development team, therefore, designed and documented its own brief as to what it thought would be appropriate levels and forms of embedment.

### **Theoretical underpinning**

This case study is underpinned by theories related to the teaching and learning of adult learners with particular reference to TEC's *Learning Progressions for Adult Literacy* (2008) and supporting documents. The approach is underpinned by Vygotsky's theoretical framework of scaffolding, where learners are provided with initial support in their instruction so that they become independent at a later stage.

### **Actions by Anne Mason**

The process of embedding involved the following:

1. As a new learning and numeracy advisor, I gained information about embedding literacy and numeracy at tertiary level from various sources. These included instructional designers and their documentation, previously embedded course materials, professional development events, TEC key literacy and numeracy documents, and the National Centre for Literacy and Numeracy for Adults website.
2. From these sources I developed guidelines on 'providing clarity and embedding literacy' for writers, which included sections on organisation, language, teaching, learning and support.

3. A practical workshop with the writers included discussion on the writing and revision process, background information about embedding literacy and numeracy in the tertiary sector, TEC's learning progressions and supporting documents, and practical activities to implement aspects of the guidelines for embedding literacy.
4. I provided writers with detailed feedback on the first sections of their course revisions.
5. Several meetings were held with those involved in the process (for example, project leader/technical editor, instructional designers, literacy and numeracy advisor, project manager and editors) to discuss shared ideas about embedding literacy and numeracy during course revisions.
6. I supported instructional designers with detailed comments and notes for each course related to effective embedding of literacy and numeracy.

### **Anne's results**

1. Brief guidelines for dealing with difficult or multi-syllable vocabulary included:
  - Key words: Define when first used and include a description and example. Use bold typeface for emphasis and add to a glossary.
  - Common subject-specific words: Support when first used – for example, further information in brackets or adding an alternative word.
  - Non-subject-specific words: Replace if not necessary or add support.
2. The more content revisions writers made for each course, the less effective they were at embedding literacy and numeracy.
3. Revisions included more support in the introductions to each section – for example, links were made to existing learning and earlier learning material and, where possible, authentic examples.

## Actions by Richard Drummond

1. As instructional designer I had had experience in embedding literacy and numeracy strategies into a range of programmes, and brought that experience to bear on the present context.
2. A set of in-house guidelines for embedding literacy support and literacy strategies within the learning materials for the programme were agreed between instructional designers and the learning and numeracy advisor. These can be grouped as follows:
  - navigation support (introductory and linking paragraphs, navigation icons)
  - vocabulary support (in-text explanations of technical words, plus provision of a glossary giving easy explanations)
  - contextual support, including enhanced use of relevant illustrations
  - literacy strategies (for example, boxed notes explaining prefixes, word families and so on).
3. The learning materials were then further reviewed after the literacy and numeracy advisor's review, with a view to incorporating plain English style – such as short sentences, plain words and bulleted lists – and providing visual support to the text.

## Richard's results

1. **Frustrations:** 'Retro fitting' learning and numeracy strategies into a pre-existing set of text-heavy courses while at the same time updating content and assessment provides a less satisfactory end product than a course that has been purposefully designed to embed literacy and numeracy strategies. Time and budgetary constraints precluded the latter approach. However, I am satisfied that the support and strategies built into the learning materials will make the text and concepts more accessible – not only to students with literacy difficulties, but to all students.

One of the more useful components in the literacy and numeracy toolkit – literacy-building and comprehension activities – although discussed with the writers, was not provided by them. One suspects that it may have been beyond their comfort zone. However, this shortcoming was noticed by the review team, who devised appropriate literacy strategy activities and embedded them into the learning materials. Current topic-centred activities and assessment tasks are also checked and modified as required, to ensure that the requirements are clear and that students are guided and supported in their responses.



2. **Successes:** A draft course was returned to a tutor/writer after the learning and numeracy components had been added in, and his unsolicited comment was that the material was now much more readable than it had been before and that students should be able to find their way around the course more easily.

### **Future possibilities – general application**

1. The guidelines were used with a workshop of other writers in another Level 2 course.
2. The brief guidelines developed by the team will be shared with other editors working on Horticulture courses.
3. Lessons learnt from Horticulture courses will be transferred to other projects.

This case study highlights the way in which flexible and timely responses are employed within the Learning and Teaching Solutions directorate at the Open Polytechnic in response to government educational performance indicators. The embedding of literacy and numeracy in courseware according to instructional design principles shows the agility and pedagogical responsibility of the organisation in fulfilling student learning objectives within the National Qualifications Framework.

## E-learning pedagogy and instructional design

Lein (2009, p. 1) points out that e-learning strategies have produced a revolution in world instruction, whereby e-learning technologies that were initially used to convert existing instructional material into digital formats now facilitate geographically dispersed distribution, consistency and reduced costs. It has been suggested that because of the distance factor the pedagogy of e-learning is more behaviourist, and that is it is concerned more with responses to external stimuli and less with the internal processes of learning. However, as Poley (1998, p. 975) suggests, 'Learners need to be at the centre of the process. Learners can learn from each other and from teaching faculty'. Furthermore, knowledge of these internal learning processes may be explicit in course, curriculum and online campus design. This may take the form of 'breaking learning material into smaller instructional steps, which have a progressive interactive or modular quality against which the learner's performance may be measured providing positive and negative feedback' (Lein, 2009, p. 2). Bronack et al. (2008, p. 64) remind of us of the interrelationship between language, technology tools and learning:

. . . as soon as we as learners became aware of language, signs, symbols, and gestures, we became forever embedded in communion with the artefacts and intents of others. Even if when alone, one uses social speech inside his/her own head and interacts with artefacts of others' experiences with the intent of using the residue of those experiences as a way of shaping their own. The learner then shares their own experience back onto those cues, which in turn, either solidify or reshape them. (2008, p. 64).

However, behaviourism is not the only model of pedagogical theory that has been applied to the distance learning environment – its major rival is cognitivism, which is often conceptualised as a response to how the learner's mind processes and uses information. Consequently, cognitivism offers to more fully explain human behaviour by modelling mental structures. Cognitivism may be characterised by the use of schema and maps to organise content (Allen, 2007, p. 41), and emphasises the role of the learner's 'thoughts, beliefs, attitudes and values' in the learning process (Schunk, 2007, p. 17).

A third pedagogical model of e-learning is constructionism. Following on from 'cognitivism' in defining learning as a contextualised process of constructing knowledge, the learning is learner-centric and learners take an active role in

the learning process, acquiring knowledge for themselves and processing it in a subjective way. Pedagogically characterised by activity-based learning, constructivism is based on three main principles:

1. Learners learn from their own framing of knowledge patterns and understanding.
2. Learning is achieved through active experience and occurs when the learner uncovers inconsistencies between current knowledge, their own experiences and instructional knowledge, so it is thus concerned psychologically with the 'cognitive-dissonance' paradigm.
3. Learning is adaptive and occurs in a socialised or remotely mediated context through interactions with an instructor and peers.

The constructivist model learning is predicated on the learner's ability to adapt, and has similarities with the question-and-answer mode of enquiry used in the Socratic method (Wachira et al., 2008, p. 2).

This model is deemed to be suited to the distance education mode in so much as it accounts for the spectrum of learning from 'high-contact' students, who respond to intensive teacher stimulus to 'low-contact' students, who seek to solve a problem on their own, rather than being given the knowledge or instructions for the problem (Modritscher, 2006, p. 7). A feature of both high-contact and low-contact distance education is the necessity to give students 'point of need' access to educational resources (Lein, 2009, p. 2). As Piskurich (2003, p. 3) suggests, good instructional design will:

help you or whoever instructs [the] course to facilitate the participants' learning effectively and efficiently and, most important it will help . . . make sure that what is in your program is what your trainees need to learn.

A fourth model of pedagogy relevant to instructional design is 'connectivism'. The main premise of this theory is that knowledge is distributed across courseware and hence less emphasis is placed on its proportionality. The main proponents of this theory are Downes (2007) and Siemens, who argue that knowledge can be considered a series of connections formed by actions and experience – a bit like a 'join the dots' puzzle. Connectivism is also a difficult theory to apply to the modality of instructional design, aside from conceptualising courseware as units within a network. While in some senses this is fitting, given that courses are taught within programmes and degrees, like behaviourism before it 'connectivism' tends to downplay the role of internal mental processes and individual agency in the learning experience. Arguably, it is a term better suited to the uses of technology.

## Instructional design for learning variety and future issues

In distance education instructional design is paramount for a number of reasons. First, it provides structure in the delivery of education. Second, it must do so for a wide range of learners – with or without high school qualifications, prior tertiary study experience, special needs or learning disabilities. Flexibility is highly desirable, as it allows the tertiary education institution to encompass the varied learning needs of distance students. Considerations of ‘learner characteristics’ and ‘student satisfaction’ are significant factors in instructional design (Zheng & Smaldino, 2003, pp. 157–159). As Burgstahler suggests, soundly designed instructional materials and activities should ‘make the learning goals achievable by individuals with wide differences in their abilities to see, hear, speak, move, read, write [. . .] attend, organise, engage, and remember’ (cited in Elias, 2010, p. 110).

Distance students include those whose learning journey is a means to overcome ethnic or age differences. As Elias suggests, distance education students ‘may face a variety of physical, learning, psychological, visual, and hearing challenges’ (2010, p. 110). Furthermore, distance learners may feel isolated from one another, the tertiary education provider and their instructor, since they are often studying while working and bringing up families or caring for relatives (Elias, 2010, p. 12). Both pedagogical and instructional design elements must contribute to supporting diverse groups of learners. For example, for Māori learners the important elements are the provision of a culturally responsive environment, the mutable roles of teacher and learner, ‘tuakana–teina’ relationships between learners, and the marriage of collective responsibility with individual responsibility (Greenwood & Te Aika, 2009). As Tamati suggests, ‘e-Ako is a pedagogical philosophy which underlies an online teaching environment, and enables Māori to follow a similar concept by using technology’ (2008, p. 19). In order to achieve increased participation and greater knowledge outcomes for Māori, an inclusive approach is necessary ‘so that everyone participates fully in group dialogue, and is not excluded from the e-learning whānau’ (Tamati, 2008, p. 19).

People, most notably ‘knowledge workers’ (educators), will increasingly create and actively maintain online personal learning environments to capture their continuous learning journey (Martin, 2007). Open-source learning management systems will continue to improve, allowing more and more add-ins (that is, it will be possible to integrate a large variety of Web 2.0 tools into a course). As many software applications are now web-based, these applications and learning management systems will become more and more interoperable. The

proliferation and fast development of new technologies necessitates the need for people working with technology in education to 'have a clear and articulate set of reasons for employing a certain technology in a particular way' (Sandford, 2006). Although it is desirable for instructional designers and teachers alike to keep up to date with new technology, both must be thinking first and foremost about learners and how to help them achieve the learning outcomes.

In summary, instructional design is integral to any education environment. It provides the building blocks of the learning process, and mediates between the educational constructs and the student. There is an increasing trend for flexibility and openness in courseware design, and for the use of more sophisticated and innovative technologies for furthering the reach of education within both mobile and global contexts. An area for future attention is the various ways in which courseware, methods of course delivery and teaching may be effectively monitored for quality of design.

## References

- Alexander, B. (2006). Web 2.0: A new wave of innovation for teaching and learning? *Educause Review*, 41(2), 32–44. Retrieved June 24, 2009, from <http://connect.educause.edu/Library/EDUCAUSE+Review/Web20ANewWaveofInnovation/40615>
- Allen, M. W. (2007). *Designing successful e-learning: Forget what you know about instructional design and do something interesting*. San Francisco, CA: Pfeiffer.
- Anderson, T. (2004). Toward a theory of online learning. In T. Anderson & F. Elloumi (Eds.), *Theory and practice of online learning* (pp. 33–60). Athabasca, Canada: Athabasca University.
- Anderson, T., & Dron, J. (2011). Three generations of distance education pedagogy. *The International Review of Research in Open and Distance Learning*, 12(3). Retrieved February 28, 2012, from <http://www.irrodl.org/index.php/irrodl/article/view/890/1663>
- Bloom, B. S., Engelhart, M. D., Frost, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *Taxonomy of educational objectives. Handbook I: Cognitive domain*. New York, NY: McKay.
- Brandon, B. (2008). Nine trends that will shape e-learning in 2008. *Learning Solutions e-Magazine*. Retrieved December 8, 2011, from <http://www.learningsolutionsmag.com/articles/118/nine-trends-that-will-shape-e-learning-in-2008>
- Bridges, B., Baily, M., Hiatt, M., Timmerman, D., & Gibson, B. (2002). A blended technologies learning community – From theory to practice. In P. L. Rogers (Ed.), *Designing instruction for technology-enhanced learning* (pp. 209–227). London, England: Idea Group Publishing.
- Bronack, S., Sanders, R., Cheney, A., Riedl, R., Tashnerm, J., & Matzen, N. (2008). Presence pedagogy: Teaching and learning in a virtual immersive world. *International Journal of Teaching and Learning in Higher Education*, 20(1), 59–69.
- Brown, A., & Green, T. D. (2006). *The essentials of instructional design: Connecting fundamental principles with process and practice*. Upper Saddle River, New Jersey: Pearson.
- Caplan, D. (2004). The development of online courses. In T. Anderson & F. Elloumi (Eds.), *Theory and practice of online learning* (pp. 33–60). Athabasca, Canada: Athabasca University.

- Downes, S. (2004). *What connectivism is*. Postings on the Online Connectivism Conference site, University of Athabasca, Athabasca, Canada. Retrieved December 8, 2011, from <http://lrc.umanitoba.ca/moodle/mod/forum/discuss.php?d=12>
- Elias, T. (2010). Universal instructional design principles for Moodle. *International Review of Research in Open and Distance Learning*, 11(2), 110–124.
- Engeström, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research*. Helsinki, Finland: Orienta-Konsultit.
- Evans, A. D., & Lockee, B. B. (2008). At a distance. An instructional design framework for distance education. *Distance Learning*, 5(3), 11–16.
- Fisher, R., Chipindiku, G., & Maathuis-Smith, S. (2010). *Experiences of teaching faculty enrolled in the Open Polytechnic of New Zealand's certificate in designing and facilitating e-learning*. Lower Hutt, New Zealand: The Open Polytechnic of New Zealand.
- Gaither, N. (1980). *Production and operations management: A problem-solving and decision-making approach*. Hinsdale, IL: Dryden Press.
- Gilbert, T. F. (1967). Praxeonomy: A systematic approach to identifying training needs. *Management of Personnel Quarterly*, 6(3), 20–33.
- Greenwood, J., & Te Aika, L. (2009). *Hei tauira: Teaching and learning for success for Māori in tertiary settings*. Wellington, New Zealand: Ako Aotearoa.
- Gustafson, K. L., & Branch, R. M. (2007). What is instructional design? In R. A. Reiser & J. V. Dempsey (Eds.), *Trends and Issues in instructional design and technology* (2nd ed., pp. 16–25). Upper Saddle River, NJ: Merrill-Prentice Hall.
- Herring, M. C., & Smaldino, S. E. (1998). *Planning for interactive distance education: A handbook*. Washington, DC: Association for Educational Communications and Technology.
- Holmberg, B. (1995). *Theory and practice of distance education* (2nd ed.). London, England; New York, NY: Routledge.
- Karrer, T. (2006). *What is e-learning 2.0?* Retrieved June 24, 2009, from <http://elearningtech.blogspot.com/2006/02/what-is-elearning-20.html>

- Keller, J. M. (1984). The use of the ARCS model of motivation in teacher training. In K. Shaw & A. J. Trott (Eds.), *Aspects of educational technology volume xvii: Staff development and career updating* (pp. 140–145). London, England: Kogan Page.
- Lee, H-J., & Rha, I. (2009). Influence of structure and interaction on student achievement and satisfaction in web-based distance learning. *Educational Technology & Society*, 12(4), 372–382.
- Lein, K. (2009). *Making fun of a process: Comparing pedagogical strategies in process-based elearning games*. Retrieved December 8, 2011, from <http://elearningpedagogy.com/KleinDigitalProject.pdf>
- Martin, M. (2007). *My personal learning environments*. Retrieved June 24, 2009, from [http://michelemartin.typepad.com/thebambooprojectblog/2007/04/my\\_personal\\_lea.html](http://michelemartin.typepad.com/thebambooprojectblog/2007/04/my_personal_lea.html)
- Ministry of Education. (2010). *Tertiary education strategy 2010–15*. Wellington, New Zealand: Author. Retrieved December 12, 2011, from [http://www.minedu.govt.nz/NZEducation/EducationPolicies/TertiaryEducation/PolicyAndStrategy/~/\\_media/MinEdu/Files/TheMinistry/TertiaryEducationStrategy2010/TES2010to2015.pdf](http://www.minedu.govt.nz/NZEducation/EducationPolicies/TertiaryEducation/PolicyAndStrategy/~/_media/MinEdu/Files/TheMinistry/TertiaryEducationStrategy2010/TES2010to2015.pdf)
- Modritscher, F. (2006). E-learning theories in practice: A comparison of three methods. *Journal of Universal Science and Technology of Learning*, 0(0), 3–18.
- Moore, M. G. (1997). Transactional distance theory. In D. Keegan (Ed.), *Theoretical principles of distance education* (pp. 22–38). New York, NY: Routledge.
- Moore, M. G., & Kearsley, G. (2005). *Distance education: A systems view*. Belmont, CA: Wadsworth.
- Piskurich, G. M. (2000). Distance learning in higher education. In K. Mantyla & J. Woods (Eds.), *The 2000/20001 ASTD distance learning yearbook* (pp. 19–25). New York, NY: McGraw-Hill.
- Poley, J. K. (1998). Distance education for American universities and the world. *American Journal of Agricultural Economics*, 80(5), 973–978.
- Prasolova-Førland, E. (2001). *Distance learning: Overview and design issues*. Retrieved December 8, 2011, from <http://csgsc.idi.ntnu.no/2001/pages/papers/ekaterip.pdf>



- Reigeluth, C. M., & Carr-Chellman, A. A. (2009). *Instructional-design theories and models, vol. III: Building a common knowledge base*. New York, NY: Routledge.
- Romiszowski, A. J. (1981). *Designing instructional systems. Decision making in course planning and curriculum*. London, England: Kogan Page.
- Rosenberg, M. (2006). What lies *beyond* e-learning? *Learning Circuits*. Retrieved December 8, 2011, from [http://marcrosenberg.com/images/What\\_Lies\\_Beyond\\_E-Learning\\_ASTD.pdf](http://marcrosenberg.com/images/What_Lies_Beyond_E-Learning_ASTD.pdf)
- Rothwell, W., & Kazanas, H. C. (2004). *Mastering the Instructional design process: A systematic approach* (3rd ed.). San Francisco, CA: John Wiley.
- Sandford, R. (2006). Digital post-colonialism. *Futurelab*. Retrieved June 24, 2009, from <http://flux.futurelab.org.uk/2006/12/14/digital-post-colonialism/>
- Schunk, D. H. (2007). *Learning theories: An educational perspective* (5th ed.). New York, NY: Prentice Hall.
- Tamati, D. (2008). *Engaging the Māori e-learner: Instructional technology, design, & delivery* (unpublished master's thesis). Unitech Institute of Technology, Auckland, New Zealand.
- Tennyson, R. D. (2010). Historical reflection on learning theories and instructional design. *Contemporary Educational Technology, 1*(1), 1–16.
- Tertiary Education Commission. (2008). *Learning progressions for adult literacy*. Wellington, New Zealand: Tertiary Education Commission. Retrieved December 8, 2011, from <http://www.tec.govt.nz/Documents/Publications/Learning-progressions-literacy.pdf>
- Wachira, P., Keengwe, J., & Onchwari, G. (2008). *E-learning pedagogy: Tools to enhance effective e-learning environments*. Paper presented at the MWERA Annual Meeting, Columbus, Ohio. Retrieved December 8, 2011, from [http://www.allacademic.com/meta/p275502\\_index.html](http://www.allacademic.com/meta/p275502_index.html)
- Willis, B. (2000). Strategies for teaching at a distance. In K. Mantyla & J. Woods (Eds.), *The 2000/2001 ASTD distance learning yearbook* (pp. 19–25). New York, NY: McGraw-Hill.
- Zheng, L. & Smaldino, S. (2003). Key instructional design elements for distance education. *The Quarterly Review of Distance Education, 42*(2), 153–166.

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