TEPSS: Initial Steps in the Design of Electronic Support for Novice Teachers

Brendan Calandra
Guolin Lai
Yuelu Sun
Georgia State University

Abstract

As part of a Preparing Tomorrow's Teachers to Use Technology (PT3) grant, the authors are working on the design, development, and evaluation of an online support environment for novice teachers and teacher support specialists/mentors that will continue to expand technology integration support throughout the critical student teaching and teacher induction phases. This paper describes the project context; a review of selected electronic support systems for teachers; an early prototype; and a proposed design approach.

Context

The Crossroads: Preparing Tomorrow's Teachers to Use Technology at the Intersection of Content, Pedagogy, and Technology project at Georgia State University is a grant project sponsored by the U. S. Department of Education. Resulting from an analysis of technology integration needs in Georgia and Atlanta Metro schools, the goal of the project is to "prepare technologically proficient teachers for Metropolitan Atlanta's many diverse classrooms by addressing the intersection of content, pedagogy, and technology with training, support systems, and environmental change" (The Crossroads, 2003, p.3). One of the grant objectives is, "to continue to expand technology integration support for our students and graduates throughout the critical student teaching and induction phases through the design, development, and evaluation of an online support environment for novice teachers, and teacher support specialists/mentors." (The Crossroads, 2003, p.3).That is, the authors were charged with designing an online environment that would expand technology integration support for novice teachers throughout their first years of teaching, one that would be situated within their actual teaching experience to help nurture their lifelong learning and reflective practice. The system would be able to help connect student teachers, their mentors, teaching resources, and evidence of best practice in one virtual space. This support system would also remain available to student teachers throughout their induction phases in order to help nurture lifelong learning and reflective practice. The original model proposed for this environment was based on the concept of electronic performance support systems (EPSS), which are more commonly discussed in a corporate context.

An EPSS is an electronic system that can provide integrated, on-demand, just-in-time, individualized on-line access to information, expert consultations, learning experiences, tools, assessment and monitoring systems to enable a high level of job performance with a minimum support and intervention by others (Brown, 1996; Gery, 1991, 1995a; Raybould, 1995; Winslow & Bramer, 1994).Gloria Gery has been credited with initiating EPSS movement in 1991 with her book, Electronic Performance Support Systems: How and Why to Remake the Workplace Through the Strategic Application of Technology. Gery and other EPSS pioneers have suggested that building and implementing an EPSS can help organizations in corporate and educational settings shift their paradigm from training to performance, from viewing performers as people to be trained to viewing them as people who need on-the-job performance support (Brown, 1996; Rosenberg, 1995). Most EPSSs consists of four components: 1) advisory component, 2) information component, 3) training component, and 4) user interface component. However, a simple prescription or a standard set of features for building an EPSS does not seem to exist. As Gery (1995b) put it, "few (designers) are guided by a set of integrated and fully articulated design principles. Many innovations are the result of individual or team creativity and iterative design employing rapid prototyping coupled with ongoing usability and performance testing." The presenters were drawn to the EPSS model because it seemed an appropriate mechanism through which a wide range of support could be provided to novice teachers situated within the context of their actual practice.

Method

The authors began by reviewing the needs analysis and resulting goal and objectives of the Crossroads grant mentioned in this paper. Formal and informal discussions then took place between instructional design experts, teacher education experts, performance technology experts, and teacher education faculty stakeholders. An extensive review of existing systems was also conducted using the following criteria: a) The system was created for educational purposes; b) the system was intended for PreK-12 or K-16 pre-service teacher education and in-service teacher professional development; c) the system addresses technology integration in the curriculum; d) some EPSS components as defined above are present. The review includes both commercial products and systems developed for public access. Seven systems were selected and are briefly described below.

Some Selected Electronic Teacher Support Systems

Knowledge Innovation for Technology in Education (KITE) is a PT3 project at the University of Missouri. Its development involves the collaboration of a consortium of eight teacher education programs. Its overarching mission is to "build a K-16 community of practice through a knowledge repository that enables learning through sharing, communal understanding through storytelling, continuous exchange and creation of new knowledge, and collective problem solving among K-12 schools and teacher education programs" (KITE, 2004).

KITE consists of four main components: Introduction, Technology Integration Cases, Technology Integration Learning Environment, and Teacher FAQ. The Introduction section presents information regarding: a) KITE's general project information; b) university partners and key players involved in the project; and c) brief introductions and web links for other technology integration resources. As an integral component of the project, KITE's introduction presents end-users with project background information. The Technology Integration Cases are the primary content of KITE. Each text-based case has two sections: case summary and whole story. Each case depicts an interviewee's experience with his/her technology integration practice. The Technology Integration Learning Environment (TILE) provides information and guides related to topics such as national education technology standards (NETS), media selection, lesson planning, assessment of technology integration experiences, and creation of a teaching unit. It serves as a supporting pedagogical framework for technology-integrated and project-based instructional activities espoused by KITE cases. Teacher FAQ provides: a) Descriptions of instructional activities conducted in several teacher education programs; b) introduction of some ideas on how to use KITE cases in teaching technology integration; and c) answers given to the KITE related questions. KITE's structure, especially that of TILE helped inform the design of the authors' system prototype.

Integrating New Technologies into the Methods of Education (INTIME) is a PT3 project at University of Northern Iowa, created by a consortium of five teacher education programs. Guided by the Technology as Facilitator of Quality Education conceptual model (TFQE) (Callahan & Switzer, 2001), INTIME aims to help teacher education programs improve pre-service teachers' knowledge and skills to effectively integrate technology in the PreK-12 classroom.

INTIME has five main components: Streaming Video Cases Build a Case Study, The TFQE Model, Multicultural Education, and Help. Streaming Video Cases are the primary content in INTIME. The cases are all technology integration cases in real PreK-12 classroom settings. Each case includes a detailed lesson plan, nine video clips each with narrations and annotations, and pre-viewing and post-viewing probing questions. Build a Case Study is an online learning tool where a student teacher can use INTIME's video clips to make his/her own case study to facilitate technology integration learning. The tool provides a step-by-step guidance on how to create a printable case study. This is an innovative and easy-to-follow tool whose concept the authors may borrow. The TFQE Model includes seven major dimensions. It serves not only as a conceptual framework for the creation, segmentation, and presentation of online streaming video cases, but also as search criteria of the video cases. Multicultural Education provides information and helpful guidance in various aspects such as school-wide multicultural benchmarks and characteristics considerations, studying of ethnic and cultural groups, curriculum consideration, and more. The Help component provides technical instructions for using INTIME. Unlike the text-based case presentation in KITE, the video cases in INTIME proved to be a more desirable model for the authors' system.

EduCatalyst is a standards-based online performance support system, which allows "schools, districts, and states to determine each teacher's strengths and challenges, design individually professional development plans, develop and implement innovative, measurable learning resources, and benchmark student performance and evaluate the effectiveness – both academic and financial of their professional development efforts" (EduCatalyst, 2004).

EduCatalyst consists of six major components: Portfolio, Professional Development Alignment Catalyst, Planning Catalyst, Instructional Strategy Catalyst, Assessment Catalyst, and Support. Portfolio provides a digital locker where teachers can store their transcripts and works, and store and track their licenses and re-certification progress. The Professional Development Alignment Catalyst helps teachers align their professional development activities with the priorities within their state, district, or school, and view the lists of professional development programs, courses, and classes made available to them. Planning Catalyst allows teachers to create, store, and complete professional development plans, and to review the recommended plans. Instructional Strategy Catalyst provides teachers with access to various effective education resources and products. Assessment Catalysts allows teachers to conduct high-quality assessments of student performance either with the help of rubrics database provided or by creating a rubric from the scratch. Support provides the educators with access to: a) Printable version of the help system and video tutorials; and b) on-line help which is composed of three search mechanisms - tree-structured contents, index, and a keyword search.

EduCatalyst boasts a few powerful features that helped inform the authors' design. First, EduCatalyst emphasizes the construction of teachers' professional development activities by linking them with various levels of educational standards. Second, EduCatalyst espouses cultivation of the educators' experiential knowledge and skills for professional development, as evidenced by their hands-on practice on creating action plans. Third, EduCatalyst maintains an online personal account that not only serves as an e-portfolio, but also governs the conduction of their different catalyst activities.

Knowledge Loom is a knowledge sharing community created and maintained by Brown University. It is organized around best practices in teaching and learning, and has evolved into "a comprehensive electronic environment that moves from information delivery to information creation, from data to people, from a learning library to a learning community" (Knowledge Loom Team, 1999).

Knowledge Loom includes two major components: Collection and Spotlight Library. Collection contains descriptions of best practices that can be sorted by theme, state, grade, setting, school type, and school design/organization. Spotlight Library provides information about specific topics such as teaching with technology, middle school math, professional development, and etc. Within a specific Spotlight such as adolescent literacy, contents can include: a) Key components of a successful adolescent literacy initiative and the best practices related to each component; b) successful strategies; c) research that identifies and supports the best practices; d) stories about the best practices in real schools and districts; e) subscription of ones own stories, open-ended questions with experts in the area, and threads of wisdom; f) presentation of the threaded online panel discussions; g) list of supporting organizations and resources; and h) spotlight contents to download.

As an ongoing virtual learning community, Knowledge Loom not only maintains an excellent mechanism for presenting and soliciting best practices, but also facilitates multiple layers of knowledge creation and sharing mechanism - both of which helped inform the authors' design.

Teachscape aims to build a virtual professional development community for teachers and educators. Teachscape advocates research-based, classroom-tested approaches to effective teaching. It adopts video teaching cases to support new teachers' existing induction programs to enhance their capabilities to embrace the 21st century challenges: "new high standards, accountability for school, and new technology" (Teachscape, 2004). It also offers experienced teachers with a range of courses helpful for their certification or re-certification requirements, as well as a mechanism for their coaching and mentoring of new teachers.

Teachscape consist of four main components: My Desk, Resource Library, Public Discussions, and Journal. My Desk lists general account information and personal homepage where assigned materials are provided. Resource Library is the primary content in Teachscape, which features content knowledge in the areas of literacy, mathematics, science and class management skills. Each course incorporates video cases, expert commentaries, discussions, written materials, and research related to the course topic. Video cases integrate rationale and background of the case, national and local standards in the content area, explore different specific topics, and provide teacher reflection and specialist commentary. Public Discussions allow the teachers to participate among their learning groups and in public arena. Journal functions as an e-locker where the teachers can write, store, and keep track of their reflections on teaching and learning. These features all helped inform the authors' design.

Elementary and Secondary Teacher Education Project (eSTEP) at the University of Wisconsin is an innovative, experimental web-based approach to teaching pre-service teachers on how to acquire current scientific knowledge about human learning and development in educational settings – learning sciences (eSTEP Team, 2002a; Sharon Derry and the STEP Team, 2002).

eSTEP integrates three main instructional components in its online tool: Knowledge Web (KWeb) Cases, KWeb Theories, and Problem-based Learning Online. KWeb is an online multimedia environment that interlinks video cases and problems with learning science theories and research. KWeb Cases are a collection of classroom problems and multimedia cases depicting stories of teaching and learning in authentic classroom settings. KWeb Theories list learning sciences theories and research from cognitive psychology relevant to teachers, to facilitate teachers' exploration of various theoretical perspectives on teaching and learning. Problem-based Learning Online facilitates individual learning, group collaborative work, and use of the eSTEP Knowledge Web. Through pbl activities, students encounter problems structured around video cases of actual instruction, collaboratively analyze the instruction from a learning sciences perspective, and redesign or adapt the instruction based on their analyses (eSTEP Team, 2002b).

Created by a consortium of nine high schools, the University of West Florida, and the Navy Training Network, *Support for Teacher Enhancing Performance in Schools* (STEPS) is a World Wide Web and CD-ROM EPSS designed to provide "just-in-time" support to help pre- and in-service PreK-12 teachers develop instructional lessons, units, and curricula aligned to Florida's Sunshine State Standards. STEPS embodies Florida school reform and accountability initiatives in four areas: integrated curriculum, integrating technology, alternative assessment, and diverse learning environments (Northrup & Pilcher, 1998).

STEPS consists of six main components (Park, Baek, & An, 2001): Lesson Architect, Tutorial Library, Best Practices, Sample Unit, Web Links, and Coach. Lesson Architect guides teachers through the processes of instructional design and curriculum planning. Tutorial Library provides about forty instructional tutorials, following the aforementioned four areas of school reform and accountability initiatives. Best Practices provide teachers with multiple search mechanisms for successful classroom activities developed and tested by teachers in their real classroom settings. Sample Units provide sample curriculum units created by teachers of the same grade level. Web Links list more than 400 web sites relevant to Math, Science, Social Studies, and Language Art identified in Florida' Sunshine State Standards. Coach facilitates three levels of scaffolding: the "big picture" level, the "what do I do" level, and the "how do I do" level. The authors' design was informed by the Lesson Architect, Best Practices, and Coach features of STEPS.

Initial Prototype

As a result of ongoing analysis, review, and related discussions with students and colleagues, the authors designed an initial prototype for a Teachers' Electronic Performance Support System – TEPSS. See Figure 1. The Information component of TEPSS consists of links to databases containing lesson plans, instructional resources, assessment tools, and more. The Training component of TEPSS will provide users with access to learning modules, and job-aids related to their practice. The Tools component of TEPSS will provide users with activity design and student-teaching video reflection "wizards" (not unlike software help wizards) that would guide the novice teacher through planning an activity and analyzing video footage of themselves implementing activities using a series of textual prompts. The Guidance component of TEPSS would consist of a communication forum, (perhaps using blogging technology), and a series of guiding questions and answers concerning how to use the system. The current conceptual model (prototype) may likely change based on our design approach and resulting stakeholder feedback.

Continued Design and Development

Rapid prototyping is defined as "the creation of a working model of a software module to demonstrate the feasibility of the function. The prototype is later refined for inclusion in a final product" (Webster dictionary). Rapid prototyping dates back to the mid-1980s, and has been widely adopted in manufacture engineering and software development. Recent years have witnessed the increasing influence of rapid prototyping design methodology in instructional design, especially for computer-based instruction (M. K. Jones, Li, & Merrill, 1992; T. S. Jones & Richey, 2000; Lohr et al., 2003; Rathbun & Goodrum, 1994; Tripp & Bichelmeyer, 1990). Tripp and Bichelmeyer (1990) provide a useful description of rapid prototyping in the context of instructional design: "after a succinct statement of needs and objectives, research and development are conducted as parallel processes that create prototypes, which are then tested and which may or may not evolve into a final product" (p. 35). Prototypes for the current project will be both paper-based and computer-based including "any required databases, the major program modules, screen displays, and inputs and outputs for interfacing systems" (Harmon, Reece, Shoffner, Calandra, & Dias, 2003; Tripp & Bichelmeyer, 1990). Presenting these models to experts and system stakeholders will serve four main purposes: a) to obtain buy-in from faculty, student and administrative stakeholders; b) to solicit feedback on tasks, content, and features of TEPSS; c) to gain development feasibility feedback from programmers; and d) to obtain implementation feasibility feedback from system administrators. The design, feedback and development loops should generate larger, more complex, and more robust prototypes with each iteration. The design of each prototype will be directly affected by feedback regarding the one previous until a satisfactory final product has been designed/developed. See Figure 2.

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