A Learner-Centred Design Idea Kit for Student/Faculty Teams: Scaling up a Learning Technology Strategy

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Abstract

The Learner-Centred Design Idea Kit is an interactive WWW-based resource being used for the fourth time in an undergraduate study unit, Designing Learning Activities with Interactive Multimedia [http://tlc.uwaterloo.ca/is301a/]. The study unit and the LCD Idea Kit which supports it are part of a larger institutional strategy to introduce technology-enabled change in the learning process, working “bottom-up” with individual faculty and using the LCD Idea Kit to scale up the study unit across multiple university departments. We are currently offering the study unit for the fourth time.

In the study unit, students from across the university work in teams with faculty to address specific instructional bottlenecks, by prototyping and testing multimedia-enabled changes in the learning process for 1-2 hours of critical learner activity. The LCD Idea Kit supports the design process with information and structure for creating:
learner profiles which bring to life the target audience,
scenario narratives for the current learning process and the target process,
a design visualization of high-level design issues.
The design visualization adapts Diana Laurillard's conversational model to provide a gestalt view of the proposed learning process. It also provides some taxonomies of learning tasks and structures for ideas to be re-used from previous systems.

We are expanding other parts of the kit including an exemplar library and structuring the design reviews and evaluations for long term re-use. The Idea Kit is intended to evolve into an indexing mechanism for access to a repository of re-usable multimedia components, and an online resource for just-in-time staff development in instructional design.

Introduction

The need for post-secondary institutions to think strategically about the application of learning technologies has been well documented. The strategy must plan to effect change in faculty approaches to teaching and learning, not just to "add technology and stir". An effective strategy will also address both content – the particular applications with the most leverage for institutional goals – and the process of obtaining commitment and moving forward. (Daniel, 1996).

In this paper we describe one component of a "strategy in progress". On the content side, this component addresses the development of *nicheware*, focused learning environments which are developed by

> "considering a piece of teaching, a teaching problem; identifying what is the main problem with it at present: the bottleneck limiting its quality (effectiveness) at present; designing a way (using a computer in these cases) to tackle that bottleneck." (Draper, 1998)

The niche systems developed in our process follow a constructivist approach to provide interactive learning experiences for students (Harper & Hedberg, 1997), and most use a cognitive apprenticeship model to structure their interactions (Collins et al, 1989).

On the process side, the key issue is the need to plan for widespread dissemination while beginning with small projects to build momentum. With instructional design and professional development staff expertise in short supply, we needed to create a process which would engage mainstream faculty and scale up across the university without requiring a proportional addition to the professional staff. The key element in our process is an interdisciplinary study unit in which student/faculty teams design and prototype learning technology projects. The study unit was originally created and offered from a central Teaching Resource Office, under the auspices of the university's Independent Studies program. The study unit is now being adopted by regular academic departments as a special topics offering. This was made possible by the construction of a performance support toolkit which provide just-in-time information for the project teams, and structures the development process to focus their attention on instructional issues rather than technology.

In the next section we describe the study unit and its place in the strategic process. Then we demonstrate the features of the support system, the Learner-Centred Design Idea Kit, which enables high productivity for both teachers and learners. The final section reports on lessons learned, the status and continuing plans for the LCD Idea Kit.

The Study Unit and its Context

We have three milestones in our development process for nicheware:

- In the study unit, the instructional problem is specified, a prototype solution is designed and evaluated with a prototype [complete enough to test the learning activity but often not at all complete in content]. Faculty are involved in problem specification and content definition, professional staff are involved as design advisors.
- After revision from the prototype evaluation, selected designs are developed to a working version by students on co-op work terms and tested again. The roles for faculty and professional staff continue; in addition, professional help is often required to finish off the final product and crash-proof it.
- After use in the target instructional setting, one more round of revision is undertaken by professional staff. If a system is particularly promising for long-term use and dissemination to others, it may be re-engineered and rebuilt.

These milestones insure that the professional staff time is highly leveraged – initially to select or suggest promising directions, later to fine tune projects whose success has been established.

The study unit itself is a regular academic offering taken by students from across the university. The application form for the course requests that students identify various skills which they could bring to the team, so that a mix of interests can be included: each team of 3-4 students ideally includes skills in technology, pedagogy, aesthetics and discipline knowledge (more details about the overall unit are available at http://tlc.uwaterloo.ca/is301a/). The major focus is on the team project, and the course overall includes the following activities in a 12 week teaching term:

- 3 weeks of group instruction, covering the fundamentals of learning theories, instructional design and multimedia development
- faculty members, as clients for the teams, describe the learners, learning outcomes and instructional bottlenecks in their current situation
- the student teams document this information in the LCD Idea Kit, and then design new learning scenarios and the required computer-based activities
- the teams construct prototypes to test critical portions of their designs, and each member conducts a walkthrough session with one student from the target user audience
- students recommend changes in their designs as a result of the evaluation, and document their reflections on the overall learning experience in the study unit.

After the initial three week period, the staff directing the study unit provide guidance to the student teams at tactical points. The faculty clients commit to meet with the teams one hour per week for guidance on content, and most staff involvement is through the interaction facilities of the LCD Idea Kit – critiquing student designs and suggesting alternatives (each student must also critique the work of another team at 3 critical stages). This limited staffing, especially when there are only 3 weeks of introductory material, relies on the just-in-time knowledge available in the LCD Idea Kit – both explicit information on learning and design issues, and the implicit knowledge embedded as process structure.

LCD Idea Kit

The biggest challenge in the course is to get the teams focused on design issues as most teams tend to focus on implementation details before finishing the design. We address this issue by using the LCD Idea Kit to guide the teams through important design issues. Three of the most notable features of the Idea Kit are: (a) extensive learner profiling, (b) use of narrative scenarios and (c) use of a design visualization.

Learner Profiling

Most projects will have 3 or 4 different learner profiles to represent the diverse learner groups who will be taking the course. The design teams create a characterization for each learner profile, including information on their learning preferences, motivation, background knowledge, etc. e.g. from the kit, “Alan prefers to learn by having information presented as …

Abstract Explanations	O O O O O	Concrete Demonstrations
Theories and Interpretations	O O O O O	Facts and Data
Visual Representations	O O O O O	Written or Spoken Words
The “Big Picture” First	O O O O O	Step-by-Step Instructions “

Scenario-based design

Learner-centred design focuses on the learners’ experience with the content, rather than the structure of the content presentations. We use a scenario-based design method to achieve this, in which the design teams create a scenario of the current problem in the learning situation and the target learning scenario they want to achieve (for the various learner profiles).

> For designers of interactive software, a usage scenario is a narrative description of what people do and what they experience… Scenarios force designers to consider the range of users who will use the system and the range of activities for which they will use it… Usage scenarios complement prototypes as vehicles for exploring, refining and communicating interaction designs…(Carey & Minstrell, 1996).

Figure 1 is a screen image of an example current learning scenario for one learner profile.

Visualization of design issues

The design visualization used in the kit adapts an existing model for teaching/learning interactions, the Conversational Framework (Laurillard, 1993), to highlight Mediated Conversations for Cognitive Apprenticeship (MCCA) (Carey, Harrigan, Palmer, in press). The roots of Cognitive Apprenticeship lie in the traditional methods by which apprentices acquire skill and knowledge from experts, and its key features are modeling, coaching, fading and reflection. The matrix of expert/novice building/applying concepts was originally illustrated with a visual aid (Laurillard, 1993, p. 103), of which an adapted version is shown in the screen shot from the Design Kit in Figure 2. This is a representation of mediated learning processes and the ways they are related. The boxes represent *operational* processes in computer-mediated learning, which involve operations on either an application problem or on representations of the concepts which need to be applied. In the cognitive apprenticeship approach, these processes could be performed by the learner or by an expert model.

Creating such a diagram in the design toolkit requires the designer to focus on high-level issues like the balance between expert and novice activities and between building and applying concepts. Since the computer-mediated learning is intended to be highly interactive, *conversational* processes are also included in the high-level representation. The arrow going from the upper left to the upper right boxes - from the Expert Operating on Concepts process to the Learner Operating on Concepts - represents an intervention by the expert (as mediated by the computer system) for a question or suggestion while the learner is engaged in building a concept. The arrow in the opposite direction represents a request from the learner for the expert to model or comment on part of the concept building activity. The arrows leading back into their originating box represent reflective or meta-cognitive activities.

Just-in-time instructional design knowledge

In order for the teams to work effectively after only a few weeks' introduction to the knowledge needed for design, the LCD Idea Kit must provide a performance support environment for novice designers. The information available includes the following components:

- What/Why/How links, as shown at the top of Figure 1, lead to one paragraph overviews for definitions of the relevant terms, the reason they are important in instructional design, and practical tips on making the required decisions. There are also pointers to content in the course reference list.
- an idea space on Designing a Learning Activity provides WWW pages on design choices like types of learning activities and the outcomes they support, different levels of challenge and feedback, and examples from past designs

There are also facilities for interactions amongst students on their work. For example, each student must constructively critique the work of another team, which leads to an electronic discussion on the thinking underlying the designs. We are extending this facility so that these electronic discussions can be used to efficiently produce a design rationale which would aid in re-use of their ideas.

Current status and lessons learned

Through the three offerings of the study unit and the ongoing development of the LCD Idea Kit, we have learned the following lessons about the link between our institutional strategy and the supporting resources and tools for the course:

〈 mainstream faculty respond positively to approaches from students interested in working on learning improvements. Some innovative faculty have approached us seeking design help, others have responded to a public offer. But to reach mainstream faculty we want the student teams to be more proactive in recruiting an instructor to host their project, particularly from one of their own previous courses.

〈 in addition to providing a truly interdisciplinary learning experience, the study unit adds value to the students' educational experience outside the unit itself. Many of the students have reported back on their growth as 'consumers' of education, and a number have redirected their course programs as a result of their learning in the unit

- interactions amongst the faculty can be an additional learning activity. In addition to the informal knowledge sharing which developed amongst the faculty sponsors, two staff members joined student teams working with other teaching staff in order to participate more fully in the design projects and acquire more knowledge about the process.
- the use of multiple decision points during development has allowed for healthy attrition of projects which were not fully thought-out by the faculty, without consuming development staff resources.

We are continuing to develop the LCD Idea Kit, and welcome collaborations to add more information for team members and more exemplars/components for re-use. The two areas of most interest to us currently are the development of a library of re-usable ideas from exemplary systems, and a way to link the LCD Idea Kit into technology components for implementation.

The design of the LCD Idea Kit was informed by our earlier study of how faculty members used a set of multimedia exemplars in designing their own courseware (Minstrell, 1997). That work demonstrated that mainstream faculty could draw ideas from computer-mediated learning activities in other disciplines, provided there had been appropriate indexing of the exemplar cases at the level of learning tasks. We are still experimenting with the right level of granularity for such descriptions, which will provide a vocabulary for use in the LCD Idea Kit – which then serves as an index into a library of ideas for implementing learning activities in computer-based environments.

A number of research efforts are now underway to encourage re-use of implementation components for courseware, e.g., the Elicitation Engine (Twining et al, 1998). As more of these become available, the ability of instructors to implement learning technology will increase, but their contact with a university's central resources in instructional design may decrease. Viewed strategically, providing access to a rich set of components through a tool like the LCD Idea Kit strengthens the potential for good instructional design to precede implementation. Linking design and development resources is another direction for future collaborations.

Acknowledgments

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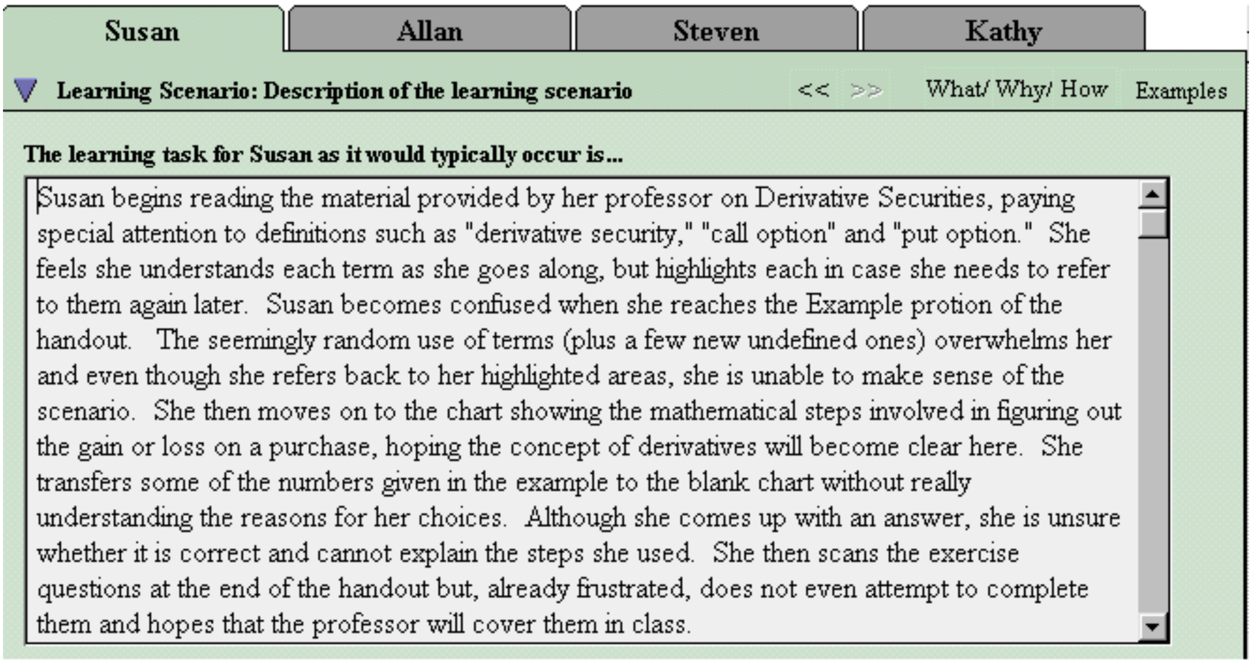

Figure 1. A screen shot from the LCD Idea Kit showing a current learning scenario.

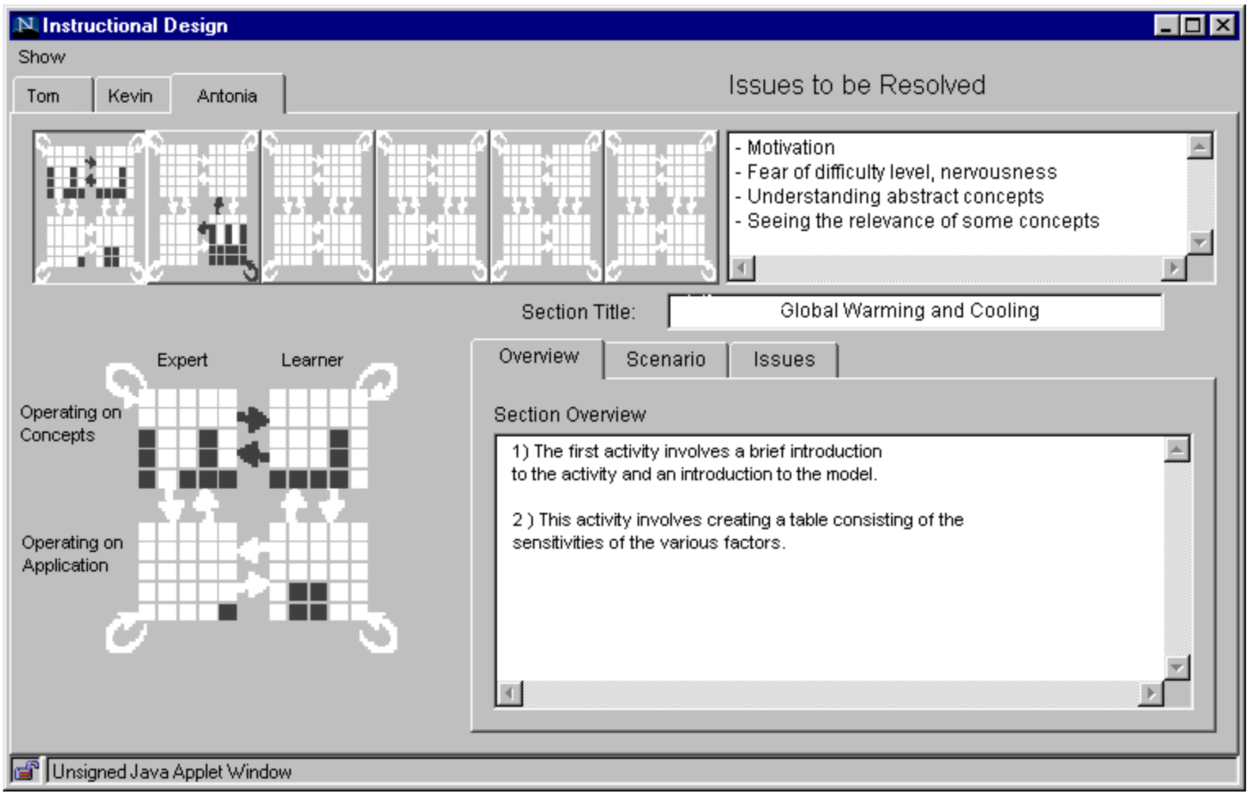

Figure 2. A screen image from the LCD Idea Kit showing the MCCA Diagrams.