

Development-based research and professional development

Mike Keppell

Centre for Learning, Teaching and Technology
Hong Kong Institute of Education

Eliza Au

Department of Creative Arts and Physical Education
Hong Kong Institute of Education

Ada Ma

Department of Mathematics, Science, Social Science and Technology
Hong Kong Institute of Education

Christine Chan

Department of Early Childhood Education
Hong Kong Institute of Education

Abstract

In this paper, we describe how four teacher-educators redesigned six online modules over a two-year period to utilise student-centred learning and learning-oriented assessment. Phase 1 of the project examined the redesign of three online modules using technology-enhanced assessment as well as completing research on teacher-educator beliefs about learning, technology and assessment. Phase 2 of the project focused more specifically on collaboration, peer learning and learning-oriented assessment, and included the redesign of a further three online modules. A development-based research approach was utilized as it emphasized analysis, development, evaluation and the production of design principles. This approach provided a means of immersing ourselves in the project over a sustained period of time in order to analyse our current way of teaching the modules, development of a new learning design for each module, student evaluation of the new learning design followed by reflection on the process in order to develop a number of key principles. In addition to the student learning benefits, there were significant benefits for the professional development of academic staff involved in the project.

Keywords

learning-oriented assessment, professional development, development-based research

Introduction

Before examining the details of the project it is useful to examine the context for the development-based research project as this has a bearing on the initiative. The Hong Kong Institute of Education (HKIED) is a teacher-education university with approximately 8,000 full-time and part-time students, and approximately 700 non-academic staff and 300 academic staff. The Institute “offers a range of programmes leading to the award of certificates, first degrees and postgraduate diplomas, which provide suitable preparation for a career in education and teaching in the pre-school, school and vocational training sectors; and also offers a series of programmes which provide professional education and development for serving teachers in these sectors” (Hong Kong Institute of Education [HKIED], 2004a). Around 75% of the face-to-face modules (i.e. course or subject) are taught in Cantonese, with the remainder being taught in English. Within the local Hong Kong context there has been a predominant emphasis on summative assessment in primary, secondary and higher education. As the leading teacher-education institution within Hong Kong, the Institute wanted to address how formative or learning-oriented assessment could be fostered in higher education. To address this issue within the Institute and within teacher-education a three-year teaching development grant was successfully obtained which provided the scaffold for the initiative in technology-enhanced assessment.

The Learning-oriented Assessment Project (LOAP) (Carless, 2003) (HKIED, 2004b) is a three-year University Grants Committee (UGC)-funded project that involves collaboration among several tertiary institutions in Hong Kong. LOAP focuses on learning-oriented assessment in the context of higher education. It is expected that the promotion of good assessment practices should enhance the quality and culture of assessment, which has been identified as a solution to address a major barrier in improving Hong Kong

education. To investigate the value and benefits from learning-oriented assessment, six action-research teams were formed at the Institute in order to examine core areas for improving assessment. The focus areas of these action-research teams comprised: feedback for learning and assessment; field experience assessment; know-want-learn (KWL) method of self-assessment; performance assessment; portfolio assessment; and technology-enhanced assessment (HKIED, 2000b). The technology-enhanced assessment action-research/development-based research team consisted of four teacher-educators from four different departments: Early Childhood Education, Information and Applied Technology, Creative Arts and the Centre for Learning, Teaching and Technology. Our focus over the initial 12-month period was to improve the use of learning-oriented assessment in four separate modules in teacher education. The second phase of the project (a further 12 months) examined the redesign of a further three modules. This paper focuses on the benefits of development-based research for professional development. Other papers have focused on other aspects of the initiative (Keppell, Au, Ma, & Chan, 2005a; 2005b; Keppell, Au, & Ma, 2005; Keppell & Carless, 2005). The implications of this approach for the field of educational technology in general will also be discussed.

Use-inspired research

An examination of the underlying research approach should provide insight into the methodology used in this development-based research project. Reeves (2000) suggested that many problems exist within the field of instructional technology/educational technology in relation to the quality and potential usefulness of research undertaken within the field. In essence he suggests that there are widespread misconceptions about the nature of basic and applied research as well as the existence of many inarticulate and low quality research publications. In addition, he suggested that few research publications in the field of educational technology provide guidance to practitioners within the field. Although Reeves focuses on the field of educational technology, the problems are not unique to this specific area of education. Educational researchers struggle with legitimizing their research within the research community and also legitimizing practical guidelines to teachers within the pre-school, primary and secondary classrooms. Educators have struggled with basic research (which is seen to be theoretical and impractical), and applied research (which is practical but often fails to provide any impetus to the theoretical foundations of the area). Stokes (1997) in his seminal book examined the concepts of basic and applied research and suggested that they may provide an inadequate framework for research. He initially defined the features of basic and applied research and then introduced his own concept of *use-inspired research*. Stokes (1997) suggested that basic research “seeks to widen the understanding of a phenomena of a scientific field” (p. 7) and applied research is “directed toward some individual or group or societal need or use” (p. 8). A major difficulty with categorizing research as either basic or applied means that researchers need to make a choice between the two forms of research resulting in different camps of researchers and different funding agencies perpetuating the concept of either a basic or practical research dichotomy. Stokes (1997) addressed this dichotomy by developing a heuristic illustrated as four quadrants. This heuristic represents not only a significant insight into the nature of research and what should be valued within society but also a model useful for the field of educational technology research.

		CONSIDERATIONS OF USE?	
		NO	YES
QUEST FOR FUNDAMENTAL UNDERSTANDING?	YES	PURE BASIC RESEARCH	USE-INSPIRED BASIC RESEARCH
	NO		PURE APPLIED RESEARCH

Figure 1: Quadrant model of scientific research (Stokes, 1997, p. 73)

The top left quadrant is basic research “guided *solely* by the quest for understanding without thought of practical use” (Stokes, 1997, p. 73). The lower right quadrant includes research guided *solely* by applied goals without seeking a general understanding of the phenomena. The top-right quadrant “includes basic research that seeks to extend the frontiers of understanding but is also inspired by considerations of use” (p. 74). The quadrant labeled use-inspired basic research is also called Pasteur’s quadrant, as he developed practical outcomes while at the same time developing our understanding of microbiology. This quadrant represents a means of addressing the basic research/applied research dichotomy and begins to refocus the research agenda that could be adhered to in the field of educational technology. The bottom-left quadrant, although empty, could be considered to be research neither motivated by understanding or use. Reeves (2000) actually suggested that much of educational technology research is located in this quadrant. Curiosity on the part of the investigator is indicative of this quadrant.

The above discussion has implications for the field of educational technology and offers some promise for future research projects in the area. In fact, Reeves (2000) advocated that new forms of research are required in the field of educational technology to address the earlier mentioned failures. Reeves suggested that ‘development research’ (van den Akker, 1999), ‘design experiments’ (Brown, 1992; Collins, 1992), ‘formative research’ (Newman, 1990) all align with the concept of ‘use-inspired research’ and offer promise for the field of educational technology. In this paper development-based research is utilized. Development-based research is defined as research “focused on the dual objectives of developing creative approaches to solving human teaching, learning, and performance problems while at the same time constructing a body of design principles that can guide future development efforts” (Reeves, 2000, p. 7 (see Figure 2)). Educational technologists need to consider how our developments benefit the user, group or society. We also need to develop our understanding of how our developments benefit our understanding of educational technology. A significant benefit of emphasizing development-based research is that it also fosters more basic research and more applied research. The following project demonstrates the application of a development-based research project and the benefits that accrue from this approach for both the end-users and the teacher-educators involved in the project.

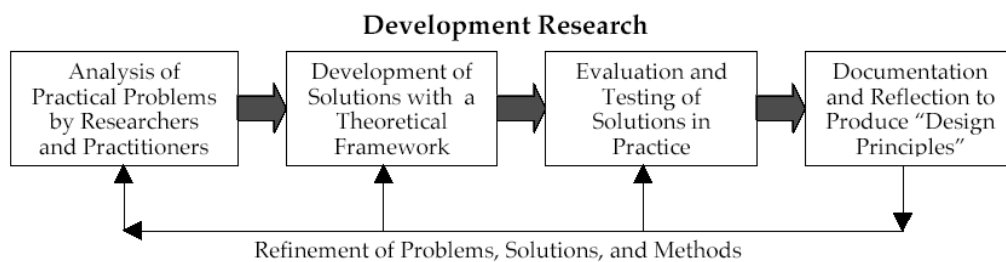


Figure 2: Development-based research process as outlined by Reeves (2000, p. 9)

Project

The roadmap for the project is illustrated in Figure 3. This figure demonstrates how the first phase of the project began with technology-enhanced assessment (in the centre of the spiral) and moved on to examine teacher-educator beliefs about teaching and learning, technology and assessment. The project then focused on redesigning each of our modules, teaching the modules, obtaining student feedback and reflecting on our work through our writing and then disseminating our findings in a number of publications. Phase 2 focused more specifically on collaboration and peer learning, redesign of our modules, teaching of our modules, student feedback, teacher reflection and the completion of further publications on the initiative.

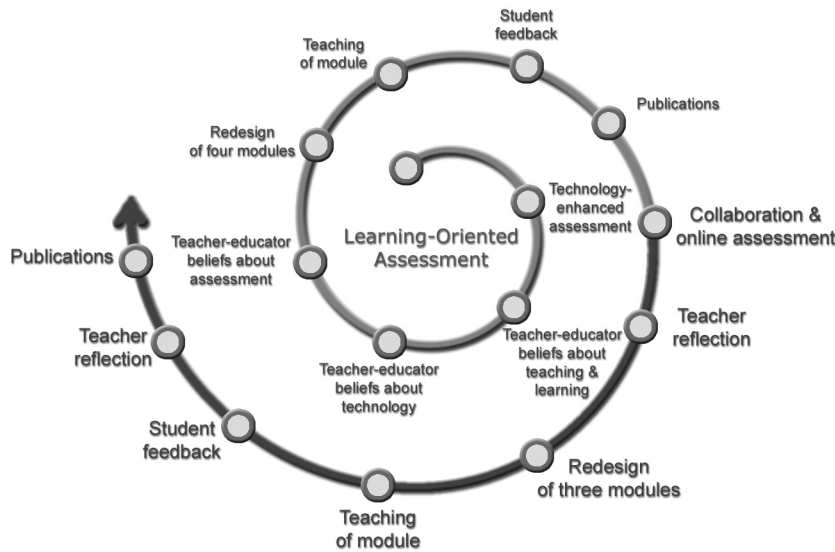


Figure 3: Road map for the development-based research project on technology-enhanced assessment

Phase 1

By initially examining teacher and student perceptions of technology-enhanced assessment, we hoped that we would refine our assessment, redesign our module to reflect this new assessment potential and consequently improve teaching and learning within our classes. The first aim of the project involved the documentation and capture of teacher-educator conceptions about assessment through the use of concept maps, audio-interviews, and video-interviews. Teacher-educator conceptions of technology and assessment have a major influence on the design, teaching, and implementation of the modules, as they reflect the underlying epistemological viewpoint of the individual teacher (Loughran, Mitchell, & Mitchell, 2003). By examining these teacher conceptions throughout the project we hoped that the analysis of the concept maps and interviews would assist in the further refinement of the integrated assessment, teaching and learning components for each module (see Keppell, Au, Ma, & Chan, 2004a). A second aim of the project in Phase 1 was to redesign our modules by integrating learning-orientated assessment and online learning. The learning design of the modules was carefully considered as we modified our assessment (see Keppell, Au, Ma, & Chan, 2005b). A third aim was to utilize authentic assessment within our modules in order to align learning design and assessment as we taught the modules (see Keppell, Au, Ma, 2005a). A fourth aim was to document student perceptions of technology-enhanced assessment through questionnaires, video interviews, and focus groups. Although many of these aspects have been reported elsewhere, this paper focuses on the benefits of the project for professional development.

Beliefs about teaching and learning

It is widely accepted that beliefs of university teachers have a significant effect on teacher actions and approaches to education. Teacher beliefs provide guidelines for teaching; a blueprint for action; and “an open or closed door to promote, inhibit or resist change” (Errington, 2004, p. 40). Teachers are often committed to beliefs that influence their goals and agendas (Lumpe & Chambers, 2001, p. 93). Howard, McGee, Schwartz and Purcell (2000) suggested that teacher beliefs affect curriculum implementation, instructional approaches, teaching strategies and problem-solving strategies. As part of our development-based research project we examined teacher-educator beliefs through video-interviews, concept maps and dialogue between the team members. Teachers engaged in dialogue about personal beliefs in order to determine how they would influence their approach in redesigning their online module using peer assessment. This peer learning approach to professional development mirrors the approach advocated by Boud (1999), who suggested that reciprocal peer learning should include:

- Participants collaborating with each other within a learning community.
- Participants reflecting on their professional practice using peer learning.
- Participants applying their knowledge within their own discipline in which like-minded peers provide constructive feedback and support.
- Participants taking collective responsibility for identifying their own learning needs.

In addition, beliefs about technology were also found to be powerful factors in how teacher-educators redesigned and subsequently taught their online module.

Beliefs about technology

Since we were specifically interested in the role of technology in teaching and learning and assessment we also examined our beliefs about technology. It is suggested that teachers' beliefs about their capacity to work effectively with technology may be a significant factor in successful integration of technology into teaching and learning (Wang, Ertmer, & Newby, 2004). As part of the development-based research project we articulated our beliefs about technology by initially creating a metaphor for technology that would provide some insight into our beliefs about technology. This metaphor assisted in our exchange of ideas about beliefs about teaching, learning and technology. For instance:

I think the metaphor that comes to mind is that technology is like a mountain climb in the Himalayas ... you can choose very different ways to reach your destination to achieve your goal... [video-interview with teacher educator].

Another metaphor sees technology as enrichment and the extra 'spice' that may enhance teaching and learning:

I think a good choice of seasoning for the ingredients is the key to success. So I would take technology as the seasoning. And food can go without seasoning ... but an appropriate choice of seasoning would definitely enhance the taste, to bring out the flavour of a particular ingredient or even improve the texture of the food [video-interview with teacher educator].

Throughout the project we also discussed the affordances of the technology and how we could best use the technology to enhance our teaching, learning and assessment. A primary focus of the project was to implement learning-oriented assessment into each module. By initially examining teacher perceptions of teaching, learning and technology we hoped that we would refine our assessment, redesign our module to reflect this new assessment potential and consequently improve teaching and learning within our classes.

Principles

At the end of Phase 1 we reflected on the process of redesigning our modules, teaching our modules, obtaining student perceptions, making numerous presentations and engaging in dialogue through writing publications about the project. In order to capture these reflections we conducted video-interviews with the four teacher-educators in the project. One of the questions focused on principles of assessment and asked participants to *outline 2-3 principles of assessment that may be relevant for other teacher-educators using technology-enhanced assessment*. The following principles represent some of the participants' perceptions and indicate how we planned to redesign our modules in the second phase of the project. These principles include:

- Give clear assessment criteria — verbally and in writing so that students understand expectations.
- Assessment should be a continuous process.
- Assessment should combine formative and summative assessment together.
- Assessment should be as authentic as possible to the task.
- There should be curricular alignment, learning alignment and alignment within the teaching of the module.
- Desired learning outcomes must feature strongly in the assessment task.
- Formative assessment in the online environment is useful because students obtain feedback from both other students and the teacher.

Phase 2

Phase 2 of the project represented a more focussed approach (see Figure 3 — outer loop of spiral) and examined collaboration and peer learning in the redesign of three new online modules. Peer Learning is a "two-way reciprocal learning activity" (Boud, Cohen, & Sampson, 2001, p. 3) in which there is mutual benefit to the parties involved. The reciprocal nature of the activity is key, as students do not hold power over each other by virtue of their position or responsibilities. Because peer learning is bi-directional, it differs from peer tutoring which implies an unequal partnership due to the position of responsibility that one person would hold. Peer learning can be both informal and formal. Informal peer learning occurs implicitly when students discuss lectures, assignments, projects and exams in casual social settings. Formal peer learning occurs when group work or group projects are explicitly scheduled into courses.

A similar process of video interviews with the academics followed by redesign of the modules, teaching, student feedback, and then a subsequent interview with the academic was completed. To provide some insight into the redesign process of Phase 2 we have provided a brief overview of the three modules and the learning design used for each module.

Case 1: Care and protection of young children

A module on early childhood education focused on care and protection of young children and utilized problem-based learning scenarios to initiate online discussion about a number of issues in pre-school education. For instance, students were presented with the following scenario (see below) and then asked to complete a care-process worksheet after examining the case and then they discussed their view of the case in an online discussion group.

Siu Fa is 2 years of age and she is the first daughter in the family. Her father is a Hong Kong citizen. Her parents married in China and last year Siu Fa and her mother immigrated to Hong Kong. Her father works occasionally in China and her mother has a full time job in Hong Kong, normally working from 8am to 8 pm. After going to nursery school, Siu Fa has to be looked after by the neighbor until her mother comes home at about 8pm.

Each student posted their worksheet online so that other members of the group could see how other students evaluated the case.

Case 2: Multimedia and web authoring

The approach to this module was to provide a broad exposure to design, development and evaluation of multimedia and web technology and utilized blended learning, project-based learning, peer learning and peer assessment. Groups of three to five students each created a website focused on an area that they could use for their own teaching in secondary school. The website needed to include:

- a rationale for the focus of the website
- a needs analysis, a concept map (macro design of website)
- educational resources for students
- 5–10 graphics, 3 videos (30secs – 2 mins in length), 2 audio segments and 1 animation.

No individual assessment within the group project was utilized, in an attempt to enhance the peer learning component of the module as opposed to the competitive nature of the individual contribution to the group project.

Case 3: Fashion industry and consumerism

This module focused on three assessment aspects including a critical analysis of fashion advertisements. The group project asked the students to examine the underlying message in fashion advertisements. For instance: Whose interests are being served in the advertisement? Who is advantaged? Who is disadvantaged? What issues of justice and injustice does a particular advertisement raise? What unquestioned assumptions about society are evident within the advertisement?

Students were also asked to complete intra-group reflections in the online environment and submit these for peer assessment. A third form of assessment focused on the development of an intra group reflective paper in which students debated, critiqued each others work and provided feedback to each other in the online environment.

Professional development and technology-enhanced assessment

The facilitator of the action-research project had three explicit goals for the two-year project that has just been completed. These areas included the production of: personal knowledge, local knowledge, and public knowledge (Ashwin & Trigwell, 2004). In the first instance the investigation into learning-oriented assessment focused on the production of personal knowledge. Learning occurred in the examination of our beliefs about learning, teaching, technology and assessment and the redesign of our modules. Secondly, the four teacher-educators within the investigation produced local knowledge to inform departmental assessment practices through the development of the six exemplars. Local knowledge was exchanged through a number of presentations within the Institute setting. Thirdly, the investigation produced public knowledge to inform a wider audience including international academics through publications and conference presentations. By focusing on the development of public knowledge the team members also developed new personal knowledge.

Ashwin & Trigwell (2004) also suggest that most professional developers tend to focus on the development of personal knowledge while often neglecting the development of public knowledge. A unique characteristic of this professional development approach within the project was the simultaneous focus on the production of personal, local and public knowledge.

Conclusion

This paper has provided some insight into a development-based research project that is focused on improving teaching and learning of teacher-education modules. It has examined how the approach has allowed the group to examine their beliefs about teaching and technology, redesign their modules and develop a number of guiding principles for assessment. The inner circle of the diagram illustrates Phase 1 of the project and begins with the focus on technology-enhanced assessment. We then examined teacher-educator beliefs about teaching and learning, technology and assessment before redesigning and teaching our modules. Focus groups with students provided feedback about the approach and publications provided a means for the group to begin to articulate their view on the area. The intermediate step between Phase 1 and Phase 2 involved video-interviews with the teacher-educators with the explicit purpose of developing preliminary principles that we would use in Phase 2 of the project. The outer circle of the diagram illustrates the stages we followed for Phase 2 of the project with a focus on collaborative online assessment. We redesigned a further three modules, taught the modules and obtained student feedback on the learning design and the teaching of the modules. The next step will be to refine our principles of online assessment, which will initiate a third phase of the project (see Figure 4). This subsequent phase will expand to colleagues in other institutions in Hong Kong and it is planned to develop an international team focusing on online assessment.

Development-based research allows researchers to no longer be constrained by the basic research/applied research dichotomy. Use-inspired research provides a means of addressing societal needs while at the same time pushing the boundaries of knowledge within the discipline — in this case educational technology. Stokes (1997) has provided us with a legacy worthy of attention in the field of educational technology and professional development.

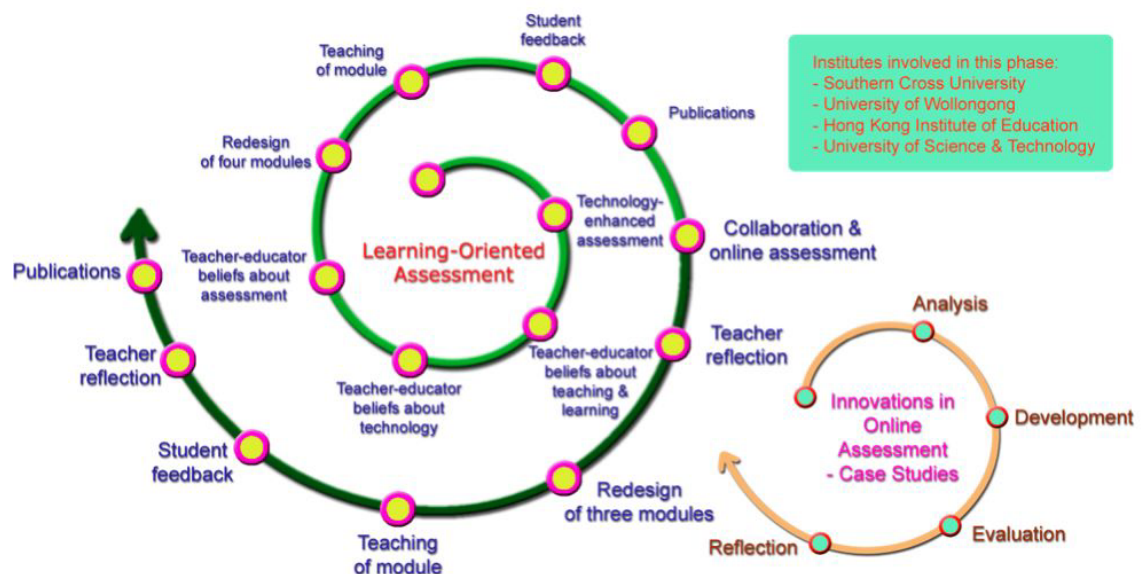


Figure 4: Phase 3 of the development-based research project in teacher-education — innovations in online assessment — case studies

References

- Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *The Journal of the Learning Sciences*, 2(2), 141–178.
- Collins, A. (1992). Towards a design science of education. In E. Scanlon & T. O'Shea (Eds.), *Computers: New directions in educational technology*. (n.p.).
- HKIEd. (2004a). *Learning-oriented assessment project*. Hong Kong: Hong Kong Institute of Education. Retrieved from <http://www.ied.edu.hk/loop/>

- HKIEd. (2004b). *Hong Kong Institute of Education: 2004–2005 strategic plan*. Hong Kong: Hong Kong Institute of Education.
- Keppell, M., & Carless, D. (2005). (in press). Learning-oriented assessment: A case study focusing on technology-enhanced assessment. *Assessment in Education*.
- Keppell, M., Au, E., & Ma, A. (2005). Authentic online assessment: Three case studies in teacher education. In S. Howell & M. Hricko (Eds.), *Online assessment and measurement* (Vol. II, pp.42–61). Hershey, PA: Idea Publishing Group.
- Keppell, M., Au, E., Ma, A., & Chan, C. (2005a). Curriculum development in technology-enhanced environments. In C. Howard, P. Rogers, J. V. Boettcher, G. A. Berg, L. Justice, & K. Schenk (Eds.), *Encyclopedia of distance learning* (Vol. I-IV, pp. 492–504). Hershey, PA: Idea Group Reference.
- Keppell, M., Au, E., Ma, A. & Chan, C. (2005b). (in press). Peer learning and learning-oriented assessment in technology-enhanced environments. *Assessment and Evaluation in Higher Education*.
- Loughran, J., Mitchell, I., & Mitchell, J. (2003). Attempting to document teachers' professional knowledge. *Qualitative Studies in Education*, 16(6), 853–873.
- Newman, D. (1990). Opportunities for research on the organizational impact of school computers. *Educational Researcher*, 19(3).
- Reeves T. C. (2000, April 27). *Enhancing the worth of instructional technology research through "design experiments" and other development research strategies*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA, USA.
- Stokes, D. E. (1997). *Pasteur's quadrant: Basic science and technological innovation*. Washington, DC: Brookings Institution Press.
- van den Akker, J. (1999). *Principles and methods of development research*. In J. van den Akker, N. Nieveen, R. M. Branch, K. L. Gustafson, & T. Plomp, (Eds.), *Design methodology and developmental research in education and training* (pp. 1–14). The Netherlands: Kluwer Academic.

Acknowledgments

The authors wish to acknowledge the invaluable assistance of Christine Wong, the research assistant for the project.

Copyright © 2005 Mike Keppell, Eliza Au, Ada Ma and Christine Chan

The author(s) assign to ascilite and educational non-profit institutions a non-exclusive licence to use this document for personal use and in courses of instruction provided that the article is used in full and this copyright statement is reproduced. The author(s) also grant a non-exclusive licence to ascilite to publish this document on the ascilite web site (including any mirror or archival sites that may be developed) and in printed form within the ascilite 2005 conference proceedings. Any other usage is prohibited without the express permission of the author(s).