Designing Online Cases as an Effective Learning Environment

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In this paper we investigate students' perspectives on the classroom implementation of online cases designed to provide pre-service administrators multiple opportunities to practice applying theory in their decision making within virtual yet realistic school settings. Data from this study indicate that several characteristics of effective learning environments were explicit in the case implementation and contributed to student learning and knowledge transfer. However, the case implementation could be improved by closer attention to the application of certain aspects of effective learning environments through the implementation of more value-added features of new technology. These findings offer insights for how the learning sciences can guide successful implementation of technology-based learning environments.

Online learning environments are complex systems encompassing the people, the technology and its applications, the physical classroom (or virtual space), and objects in the environment, as well as the psychological, social, and cultural climate (Sawyer, 2006). In addition, Salamon and Almog (1998) include all teaching and learning activities within a specific context in their definition of a learning environment. By and large, there are two theoretical schools of thought on the design of technology-enhanced learning environments (Brown, 2008). The first is a techno-centric perception that concentrates on the structural elements of technological systems that facilitate various learner-computer interactions with disregard for the context in which the technology is applied. Conversely, a human-centric viewpoint considers the social context of learning and realizes that the culture of the environment as a whole can significantly affect learning. Brown (2008) reasoned that the two perspectives are not mutually exclusive and that positioning them on opposing ends of a design spectrum is not beneficial.

In this paper we investigate students' perspectives on the classroom implementation of Educational Theory into Practice Software (ETIPS) online cases designed to provide pre-service administrators multiple opportunities to practice applying theory in their decision-making within virtual yet realistic school settings. We focus not only on the technology-specific elements that contributed to the effectiveness of the learning environment but also on the social and contextual aspects of implementation. Data from this study indicate that several characteristics of effective learning environments were explicit in the case implementation and contributed to student learning and knowledge transfer. However, the case implementation could be improved by more attention to the application of certain features of effective learning environments. These findings offer insights for how the learning sciences can guide successful implementation of technology-based learning environments.

Theoretical Framework

Established as an effective instructional method in the fields of business and law, the use of cases is finding its way into the field of education (Merseth, 1991; Sykes & Bird, 1992; Williams, 1992). A case's problematic situation requires analytical skills and fosters deep understanding of specific concepts by bridging theory and practice (Diamantes & Ovington, 2003; Griffith & Taraban, 2002; McAninch, 1993; Merseth, 1994; Zuelke& Willerman, 1995). When properly used, cases can help educators practice how to think professionally about classroom and school-based problems, solutions, and alternatives (Lacey & Merseth, 1993; Merseth & Lacey, 1993; Masingila & Doerr, 2002). Cognitive science offers guidelines to help developers design environments that meet the demand for cases to foster complex learning and suggests ideas for how technology can add value.

A synthesis of cognitive science research suggested some design implications for effective learning environments (Bransford, Brown & Cocking, 2000). They should be knowledge-centered, focusing on what ought to be taught, why it is important, and what mastery looks like; learner-centered, considering the unique attributes learners bring to the educational context including their knowledge, abilities, attitudes, and beliefs; assessment-centered, providing students with regular opportunities for feedback and encouraging students to revise and improve their thinking; and community-centered, emphasizing collaboration and joint construction of knowledge.

A synthesis of technology research suggests that when technology is congruent with the tenets of effective learning environments it can add value (Bransford et al., 2000). Beyond giving students access to data and tools for managing it, technology can bring real world problems into classrooms; provide "scaffolding" to support learners on their path to deep understanding; increase opportunities for learners to receive quality feedback from teachers, peers, or the software itself; and establish conditions for collaboration and joint knowledge construction (Bransford et al., 2000; Means et al., 1993).

The developers of the online cases described in this study designed many features to improve students' learning and depth of understanding based on cognitive science and technology research; faculty members who implemented the cases into their course(s) were trained on implementation strategies that were in keeping with effective learning environments and case instructional methods. This study looks at how students responded about their experiences in these online case-based learning environments.

The ETIPS Online Learning Environment

The ETIPS online learning environment offers cases in multiple settings and contexts. Currently there are 9 different school settings: 3 elementary schools, 3 middle schools, and 3 high schools which include urban, rural, and suburban locations and low, medium, and high functioning. Instructors can choose from 10 case introductions that address topics including organizational leadership, instructional leadership, and relational leadership to pair with the schools yielding 90 possible case combinations. This allows instructors to present the same case topic in more than one school setting and to ask students to consider how a different context might affect their considerations and decisions.

ETIPS cases have a nonlinear structure that allows students to explore the Internet and intranet websites of the virtual schools in which the cases are set. The websites contain unique information for each of the schools, while a standard menu allows all users to easily locate and view pertinent information. Students can take notes alongside the web pages and also have the ability to view and print all their notes from one page. An embedded decision making framework scaffolds students as they work through the ETIPS cases. ETIPS cases use a four-step decision making model that requires students to (a) identify a leadership issue, (b) identify and align guiding principles, (c) consider alternatives with associated opportunities and constraints, and (d) select the best alternative for the context and create a plan.

Each ETIPS case begins with an introduction that sets the stage for learning. Students are posed with questions to stimulate thinking about the assigned leadership topic. For every scenario the student plays the role of a member of the school's leadership team. The student is asked to provide input on future directions for the school that would be shared and supported by the community. The task is to identify the primary issue(s) that need to be addressed and the action steps to take in order to develop areas of excellence within the school.

Students work their way through the decision making process by following the steps in the order indicated by tabs at the top of the ETIPS screen. Embedded scaffolding provides students with tips for effective decision making before they begin each step. After completing the questions for all four steps, students submit their answers electronically. Once their instructor scores the assignment students receive feedback within the ETIPS environment.

Data Sources and Methods

Nineteen faculty members were recruited into the online cases test-bed from 11 of the 16 institutions of higher education in a southeastern Atlantic state that offer educational administration programs. All of the participating universities are publicly funded except for two. These programs vary across a number of dimensions including location (urban, suburban, and rural), size and nature, achievement levels of the students in districts in which most of their administrator candidates will work, and utilization of technology.

All 19 test-bed faculty members implemented at least two of the cases as an integral component of an educational administration course. A convenience sample of students who were instructed by one of the test-bed faculty was asked to participate in the study and complete an on-line post-implementation survey. About twenty-three percent (120) of the registered students completed a post-case survey in which they answered open-ended responses about the (1) most and (2) least helpful aspects of how the cases were used in the class, (3) changes they'd recommend in the way the cases were implemented in their course, and (4) suggestions for improving the online cases.

We completed a qualitative analysis of the fall 2007 and spring 2008 student data following a deductive model (Miles & Huberman, 1994) starting with a priori notions about which factors contribute to the effectiveness of a learning environment while remaining open to emerging themes; this included developing a coding scheme based on the conceptual framework of Bransford et al. (2000) and the first two authors independently coding all student responses with it. Any disagreements in codes were discussed and consensus was reached. After an initial

round of coding, we added two categories, not applicable and technology-specific, so as to better capture the extent and meaning of student remarks about the software itself. Table 1 describes the final coding scheme.

Table 1. *Coding scheme.*

Code	Student responses addressed one or more of the following:
Not Applicable	• Instances of "N/A" or "None" • Situations where cases were not used in class • Topics not pertinent to the question asked • Could not be determined because the response was incoherent
Knowledge Centeredness	• Alignment with the course/program curriculum • Content organization/presentation • Opportunities for critical thinking and deeper understanding • Practical application of professional competencies (including decision-making skills)
Learner Centeredness	• Adaptability to individual learning needs/styles • Consideration of pre-existing knowledge • Relevancy to career goals
Assessment Centeredness	• Relevancy/quality of assessment • Timeliness/quality of feedback
Community Centeredness	• Emphasis on collaboration • Opportunities for class/group discussion • Value of multiple perspectives
Technology Specific	• Availability of technical support • Ease of use • Relevancy to instructional/curricular goals

Results

Several themes emerged regarding what the students liked and disliked about the online cases and how they were implemented. Next we describe those themes, with supporting examples from the various categories of remarks. Tables 2-5 summarize the students' responses to the open-ended questions and report the relative frequency of how student responses were distributed among the five categories of our coding scheme.

Most Helpful Aspects of Case Implementation

To determine what elements of an effective learning environment were explicit during case implementation, we asked students about the most helpful aspects of how the cases were used in their class. Most students (about two thirds) who responded to the question commented on how the use of cases helped them with knowledge construction. Several students expressed that ETIPS cases provided opportunities for critical thinking and developing a deeper understanding of the content stating, "That it challenged us to think critically about various aspects of the administrative arena." Other students addressed how well ETIPS cases aligned with the course curriculum. One student called it a "great application of the principles we discussed in class." Students also found the way the case content was organized and presented beneficial. They liked how the data was represented on the schools' intranet sites, specifically, "The variety and presentation of data to include conversations of staff, graphs and tables, etc." Additionally, students commented that ETIPS allowed for practical application of professional

competencies in a realistic, yet safe setting. According to one student it was helpful, "Being able to identify weaknesses and form a plan to increase effectiveness without it being real and worrying about right or wrong decisions."

Over one quarter of students who responded found the community centeredness of case implementation helpful. According to one student, "Discussing the cases in class was helpful because it allowed us to share what we learned. We all saw many of the same concerns at the school and many of us found problems that the rest of us overlooked." Two students commented on attention to their learning needs, with one remarking, "I thought the use of real examples really helped with evaluating myself and how I would deal with each case in real life." Only one student mentioned the beneficial utilization of technology and no students commented on the usefulness of assessment to the learning environment.

Table 2. *Student comments on most helpful aspects of case implementation by category.*

Coded elements of a learning environment	**Summary of student responses (N=100, 15 coded N/A) with relative frequency of distribution**
Knowledge Centeredness	*Most helpful (68%): Cases aligned with purpose and content of course(s); website realistic and easy to navigate; challenged thinking; provided opportunities to practice professional competencies in a realistic, yet safe setting
Learner Centeredness	Marginally helpful (2%): Note pages helpful; real examples relevant to career goals
Assessment Centeredness	Not mentioned (0%)
Community Centeredness	Helpful (28%): Liked working in groups and discussing cases and decision-making process in class/small groups; gained insight from other students' ideas
Technology Specific	Marginally helpful (1%): Technology was beneficial but needed to offer more opportunities for discussion

*Indicates the category with the largest cluster of student responses. Underlined statements are the researchers' judgments based on the relative frequency of how student responses were distributed.

Least Helpful Aspects of Case Implementation

Students' comments about the least helpful aspects of how the cases were used in the class provided insight about what aspects of effective learning environments were missing. Students tended to believe either there was lack of attention to assessment or there were too few collaborative activities (about one quarter of responses per category). Some questioned the relevancy and quality of assessment, deeming the pre- and post-tests not helpful. Others remarked on the timeliness and quality of the feedback. One student wrote, "I never saw what the real answers were compared to how I responded."

Regarding collaboration, many students expressed desire for more discussion of the cases in class. One student noted, "We did not use the cases to hold discussions which would have been helpful." Students thought "more group input" was needed while working through the cases, some noting that there were missed opportunities to "get additional perspectives."

The remainder of student responses was split among knowledge centeredness (19%), learner centeredness (16%), and technology centeredness (16%). Some students remarked that there were not enough opportunities for knowledge building in class, such as this one who said, "They were assigned, one was scored, and that was it. There was no substantive discussion or

coverage of the material or the purpose of the assignment." Many students commented on the consequences of working alone on the cases while others reported on technical glitches.

Table 3. *Student comments on least helpful aspects of case implementation by category.*

Coded elements of a learning environment	**Summary of student responses (N=101, 39 coded N/A) with relative frequency of distribution**
Knowledge Centeredness	Fell somewhat short (19%): Not enough or irrelevant information; not enough opportunities for knowledge building in class; process was "too time consuming" with "little follow-up/application"
Learner Centeredness	Fell somewhat short (16%): Overwhelmed by amount of information or the time allotted to complete the case; did not like working alone; difficulty understanding terms used and questions asked
Assessment Centeredness	*Missing/fell short (26%): Pre- and post-tests not helpful; did not receive feedback, which led to feelings of uncertainty
Community Centeredness	*Missing/fell short (26%): Desired more collaboration and discussion of cases in class to get additional perspectives
Technology Specific	Fell somewhat short (16%,): No one available to answer questions; technical glitches frustrating; layout of program difficult to navigate

*Indicates the categories with the largest clusters of student responses. Underlined statements are the researchers' judgments based on the relative frequency of how student responses were distributed.

Recommendations for Changes to Case Implementation

Students' ideas for changes to the way cases were implemented in their course suggested that improving certain features of classroom practice could enhance the overall quality of the learning environment. Similar to how they responded about least helpful aspects of how the cases were used in class, most students concentrated on assessment and community in their recommendations for improving case implementation (just under one third of responses per category). Some students suggested changing the pre- and post-tests or eliminating them altogether because they did not see the relevance to their coursework. However, others suggested there should be more explicit feedback, such as one student who wanted to "Discuss what the teacher felt were the best and most unique solutions."

Additionally, students thought greater emphasis on collaboration would make the cases more realistic. For example, one student explained, "I think this tool would be most beneficial as a group project since most administrative decisions are made in collaboration with peers." Another student suggested, "Use class time after assignments to discuss results/choices of students," reinforcing the notion that opportunities for whole class or group discussions are an important part of an effective learning environment that includes community centeredness.

About one fifth of student responses offered suggestions for making the learning environment more knowledge centered, as one student noted, "It would be great to be able to go back to the cases after the feedback and do more interaction with the case. The cases were good, but the interaction should be deeper with the material." Fewer students (13%) believed there needed to be more focus on the learners. Only a handful of students (7%) recommended changes to the technology; most of these remarks were related to functionality of the software or the user interface.

Table 4. *Student recommendations for changes to case implementation by category.*

Coded elements of a learning environment	**Summary of student responses (N=104, 29 coded N/A) with relative frequency of distribution**
Knowledge Centeredness	Room for improvement (20%): Integrate cases more fully; provide more and better structure of information; opportunities for deeper interaction with material; "Minimize the four step process and eliminate unnecessary data."
Learner Centeredness	Room for improvement (13%): More time to complete cases in class; provide more structure/guidance; assign cases later in the program
Assessment Centeredness	*In need of change (29%): Eliminate or change the pre- and post-tests; discuss "best and most unique solutions" in class
Community Centeredness	*In need of change (31%): More collaboration with peers; more class time to discuss results
Technology Specific	Of little concern (7%,): Improve functionality of software and user interface

*Indicates the categories with the largest clusters of student responses. Underlined statements are the researchers' judgments based on the relative frequency of how student responses were distributed.

Suggestions for Improving Online Cases

The researchers also learned how features of the online cases could better contribute to the effectiveness of the learning environment from students' suggestions. Most students (over one quarter of responses) attended to the technology itself, primarily commenting on usability aspects of the technology that frustrated them or interfered with learning. For instance, one student stated, "The program could be more user friendly. I found it difficult to compare data because it is found on many different pages." Some comments on making the program easier to use were specific, such as "Fewer steps and less time involved" and "BIGGER boxes in which to type," while more general responses simply suggested the site be more "user friendly."

The second greatest area of concern (one quarter of responses) was more support for students' knowledge development from the program, particularly in the organization and presentation of the content. For example, students suggested the data in the cases should be "more complete and all-inclusive." More to the point, students recommended we "increase background information on case study schools," include more "diversity in populations," "narrow the focus," and make the "issues stand out more." A couple of students thought more instruction should be included in order to clarify how the cases aligned with course goals. Another said providing sample answers would "spark creative juices when dealing with the cases" while others made suggestions about how to handle practical application of professional competencies in the online cases. For example, one student recommended, "Have clear directions about what you want to improve or what problems the schools are facing."

About one fifth of students who responded wanted the online cases to be more learner-centered by making ETIPS more adaptable to individual learner's needs and more considerate of learners' pre-existing knowledge. They offered ideas ranging from providing "clarifying questions" to "having audio on the cases" and "having more graphs." In addition, many students thought the vocabulary needed to be less confusing. A few less (just under one fifth of responses) suggested improving assessment, once again questioning the relevancy of the pre- and posttests. Only a few students (8%) suggested the community aspect of the online cases be improved.

Table 5. *Student suggestions for improving online cases by category.*

Coded elements of a learning environment	**Summary of student responses (N=109, 32 coded N/A) with relative frequency of distribution**
Knowledge Centeredness	*In need of change (25%): More support of knowledge development from software program, particularly in the organization and presentation of content
Learner Centeredness	Room for improvement (22%): Additional scaffolding to complete steps; include audio and more visual aides; "tone down the language"
Assessment Centeredness	Room for improvement (18%): Discuss/practice answering questions; more and increased frequency of feedback
Community Centeredness	Of little concern (8%): More opportunities for collaboration and discussion in class or on-line
Technology Specific	*In need of change (27%): Better usability; more interactivity with ability to ask questions and provide input

*Indicates the categories with the largest clusters of student responses. Underlined statements are the researchers' judgments based on the relative frequency of how student responses were distributed.

Conclusions and Implications

Classroom implementation of the online cases was successful in creating an environment for developing students' critical thinking skills, deep understanding, and the ability to transfer knowledge. Students found the support the online cases provided for knowledge construction to be the most helpful aspect of how the cases were used in class and suggested additional ways the software could aid learning processes. The literature supports this conclusion. Indeed, a knowledge-centered learning environment focuses on standards that define the knowledge and competencies students must acquire (Bransford et al., 2000). The goal of instruction is to help students learn in ways that lead to understanding and the ability to transfer knowledge with an emphasis on metacognitive skills.

Where ETIPS case implementation fell short was in assessment of student learning and support of community building. According to the literature, feedback encourages students to revise and improve their thinking, yet students reported that there was too few opportunities for feedback in the cases, which made it difficult to monitor their progress. Formative assessment is used to make students' thinking visible and should be an integrated part of instruction (Bransford et al., 2000). Likewise, the students desired more collaboration and discussion while working through the cases, activities that research has shown leads to joint construction of knowledge.

If the online cases and the educational setting in which they are implemented are together considered the learning environment, then either the software or the instructor could be responsible for the contributions of knowledge building, assessment, and community. Brown (2008) maintains that developers of interactive technology like ETIPS should consider both techno-centric and human-centric perspectives in the design of the learning environment, i.e., the technology that mediates learning and the social context in which it is embedded. Our research findings suggest two alternatives for making a difference in the quality of technology-enhanced learning environments. The first option is to augment the technology to better facilitate knowledge building and scaffolding (perhaps with video and/or audio and embedded instructional aids) and improve assessment and collaboration. The second is to address the learning context by creating more professional development to help instructors realize the importance of and make significant changes to their methods of instruction. Rather than

polarizing the two perspectives, Brown argues for "a framework that promotes reciprocity and steers a delicate balance" (p. 236). Although achieving this type of balance is a significant challenge for developers of interactive learning environments, it is both necessary and possible.

Automating feedback is particularly challenging for online assessments that incorporate open-ended questions. One solution is to employ an automated essay scorer (AES) that provides formative feedback to students as they work through material in an online learning environment. For example, select cases in the first generation of ETIPS designed for pre-service teachers to practice instructional decision-making skills related to technology integration and implementation offer students access to an AES (Scharber, Dexter, & Riedel, 2008). Students can opt to submit their answer drafts to the ETIPS' AES and receive a prediction of their score, according to rubric criteria. This score and the related feedback are intended as formative feedback that can be used by students to improve their responses before submitting their final answers to the instructor. Research on the development of and technology behind AESs has improved their accuracy, making them a feasible enhancement to online learning environments. Providing students space within the online environment to give each other feedback is another possibility. To further improve the effectiveness of these techno-centric solutions, they should be supported by improvements to classroom approaches to assessment and feedback. This could include more opportunities for face-to-face peer review during class. Developers might also emphasize the importance of instructor feedback during faculty professional development and provide ongoing support in the form of detailed rubrics.

A techno-centric approach to enhancing the community centeredness of a learning environment includes embedding mechanisms that allow students to collaborate within the online setting. Built-in features like discussion boards, wikis, and live chat rooms allow students to communicate with each other and the instructor. Alternatively, instructors could make use of similar online communication tools outside of the learning environment. For example, many professors already supplement class meetings with online components via course content management systems. Most of these systems have mechanisms that support collaborative content development, which could be used in conjunction with assignments like ETIPS cases. Providing students with a tool for comparing answers with their peers is another way to encourage joint construction of knowledge. ETIPS began offering a "Snapshot" feature to faculty in Fall 2008. A Snapshot report is a whole group data display that includes all students' responses to ETIPS questions for both completed assignments and those in progress. Although Snapshot was originally conceived as a tool for faculty, it could be modified to give instructors the option to allow access to their students. Again, these features would benefit from complementary classroom practices such as whole class or small group discussions and displaying students' responses to tasks during class.

Currently the ETIPS software primarily serves as a means for delivering content and managing administrative tasks. However, more of the value-added features of new technology could be implemented to help meet the challenge of improving the effectiveness of this online case-based learning environment. There is still much work to be done in the field when it comes to balancing technology that mediates learning and the social context in which it is embedded.

The findings from this study offer insights for how the learning sciences can guide successful implementation of technology-based learning environments.

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