

Management of an eLearning Evaluation Project: The e3Learning Model

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This article describes the evaluation of purpose-built course websites for university-level teaching and learning developed by a funded project (e3Learning, e3L) in Hong Kong, which was designed to support teachers in three universities to supplement classroom teaching with eLearning. Previous articles on the e3L project have described the customized, flexible nature of the large number of evaluations conducted in the period 2003–2005. This article concentrates on the procedural mechanisms and management strategies that have considerably facilitated the process and guaranteed the continued quality of the evaluations. The mechanisms and strategies incorporated have ensured externally good communication between the evaluation team and the teachers, and internally a smooth-running workflow in which the responsibility of each member in the evaluation team is well defined. Evidence is presented of the benefits of this model of, and strategies for, evaluation.

THE CONTEXT OF E3LEARNING

As more effort is spent on web-assisted teaching, the need to evaluate various aspects of how the Web can assist teaching and learning becomes more imperative. Reeves and Hedberg (2003) suggested that the integration of evaluation into all technology-enhanced interactive learning systems is essential.

There are many aspects of eLearning that need to be evaluated. There are a number of “macro” issues in the successful integration of teaching and technology such as institutional policy, leadership, culture, support, infrastructure, reallocation of resources, and staff training and development (Thompson, 1999; Robinson, 2001). This article does not focus on this macro level. The project we describe has been concerned with a large number of “micro”

evaluations of teachers and students in single university courses.

Our work is the evaluation of purpose-built course websites for university-level teaching and learning developed by a project funded by the University Grants Committee of Hong Kong to support teachers in three universities to supplement classroom teaching with eLearning. The article builds on an earlier paper on the evaluation model used in the same project reported in *ED-MEDIA 2004* (Lam & McNaught, 2004). The focus of the first paper was on the requirements and characteristics of the evaluation, while this article concentrates on the procedural mechanisms and management strategies that have considerably facilitated the process and guaranteed the evaluation quality.

The e3Learning (enrich, extend, evaluate learning; e3L) project was designed to assist teachers to better exploit the possibilities of web-assisted teaching by offering a range of services: from introducing teachers to practical ideas about using the Web in education, to helping them to make better use of the functions of teaching and learning platforms such as WebCT, to developing complete course websites for the teachers. Full details of the design of this project are in James, McNaught, Csete, Hodgson, and Vogel (2003) and the project website <http://e3learning.edc.polyu.edu.hk/>. The e3L project operated across three universities: the Hong Kong Polytechnic University, the City University of Hong Kong, and The Chinese University of Hong Kong. Over the period 2003–2005 the e3L project supported the web development of 139 educational websites (termed subprojects or cases). Evaluations of 70 websites were completed, involving more than 5,000 students, with over 70,000 accesses to these websites being recorded until the end of 2005. While the e3L project has formally ended, the evaluation mechanism is still being used in a number of other projects at The Chinese University of Hong Kong and continues to evolve.

In team work of this complexity, a well-designed model of development is of great importance in order to achieve efficiency (Phillips, 1997). This article further stresses the importance of building a functional and efficient model of eLearning evaluation to match the scale of development services provided in this type of large joint-university project.

ROLE OF EVALUATION

The e3L project was not just an IT technical support project, but also provided a comprehensive educational support for eLearning that combines eLearning consultation, development and evaluation. Williamson, Kennedy, McNaught, and De Souza (2003) described the nature of multi-disciplinary eLearning development teams as comprising members with a diversity of knowledge and skills. Some roles include project managers, graphic designers, programmers, editors, educational designers, and subject matter experts. The work of all these project participants needs to be effectively coordinat-

ed. The e3L project treated each teacher’s request for eLearning development and evaluation as a complete subproject. Each subproject had its own lifecycle through the phases of planning, design and development, implementation, and evaluation.

In the initial stage, academics received integrated educational and technical advice. If teachers had only sketchy ideas, the initial meeting (one-stop shop meeting) was designed as a showcase of other projects and an opportunity to brainstorm ideas. This exploration was particularly useful for teachers as they could see some concrete examples developed by academics from the same or different departments. Ideas generated from viewing different practices in departments were often cross-fertilized. However, some teachers came with quite concrete ideas and this exploratory phase was shortened. In the one-stop shop meeting the development staff explored the technical needs of the site development, or provided suggestions for modification if the ideas were not feasible.

Figure 1 is a summary of the multiple evaluation purposes of the e3L project. Discussion about how to evaluate the experience began in the first (one-stop shop) meeting and the questions that teachers asked about their students’ learning informed the design and technical development of the websites (McNaught & Lam, 2005b). During the development stage, the project staff members provided technical support; formative evaluation occurred here as well. In the implementation stage, academics were welcome to seek in-time advice for emerging issues. In the final “reflective” stage, detailed

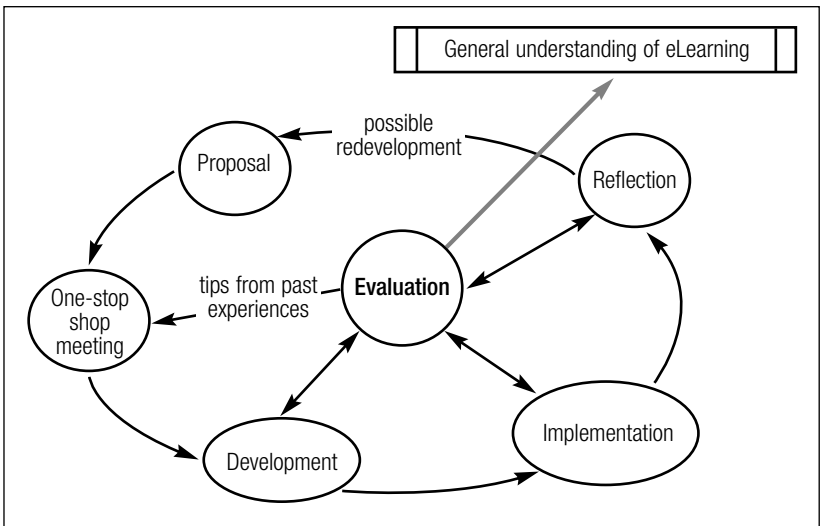


Figure 1. Role of evaluation

evaluation was carried out in cooperation with the teachers. Overall, evaluation helped to affirm individual teachers' efforts through investigating their cases and informing them of strengths, weaknesses and ideas for improvement. It also revealed new possibilities for eLearning in Hong Kong as the stories of the teachers started to accumulate and meta-analytic studies became possible (McNaught & Lam, 2005a).

FLEXIBILITY IN EVALUATION

Evaluating the web materials in this project was difficult because of the highly diverse ways in which individual teachers used the Web in their teaching. The overall design of the evaluation process is a reflection–improvement model in which the findings of the evaluation contributed to further improvements in each of the web-assisted courses under investigation. There are evaluation resources already available, such as toolkits (Oliver, McBean, Conole, & Harvey, 2002) or “cookbooks” (Learning Technology Dissemination Initiative, 1998) but we chose to use a process mediated by an evaluation officer (called “team leader” in the terminology used later in the article) in order to fairly rapidly build up a set of cases of good evaluation practice to which Hong Kong university teachers could refer. Our system (like all others) is not value-free and tends towards a naturalistic model (Guba & Lincoln, 1981; Alexander & Hedberg, 1994).

As discussed in detail in Lam and McNaught (2004), five main sources of diversity have shaped the evaluation approach of the e3L project. They are briefly explained next:

- *Diversity in evaluation purpose:* Formative evaluation and effectiveness evaluation are two main evaluation purposes.
- *Diversity in the nature of web-assisted courses:* The teaching and learning functions of the Web can be grouped into four main categories – (a) content delivery, (b) engaging in communication, (c) conducting assessment, and (d) giving learning support (McNaught, 2002).
- *Diversity in evaluation questions:* McNaught and Lam (2005b) classified all the evaluation questions in the e3L project (457 questions in 70 subprojects). During the time span of e3L there was increasing interest in learning about students' learning outcomes, rather than just whether they enjoyed the course. In addition, teachers became more interested in conducting needs analyses and in having formative as well as summative evaluations.
- *Diversity in evaluation data types:* There are “feel” (opinion), “know” (learning tasks) and “do” (actions) types of data, and the evaluation participants included teachers, students, and third-party content/ eLearning “experts.”

- *Diversity in evaluation instruments:* Many evaluation instruments were used which included individual and group interviews, satisfaction questionnaires, the Study Process Questionnaire (SPQ) which measures students’ approaches to learning (Biggs, Kember, & Leung, 2001), site access counters, classroom observations, reflective journals, and expert reviewers’ reports.

To cope with this diversity, a main feature of our evaluation mechanism was close cooperation with the teachers from the beginning to the end of the whole evaluation process. A five-step model was adopted, illustrated in Figure 2.

- meet with the teachers in the very beginning of the evaluation process to understand needs, current and desired use of the Web; and then to suggest evaluation questions, strategies and instruments to use;
- finalize evaluation questions, data types, evaluation instruments, and the evaluation schedule; and write an evaluation plan;
- design the various evaluation instruments needed based on the evaluation questions in the evaluation plan and then collect the data according to the timing set down in the evaluation plan;
- analyze the feedback and write reports; and lastly
- meet with teachers to plan further actions based on evaluation results.

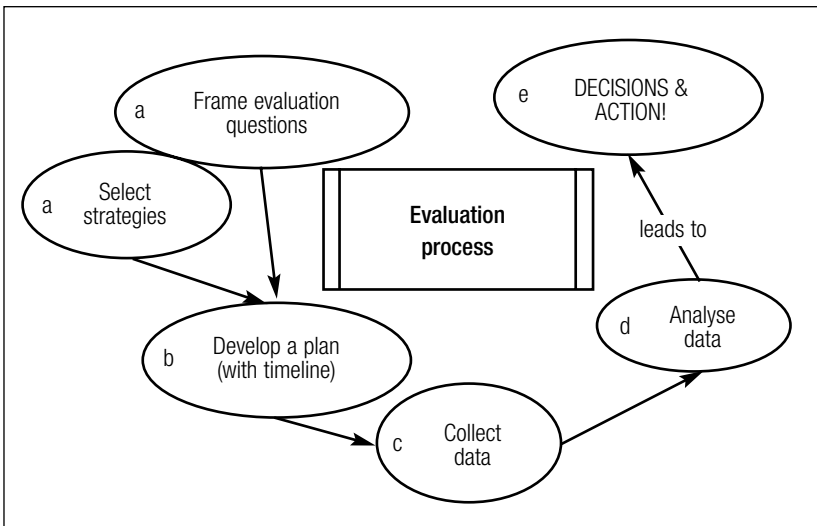


Figure 2. The evaluation process

Seventy (70) cases in the e3L project went through this evaluation process and this generated a great deal of work, particularly as the evaluation team was composed of only one supervisor, one team leader, a full-time research assistant, and two to three part-time student helpers. The project has, over time, built a good evaluation management model which stresses the effectiveness of both the external teacher-evaluation team working relationships, and the internal evaluation team-mates' workflow. As can be seen from Figure 2, effective teacher–evaluation team working relationships are essential for steps a, b, c and e in the evaluation process. An effective evaluation team workflow is essential to the efficiency of step d. During the project a number of strategies were devised that effectively facilitated the teacher–team relationships and the workflow within the evaluation team.

TEACHER – TEAM RELATIONSHIPS

The key strategy to ensure teacher – evaluation team cooperation is good communication. Hodgson and Lam (2004) discussed how good communication is essential in web development projects to ensure that products meet both the requirements of the teachers and fully utilize the potential of the Web. Just as development staff and teachers should talk, it is also of utmost importance that the evaluation team and teacher successfully exchange their needs and suggestions to each other. This situation is depicted in Figure 3. Teachers need to convey to the evaluation team what their evaluation needs are while the team in return informs teachers about common evaluation strategies – their potential, possibilities, and challenges – to assist the teachers in formulating useful decisions. The team also needs to transfer these decisions into workable plans and prepare the evaluation instruments as required. The teacher then helps to arrange for the data collection. Lastly, the

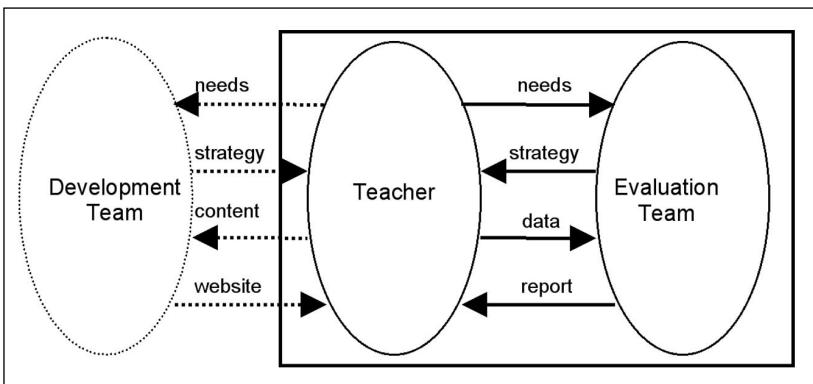


Figure 3. Interactions between the teacher and the evaluation team

team and the teacher communicate again when the team hands over the evaluation results in the form of an evaluation report.

Initial discussions about evaluation needs included an explanation of the common evaluation themes that we have found teachers to be most interested in from other cases. The themes are grouped into those related to the learning environment, learning processes, and learning outcomes (Bain, 1999). Students work within learning environments, going through learning processes to achieve learning outcomes. The themes we articulated in the e3L project are listed across the top of Table 1.

The other strategy sometimes used to help teachers with multiple evaluation focuses was the use of an evaluation decision matrix (Table 2). The matrix was usually helpful in enabling teachers realize that data may come from multiple sources (teachers, students, and third party reviewers); may look at one or more aspects of the learning environment/ learning processes/ learning outcomes; and may make use of many different types of instruments. The matrix also served (and continues to serve) as a checklist on which preliminary decisions are recorded.

The evaluation decisions were later transferred into a detailed evaluation plan in which the website design, evaluation questions/themes, the evaluation instruments, and the timelines of the evaluation were all recorded. (See http://e3learning.edc.polyu.edu.hk/evaluate_scenarios2_plan.htm for a sample evaluation plan.) All our evaluation plans also explicitly articulate the policy for the evaluation data use, which basically guarantees that teachers have access to all their evaluation data and have the rights to use the data for their own research purposes.

The evaluation team also believes that some real examples of how evaluations are planned and conducted may assist teachers to work out what they need and what they can expect from us. Because of this, apart from general information about eLearning evaluation and common evaluation strategies and tools, a few authentic evaluation stories have been put onto the project website (<http://e3learning.edc.polyu.edu.hk/evaluate.htm>).

The team kept a good record of the survey questions used in our various cases, and gathered them into a question pool, grouped according to the evaluation themes previously mentioned. The survey question pool now contains more than 200 items and has become increasingly useful for the team in preparing questionnaires for teachers (see <http://e3learning.edc.polyu.edu.hk/Qdb.htm>). The basic structure of the themes and subthemes used in the survey question pool can be seen in Table 1. Items exist for all subthemes. To facilitate data collection, online surveys are widely used. The team, however, is prepared to administer paper surveys any time when the online option is ruled out because of practical limitations.

Finally, the communication between e3L teachers and the team was ensured with a comprehensive report. The format of the evaluation report

Table 1
Themes and Subthemes Used in the Question Pool

| Main theme | 1. Pre-development | 2. Environment | 3. Teaching & learning processes | 4. Learning outcome | 5. Others |
|------------|---------------------------|-----------------------|---|---|-------------------------------------|
| Subtheme | Habits/ computer literacy | Usability evaluation | Web usage pattern/ level of engagement | Learning benefits: <ul style="list-style-type: none"> • Unspecified and general • Remember/ understand • Apply/ analyze • Evaluate/ create (Bloom, 1956) | Opinions on web teaching as a whole |
| | Motivation to learn | Opinions on content | Class management | Confidence building | Background of students |
| | Expectations & needs | Ideas for improvement | Communication | Improvement on general learning skills | Free ideas |
| | | Strength/ weaknesses | Enjoyment | Enhancement of course-specific skills | |
| | | | Ideas for improvement | Facilitating preparation of classes | |
| | | | Difficulties met | Facilitating revision of classes | |
| | | | Technical issues | Improvement of the ability to reflect on own learning | |
| | | | Integration of web components into course | Building of sense of community | |
| | | | Workload | Promoting self-studying | |
| | | | | Enhancement of motivation to learn | |
| | | | | Changes to style/ approach to learning taken | |
| | | | | Extending scope of learning | |

Table 2
e3Learning Evaluation Decision Matrix

| E-Learning Components | Pre-development | Environment | Process | Outcome | Others |
|--|--|---|--|---|--|
| | <ul style="list-style-type: none"> • Habits/ computer literacy • Motivation to learn • Expectations and needs | <p>Content</p> <ul style="list-style-type: none"> • Coverage • Clarity of explanation • Ideas for improvement <p>Usability</p> <ul style="list-style-type: none"> • Interactivity • Ease of use • Speed • Graphic design • Clarity of instruction | <p>Web usage</p> <ul style="list-style-type: none"> • Web usage pattern/ level of engagement <p>Opinion</p> <ul style="list-style-type: none"> • Workload • Enjoyment • Difficulties met • Technical issues <p>Convenience</p> <ul style="list-style-type: none"> • As class management tools • As communication tools <p>Integration</p> <ul style="list-style-type: none"> • Use of site in class • As self-study materials | <p>Learning</p> <ul style="list-style-type: none"> • Learning enhancement • Confidence building • Skills • Preparation & revision of classes • Extended scope of learning <p>Approach & beliefs</p> <ul style="list-style-type: none"> • Independent learning • Motivation to learn | <ul style="list-style-type: none"> • Opinions of eLearning as a whole |
| <p>Evaluation Strategies</p> <p>Selection of strategies to collect data from <i>teachers, students and third-party reviewers.</i></p> | <p><i>Strategies to consider:</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Needs analysis <input type="checkbox"/> Evaluation of previous versions of materials <input type="checkbox"/> Other | <p><i>Strategies to consider:</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Students tryout sessions <input type="checkbox"/> Expert reviews <input type="checkbox"/> Teacher-developer meetings <input type="checkbox"/> Functional checklists <input type="checkbox"/> Other | <p><i>Strategies to consider:</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Counter on homepage <input type="checkbox"/> Counters on individual resources <input type="checkbox"/> Self-report <input type="checkbox"/> Observation <input type="checkbox"/> WebCT logs <input type="checkbox"/> Surveys <input type="checkbox"/> Focus-group meetings <input type="checkbox"/> Other | <p><i>Strategies to consider:</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Assignments <input type="checkbox"/> Exams <input type="checkbox"/> Tests <input type="checkbox"/> Self-report <input type="checkbox"/> Observation <input type="checkbox"/> SPQ <input type="checkbox"/> Self-report <input type="checkbox"/> Surveys <input type="checkbox"/> Focus-group meetings <input type="checkbox"/> Other | |

has been slowly evolving throughout the two + years of the project and it now contains sections such as the executive summary, description of the website, evaluation plan, and many appendices in which the raw and the analyzed data collected by each of the evaluation instruments are recorded.

TEAM WORKFLOW

The e3L evaluation team has an internal workflow and structure as shown in Figure 4. There are regular research group meetings of the researchers and the manager (and often research assistants from other projects) in which decisions about research interests, ideas, and research designs are debated. The researchers concentrate on overseeing the overall procedures and devise plans that can effectively investigate the research topics identified. The manager monitors the carrying out of the planned procedures. Helpers assist the collection, input, processing and analysis of data. The observations of the various studies are organized into reports and findings written into research papers after discussions among the team members in separate occasions or in the main research group meetings. Several of the papers produced by the e3L project can be accessed at <http://e3learning.edc.polyu.edu.hk/ResourcesOverview.htm>. Some examples of the themes of these papers are: the use of media (Lam & McNaught, 2006a); peer and group assessment (Lam & McNaught, 2006b); peer-review activities (Mohan & Lam, 2005); the use of forums (Lam, Cheng, & McNaught, 2005); carrying out assessments online (Lam, Csete, & Hodgson, 2005); and case-based learning (McNaught & Lam, 2006).

An important advantage of the workflow and structure is that the research team has benefited through the constant internal team dialogues about research ideas and results. We are not only aware of the evaluation needs of

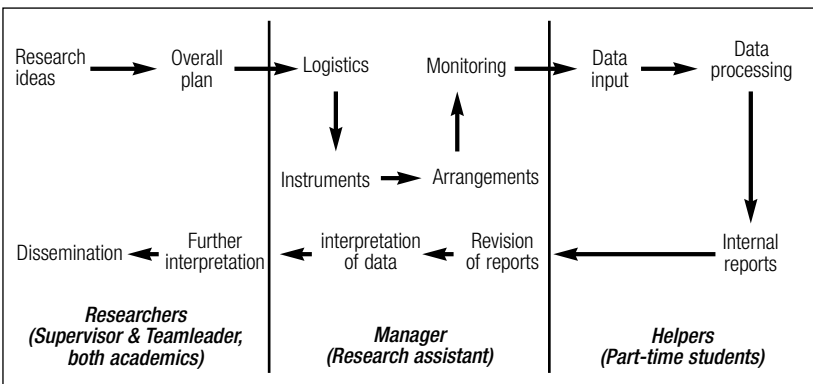


Figure 4. Workflow and structure of research team

the teachers in the individual cases but are also conscious about the research agendas of the overall eLearning community. Reading-group meetings occur on a regular basis to further heighten team members' awareness of key issues. Reports are compiled to answer individual teachers' concerns and interest about their own eLearning experiences, but meta-analyses are also done to answer questions that relate to overall use of eLearning strategies (McNaught & Lam, 2005a).

An effective management of evaluation also includes building a team spirit. This is achieved by breaking down the evaluation tasks into manageable components, clearly assigning the responsibilities to the helpers, but at the same time making sure that none of the helpers feel that they are alone.

Our method used is illustrated by Figure 5. Dual responsibilities are assigned to each helper so that s/he is in charge of a few teacher-cases and one or two evaluation tools at the same time. For example, helper A may be responsible for collecting and analyzing all student survey data and writing the reports. Helper A is also responsible for a Case "a" so that s/he needs to compile the final complete report for the case by consulting the other helpers

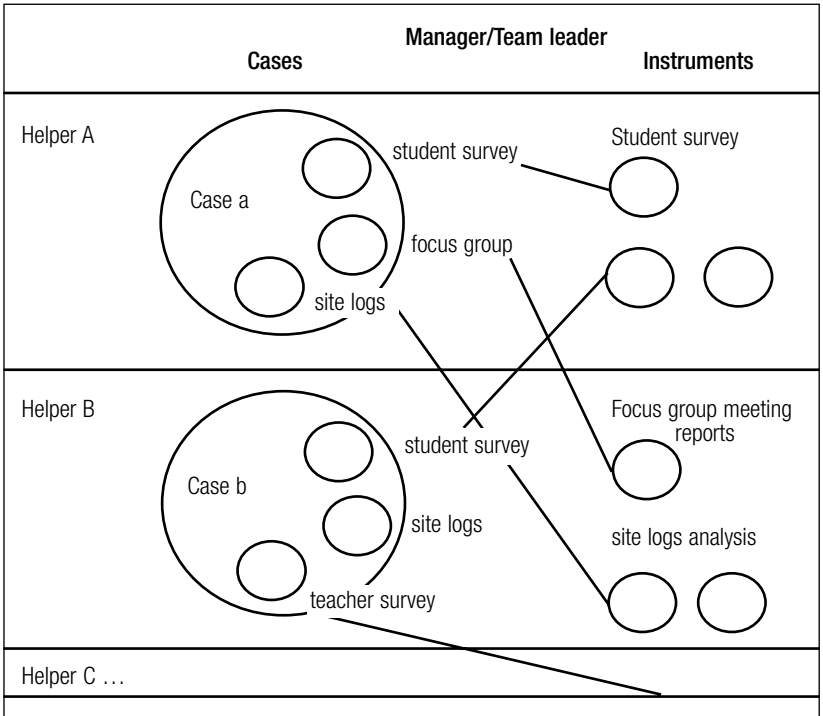


Figure 5. Dual responsibilities of the evaluation team members

for the other component-reports, such as the focus-group meeting report and the site logs report. The team leader oversees the whole smooth-running of the process and constantly reviews the standards for the final reports and the component reports.

Other strategies to facilitate team internal workflow include the utilization of the Web to assist exchange of files (ftp) and ideas/ instructions (icq). Moreover, the team has set up templates of each type of report produced. These are discussed at half-year intervals for progressive improvement and to produce upgrades.

EFFECTIVENESS OF THE E3L MODEL

The e3L project accumulated evaluation stories and evaluation evidence from 70 subprojects. Lam and McNaught (2006c) examined this evidence and reported three main ways in which the evaluation work benefited the teachers and students in the subprojects and had implications for the wider educational community. These three contributions are:

1. ***Quality of materials.*** In the subprojects where formative evaluation occurred, there was refinement of materials during the development process before implementation took place. One example, cited in Lam and McNaught (2006a), is how an indepth focus group with students assisted in the design of animations and simulations in a computing principles course. With this quite simple strategy, somewhat grandiose and expensive ideas were developed into a focused and streamlined plan, with a lower budget. Throughout the project, the number of projects using formative evaluation increased significantly (McNaught & Lam, 2005b).

2. ***Staff development for teachers.*** Summative evaluation provides evidence of the strengths and weaknesses of the eLearning strategies adopted in each specific case. This can assist individual teachers to improve their original eLearning designs. An analysis was conducted to investigate the evaluation questions in the 26 cases involving 13 teachers who had repeated requests for e3L services (Lam & McNaught, 2006c). Eleven of the 13 teachers had different evaluation questions the second time round, indicating that the teachers' concerns had changed. In general, after the first evaluation had been done, the teachers were less interested in learning about opinions on the eLearning materials and the ideas to further improve them; their attention had shifted to identifying learning outcomes.

3. ***Evidence of successful eLearning strategies disseminated to the wider educational community.*** The lessons learned in the early subprojects were naturally fed into later subprojects. In general, summative evaluation has led to ideas on more effective eLearning strategies, which

are now available for all teachers; and refinement of the evaluation strategies, which can be used in future studies. Examples included suggestions about eLearning strategies that were generated through meta-analyses across several eLearning cases in the e3L project. Examples are:

- Lam, Csete, and Wong (2005) summarized ways to improve eLearning strategies by enhancing three forms of interaction: learner–content, learner–instructor, and learner–learner.
- Lam, Cheng, and McNaught (2005) reviewed eight cases that used online forums to identify relationships between the levels of teacher involvement, the designs of the discussion activities, and the quality of discussion. Findings were, that structured forums generally have a higher quantity and quality of postings than free forums, and that student-centered ones also tend to be more effective than teacher-centered ones in encouraging quality online discussion. Further, through analyzing the evaluation feedback from students and teachers in these cases, the study identified three key factors that tend to affect forum success – ease of use, clear facilitation, and motivation to engage. The centrality of the role of the teacher was confirmed.
- McNaught and Lam (2005a) discussed the perceived usefulness of 17 common eLearning strategies and deduced some factors that influence these perceptions. In the Hong Kong context four functions were perceived as being most useful: learning tools such as glossaries, notes, and PowerPoints, assessment tasks associated with grades, and creation and exhibition of multimedia projects.
- Lam and McNaught (2006b) examined three sets of online strategies for facilitating peer and group assessment utilizing eResources, eDisplay, and eCommunication. The data collected generally confirmed that web-enabled peer and group assessment activities can produce positive results. The need for careful planning for these types of assessment activities was also clearly illustrated.
- Lam and McNaught (2006a) examined the role of media elements in online courses. Evaluation data give qualified support to media-enhanced aspects of the courses being beneficial to student learning. The study also highlighted factors that influence the success of the learning experience: attention to the quality and design of the media, considering student motivation, and focusing on feedback on learning during the course. Media and learning design, thus, are inextricably intertwined in a complex relationship.
- McNaught and Lam (2006) presented data from three courses where a case-based teaching and learning (CBT&L) approach was judged to be useful. There were, however, several lessons learned from this study.

For example, the media used in case presentation does not appear to be the key factor in motivating students; this is a salient finding, given the tremendous amount of time and effort that is often expended in preparing cases. Assessment grades remain as a very important source of motivation. Further, student workload needs to be carefully gauged in CBT&L courses. Finally, the role of the teacher in designing learning activities and feedback mechanisms, both on- and offline, was affirmed.

CONCLUSION

This article has described the strategies the e3L evaluation team developed to make the evaluation process run as smoothly as possible, so the evaluations matched the diverse needs of the teachers, and also served to answer key research questions about eLearning. Well-structured models and strategies are essential in eLearning design and development. It is argued in this article that models and strategies are also of utmost importance in the evaluation component of an eLearning project.

The model and strategies outlined in this article have the following characteristics:

- External to the team, the model provides a flexible way for teachers to work with the team to decide evaluation questions and then evaluation procedures specific to their cases.
- There are strategies for documenting all decisions made (in evaluation plans), actions taken, data collected, and evaluation results (in evaluation reports). Teachers can have input into any of these parts at any stages.
- Internal to the team, the model provides a mechanism to support personal growth of team members through extensive discussions of research issues, research designs, and research results.
- Helpers have dual responsibilities so that they work on an evaluation instrument as well as following through a teacher case.
- Technology is employed to efficiently facilitate communication and file exchange.
- There is a system to allow team members to reflect upon the existing practices and to enable continuous improvements.

References

- Alexander, S., & Hedberg, J. (1994). Evaluating technology-based learning: Which model? In K. Beattie, C. McNaught, & S. Wills (Eds.), *Multimedia in higher education: Designing for change in teaching and learning* (pp. 233–244). Amsterdam: Elsevier.
- Bain, J. D. (1999). Introduction. special issue: Learning-centered evaluation of innovation in higher education. *Higher Education Research & Development, 18*(2), 165–172.

- Biggs, J., Kember, D., & Leung, D. Y. P. (2001). The revised two-factor study process questionnaire: R-SPQ-2F. *British Journal of Educational Psychology*, 71, 133–149
- Bloom, B. S. (Ed.). (1956). *Taxonomy of educational objectives. Handbook 1. The cognitive domain*. New York: David McKay.
- Guba, E. G., & Lincoln, Y. S. (1981). *Effective evaluation: Improving the usefulness of evaluation results through responsive and naturalistic approaches*. San Francisco: Jossey-Bass.
- Hodgson, P., & Lam, P. (2004, July). Quality management of a joint-university e-learning project: e3Learning. *Global Education*. Retrieved May 27, 2006, from <http://www.globaled.com/articles/PaulaHodgeson2004.pdf>
- James, J., McNaught, C., Csete, J., Hodgson, P., & Vogel, D. (2003, June). From MegaWeb to e3Learning: A model of support for university academics to effectively use the web for teaching and learning. In D. Lassner & C. McNaught (Eds.), *Proceedings of the 15th Annual World Conference on Educational Multimedia, Hypermedia & Telecommunications* (pp. 3303–3310), Honolulu, HI. Norfolk, VA: Association for the Advancement of Computing in Education.
- Lam, P., Cheng, K. F., & McNaught, C. (2005, June/July). Asynchronous online discussion: Empirical evidence on quantity and quality. In G. Richards & P. Kommers (Eds.), *Proceedings of the 17th Annual World Conference on Educational Multimedia, Hypermedia & Telecommunications* (pp. 3209–3215), Montreal, Canada. Norfolk, VA: Association for the Advancement of Computing in Education.
- Lam, P., Csete, J., & Hodgson, P. (2005). Enrichment of interaction in online assessments. In S. Frankland (Ed.), *Enhancing teaching and learning through assessment: Embodied strategies* (pp. 70–79). Hong Kong: Assessment Resource Center, Hong Kong Polytechnic University.
- Lam, P., Csete, J., & Wong, Y. H. (2005, August). Online learning strategies that work: Real examples (with an emphasis on strategy planning). *Proceedings of the 21st Annual Conference on Distance Teaching & Learning*, Madison, WI. Retrieved May 27, 2006, from http://www.uwex.edu/disted/conference/Resource_library/proceedings/05_1797W.pdf
- Lam, P., & McNaught, C. (2004, June). Evaluating educational websites: A system for multiple websites at multiple universities. In L. Cantoni & C. McLoughlin (Eds.), *Proceedings of the 16th annual World Conference on Educational Multimedia, Hypermedia & Telecommunications* (pp. 1066–1073), Lugano, Switzerland. Norfolk, VA: Association for the Advancement of Computing in Education.
- Lam, P., & McNaught, C. (2005, June/July). Management of an eLearning evaluation project: e3Learning. In G. Richards & P. Kommers (Eds.), *Proceedings of the 17th Annual World Conference on Educational Multimedia, Hypermedia & Telecommunications* (pp. 2261–2268), Montreal, Canada. Norfolk, VA: Association for the Advancement of Computing in Education.
- Lam, P., & McNaught, C. (2006a). Design and evaluation of online courses containing media-enhanced learning materials. *Educational Media International*, 43(3), 199–218.
- Lam, P., & McNaught, C. (2006b). Evaluating designs for web assisted peer and group assessment. In T. Roberts (Ed.), *Self, peer, and group assessment in e-learning* (pp. 210–244). Hershey, PA: Idea Group Inc. (IGI).
- Lam, P., & McNaught, C. (2006c, June). A three-layered cyclic model of eLearning development and evaluation. In E. Pearson & P. Bohman (Eds.), *Proceedings of the 18th Annual World Conference on Educational Multimedia, Hypermedia & Telecommunications* (pp. 1897-1904), Orlando, FL. Chesapeake, VA: Association for the Advancement of Computing in Education.
- Learning Technology Dissemination Initiative. (1998). *Evaluation cookbook*. Retrieved May 27, 2006, from <http://www.icbl.hw.ac.uk/ltidi/cookbook/contents.html>

- McNaught, C. (2002). Adopting technology should mean adapting it to meet learning needs. *On The Horizon*, 10(4), 14–18.
- McNaught, C., & Lam, P. (2005a). Building an evaluation culture and evidence base for e-learning in three Hong Kong universities. *British Journal of Educational Technology*, 36(4), 599–614.
- McNaught, C., & Lam, P. (2005b, December). What do teachers want to know about their student's eLearning? A study of 70 evaluation plans. In H. Goss (Ed.), *Balance, fidelity, mobility. Maintaining the momentum?: Proceedings of the 22nd Annual Australian Society for Computers in Learning in Tertiary Education 2004 Conference* (pp. 2083–2090), Queensland University of Technology, Brisbane, Australia. Retrieved May 27, 2006, from http://www.ascilite.org.au/conferences/brisbane05/blogs/proceedings/50_McNaught.pdf
- McNaught, C., & Lam, P. (2006). Evaluation of web-supported case-based learning designs. In O. S. Tan (Ed.), *Problem-based learning in e-learning breakthroughs* (pp. 71–96). Singapore: Thomson Learning.
- Mohan, J., & Lam, P. (2005, June/July). Learning for understanding: A web-based model for inquisitive peer-review learning activities. In G. Richards & P. Kommers (Eds.), *Proceedings of the 17th Annual World Conference on Educational Multimedia, Hypermedia & Telecommunications* (pp. 2083–2090), Montreal, Canada. Norfolk, VA: Association for the Advancement of Computing in Education.
- Oliver, M., McBean, J., Conole, G., & Harvey, J., (2002). Using a toolkit to support the evaluation of learning. *Journal of Computer Assisted Learning*, 18, 199–208.
- Phillips, R. (1997). *The developer's handbook to interactive multimedia: A practical guide for educational applications*. London: Kogan Page.
- Reeves, T. C., & Hedberg, J. G. (2003). *Interactive learning systems evaluation*. Englewood Cliffs, NJ: Educational Technology Publications.
- Robinson, B. (2001). Innovation in open and distance learning: some lessons from experience and research. In F. Lockwood & A. Gooley (Eds.), *Innovation in open & distance learning: Successful development of online and web-based learning* (pp. 15–20). London and Sterling, Va: Kogan Page and Stylus.
- Thompson, D. (1999). From marginal to mainstream: Critical issues in the adoption of information technologies for tertiary teaching and learning. In A. Tait & R. Mills (Eds.), *The convergence of distance and conventional education: Patterns of flexibility for the individual learner* (pp. 150–160). London: Routledge.
- Williamson, A., Kennedy, D. M., McNaught, C., & DeSouza, R. (2003). Issues of intellectual capital and intellectual property in educational software development teams. *Australian Journal of Educational Technology*, 19(3), 339–355.

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