2010

VIRTUAL TEACHING CASES?AN EXPLORATORY STUDY

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Research-in-Progress

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Abstract

This research, when complete, will represent a prototype of the development of a virtual teaching case and the use and assessment of the initial versions of research instruments whose aim is the assessment of this new form of teaching case, or any type of teaching case, with regards to learning efficacy, gains, satisfaction, and environment. The purpose of this virtual teaching case (that is, a teaching case, embedded within a virtual world) is to leverage the rich heritage of case-based teaching while helping today's students to learn by providing a more engaging environment where these students (experienced with multiplayer computer games and the Internet) can collaboratively practice project management skills such as planning scopes of work, schedules, and budgets—skills they have already learnt in class. In a virtual teaching case, students can experience the challenges of discovering problems; collaboratively creating, judging, and transforming resolutions; and reacting to changing circumstances.

Keywords: Teaching case, learning, evaluation methods and criteria, IS education, virtual world, project management, problem solving

Introduction

In the virtual teaching case research and development project reported here and elsewhere we have designed and built a new platform for learning ill-structured problem solving generally, and project management planning specifically, using a 3D immersive virtual world (Robbins and Butler 2009a, 2009b). In this section we summarize the virtual teaching case. In the next section we describe the theoretical justification of our approach. In the research, development, and teaching model section we first describe our desired learning outcomes and then our approach, with concrete examples at each step. Finally, in the research measures for teaching case quality section we describe how we plan to answer four research questions that focus on providing transparency into the virtual teaching case's learning efficacy and student satisfaction, as well as how traditional versus virtual teaching cases compare from a student's point of view.

The purpose of this virtual teaching case (that is, a teaching case, embedded within a virtual world) is to help students learn by providing an engaging environment where students can collaboratively practice project management skills such as planning scopes of work, schedules, and budgets—skills they have already learnt in class. Virtual worlds (VW) allow users to represent themselves as 3D animations (known as avatars); communicate with other users' avatars; and build, change, and travel within their 3D computer-game-like environments (Messinger et al. 2009). VWs show promise as a method for "enhancing, motivating, and stimulating learners' understanding of certain events, especially those for which the traditional notion of instructional learning have proven inappropriate or difficult," such as the teaching and learning of project management (Bares et al., 1998; Malone and Lepper, 1987; Pan et al., 2006; Phang and Kankanhalli 2009). The goal of our overall program is to enhance educational capabilities by developing technology and techniques for using VWs to provide realistic but safe practice scenarios for collaborative learning that can be used in combination with traditional methods such as classroom discussions, textbook reading, and traditional homework. In a VW, students can experience the challenges of discovering

problems that need addressing, collaboratively creating, judging, and transforming potential resolutions, and reacting to changing circumstances.

Although the scope of this project has primarily been limited to the MIS foci in the graduate and undergraduate business schools at the authors' university and one other university, the potential uses of interactive VW technologies and associated techniques as an educational platform is much broader. For example, while organizational problem solving (such as IT project management or IT opportunity identification) is central to the educational programs offered by business schools, there is increasing interest in other areas, including law, social work, government, and medicine to develop their students' capabilities to recognize, engage, and collaboratively address corollary complex organizational problems. In addition, VWs can support various modes of distance learning such as synchronous text/voice/video-based discussions, interactive teamwork of geographically distributed students using shared software applications, or embedded scenarios that allow teams of students to discover, react, or plan in context, and to some extent, in situ (Bronack et al., 2008; Lamont, 2007; Virtual World News, 2007). The development of interactive VWs with these foci and abilities to support education open up the possibility of interactions among students in schools not usually bridged or integrated (e.g., leadership and philosophy, information systems and computer science students, or between students at similar schools at different universities). In fact, in this project, during one of three pilots, IT project management students at the authors' mid-Atlantic United States' university and at a Southeastern US university collaborated. Therefore, there is broader potential impact for this innovative project which seeks to complement other IS education research (Borrajo et al., 2010; Dreher et al., 2009; Harris and Rea, 2009; Gupta and Bostrom, 2009; Keller, 2009; Law, 2007; Shen and Eder, 2009; Topi et al., 2010; Wagner and Ip, 2009; Wang and Brahman, 2009; Wu et al., 2010) and develop a framework for developing, using, and assessing VWs as learning environments in which students may practice their collaborative organization problem solving skills in safe but realistic contexts.

The virtual teaching case reported here asks students to role play, in teams, inside a virtual world, and to be part of a project management consulting firm that has been hired by a sterile disposable medical device manufacturing firm (The Trilleum Corporation) to restart their manufacturing operations relocation project and assure that their stalled project is completed successfully. By the end the virtual teaching case, the students, in teams, develop and present a plan within the virtual world that shows their client organization (represented by characters/avatars that are "brought to life" by professors, working professionals that are alumni, or professional actors) that they (the students acting as consultants) can help the client organization manage the scope, schedule, and budget of the manufacturing operations relocation project. The case begins when the client organization's managers indicate to the student consultants that the Trilleum Corporation, which manufactures intravenous catheters, blood transfusion kits, wound drainage sets, etc., was recently sanctioned by the United States Food and Drug Administration (FDA) and the corollary organization in the EU, the European Medicines Agency (EMEA), for not using Good Manufacturing Processes (GMP). Further, by mandate of the EMEA and FDA, the Trilleum Corporation must geographically transfer and integrate three manufacturing processes per an agreed upon and validated design by July 4th in order to avoid fines, avoid an otherwise mandatory shutdown, and continue to sell sterile medical disposables. Note we created a non-IT-centric case in order to make this case usable to all kinds of business students, not just MIS students. Also note that while some of the goals of the project are clear, for example—the geographical transfer and physical integration of three manufacturing lines into one line that is EMEA and FDA GMP-compliant by end of the July 4th shutdown week, there are many goals or activities within the problem that have to be identified, considered, ranked, and integrated by the students, such as addressing sales demand concurrent to operations integration, balancing competing stakeholder interests, and managing outsourcing contracts for parties involved in the move. Finally, note that since the problem is not fully defined, the planning process begins with a complex problem that must be structured.

Within the VW, the students collaborate virtually with others using shared applications, voice and text chat, and physical interactions (e.g., focused attention, waving). The VW contains virtual buildings, furniture, files, etc. One of two virtual buildings provides student consultants with a virtual consulting practice while the other is the student consultants' client's offices and manufacturing facilities. The virtual buildings are within a virtual city and students can move from one building to the other more traditionally, by "walking," or by taking advantage of features only available in virtual worlds such as teleporting from location to location. The students' virtual consulting practice contains a working conference room, a "war room," individual problem solving spaces, a lobby, and the consulting partners' office. While working in the virtual teaching case as consultants, students are able to, as necessary, obtain advice from a senior consulting partner—a character in the virtual case—that is played by the instructor of the

students that are using the Trilleum case. When the student consultants "arrive" at the Trilleum Corporation for the first time, they are brought to the Trilleum conference room and Trillieum's ill-defined problem is presented. Students and their avatars are introduced to avatars that represent Trilleum managers—played by the course instructor or other professors, alumni—especially those with operations or project management experience, or professional actors. Following an initial presentation, the students are shown the current and new manufacturing "spaces" at the virtual Trilleum Corporation.

After this first interaction with the client, the students move back to their virtual consulting practice and determine who, they, as a team, will interview at the client's location and what questions to ask while they are interviewing any particular Trilleum manager. The Trilleum managers that the student consultants are able to interview are Estella Hernandez—VP of Operations, Bill Rapinalo—Director of Manufacturing, Jeff Goldstein—Supply Chain Manager, Jorge Gonzalez—Maintenance Manager, Consuela Rodriguez—Production Manager, Sam Weyland—Facilities Manager, and Steve Gordon—the Quality and Safety Manager. Each of these virtual client managers has a virtual office at the Trilleum Corporation where s/he can meet with student consultants, and each office may have editable word processing, spreadsheet, or project management files, such as the planned manufacturing operations relocation design, information about what manufacturing processes have been moved already, as well as information about particular sterile disposables' demand and line capacity.

While the case is about applying and practicing project management planning skills, the students are provided information about the Trilleum Corporation's operations. We included this additional, extraneous information so that the students would experience a real, and complicated, context. In fact as a result of our second pilot, we learned that students can become significantly focused on understanding the operations when what is important for their project planning purposes is their focus on the logistical transfer of machines per an already agreed upon operations design, identifying persons qualified to validate installations, assuring additional movers, etc. Note that these kind of student experiences (e.g., where students believe they need certain information when they actually do not) provide an opportunity for a post-case discussion among the instructor and students about focusing upon the correct information in a problem or the need to refine the problem statement (planning the project) prior to starting other problem solving activities, and that this kind of discussion is not piqued by traditional, snapshot-of-the-past, paper-based cases. After interviewing Trilleum managers, student consultants then retreat to their consulting practice, develop early shared mental models of the problem context, re-interview clients at the client's site as necessary, and use educational scaffolds (such as samples of work breakdown structures (WBS), schedules, and budgets). At the end of the case, the students present their plans and the client asks the students to rework the plan on specific points that the students did not consider – often because the students, did not interview the client managers (again, played by professors, alumni, and professional actors) effectively. At the close of the case, the students' instructor shares an ideal (but non-unique) solution to the problem and leads a virtual discussion.

Theoretical Justification

The foundation for this project is the case method of teaching and learning. The case method "enables students to discover and develop their own unique framework for approaching, understanding, and dealing with business problems" (Barnes et al., 1994, p. 42). The case method supports experiential, active, and collaborative learning (Heckman and Annabi, 2006). Further, it supports teaching principles, concepts, morals, ethics, strategies, dispositions, and "images of the possible" (Shulman, 1992, p. 3). It helps students learn how to encapsulate a problem, see the inter-relatedness of organizations and processes, and take responsibility in their decision making (Barnes et al., 1994). Kerr and colleagues (2003) indicate that students playing roles in cases report that their learning is enhanced.

Traditional text-based presentation of case materials to individuals, followed by class discussions in the abstract, reduces the effectiveness of the case method for teaching students how to engage complex, organizationally situated project planning, when compared to modern technologies that can support the case method of teaching. The bounded and focused nature of classic written case descriptions eliminates some of the challenges associated with collaborative problem identification. It also reduces some of the ambiguity associated with evidence and argumentation that are common when dealing with planning in organizational settings. Lastly, the linear-bounded nature of reading largely eliminates the interactive, exploratory aspects of organizational decision making, such as those necessary when planning projects. Thus, while the case method is a powerful tool for teaching students how to engage complex problems, traditional case delivery vehicles are subject to significant limitations as a basis for

experiential learning related to organizational problem solving. VWs have features that can be used to augment case-based learning of problem solving and enable more of the active, constructive, collaborative, intentional, complex, contextual, conversational, and reflective activities called for by problem-solving education researchers (Jonassen, 2006), VW learning pioneers (Bronack, 2008), and others (Spiro et al., 1992; Whitehead, 1929/1985). Key VW features include context-situated knowledge spaces, a communicating community, active actions, and facility toolkits (Pan et al., 2006). Knowledge spaces provide information that can help the learner as well as the teacher. These include embedded learning resources such as conceptual definitions, evaluation tools which track how a student or student team arrives at a decision and tutorials or other educational scaffolds that help students with a task the first time they perform it. Communicating communities enable all students to interact, not just those strong and comfortable oral performers during class discussions. These communities include tools such as text or voice chat, email, discussion boards, and support for gesturing. Active action is facilitated by tools that allow learners to act as intensive information providers, problem finders, question answerers, issue analyzers, and solution synthesizers. For more on selecting the appropriate VW for your educational purpose, see Robbins and Butler (2009a) and (2009b).

However, the use of VWs for education in isolation does not naturally lead to learning (Cai et al., 2008; Lakkala et al., 2007; Wells et al., 2008; Windschitl and Sahl, 2002). Therefore, in order to adapt to using new technology within the classroom, careful pedagogical thought about how the technology is to be integrated into the classroom must occur (Badge et al., 2005; Lakkala et al., 2007). One pedagogical approach that can be applied in the context of virtual learning is progressive inquiry learning (Hakkarainen, 2003; Muukkkonen et al., 2005). Progressive inquiry learning focuses on students developing their own questions and creating their own explanations prior to the use of an authoritative source. Progressive inquiry learning can be applied to the learning of solving ill-structured problems, such as the process of developing plans for projects. In order to develop a virtual teaching case that was as exemplary of the ill-structured problem solving that is ubiquitous in industry, but which is scant in our classrooms, and which was apropos for our learning outcomes and educational purposes, we grounded our research, development, teaching, and assessment in the instructional design models suggested by Jonassen (1997) and Choi and Lee (2009).

Research, Development, and Teaching Model

With regards to our desired learning outcomes (Table 1) we seek to help our students use multiple perspectives as they develop project plans. The multiple perspectives that the students should learn to apply include the perspectives of the various managers at the client they are engaged with. Further, the students should apply other perspectives, such as those of their managers or their colleagues within their virtual consulting practice. Finally, if there are other dominant stakeholders, our students should be able to take their perspectives as well – in this teaching case two other dominant stakeholders are the EMEA and the US FDA. We also seek to help our students develop their abilities to justify their identified problems and/or their identified solutions. One problem that can be identified and

Table 1. Desired Learning Outcomes (Adapted from Choi and Lee (2009).

Skill	Literature Support
When Identifying Problems or Generating Solutions, Students Should	
Use Multiple Perspectives	Dewey, 1933; Fleischmann et al. 2009; Jonassen, 1997; Schraw et al., 1995; Shin et al., 2003; Zeichner and Liston, 1996.
Justify Problem	Harrington et al., 1996; Jonassen 1997; Shin et al., 2003; Sinnot, 1989; Voss et al., 1991; Zeichner and Liston, 1996.
Think Critically	Schraw et al., 1995; Zeichner and Liston, 1996.
Use Theory	Bransford, 1993; Chi et al., 1988; Schraw et al., 1995; Shin et al., 2003.

justified in the case is the inability of the client organization (Trilleum) managers to work cooperatively on an ill-defined project – as opposed to their well-structured daily operations. We seek to help our students think critically. For example, students working this case need to come to the realization that the case is about project management, NOT operations management, even though the case is fraught with operations production information. Finally, we seek to help our students apply theory. A core "theory" we ask our students to apply is the Project Management Body of Knowledge (PMBOK). As the designers and developers of the learning environment we first *articulated the problem context* of the virtual case (Figure 1, Activity 1). In order to articulate the problem context (or the setting of

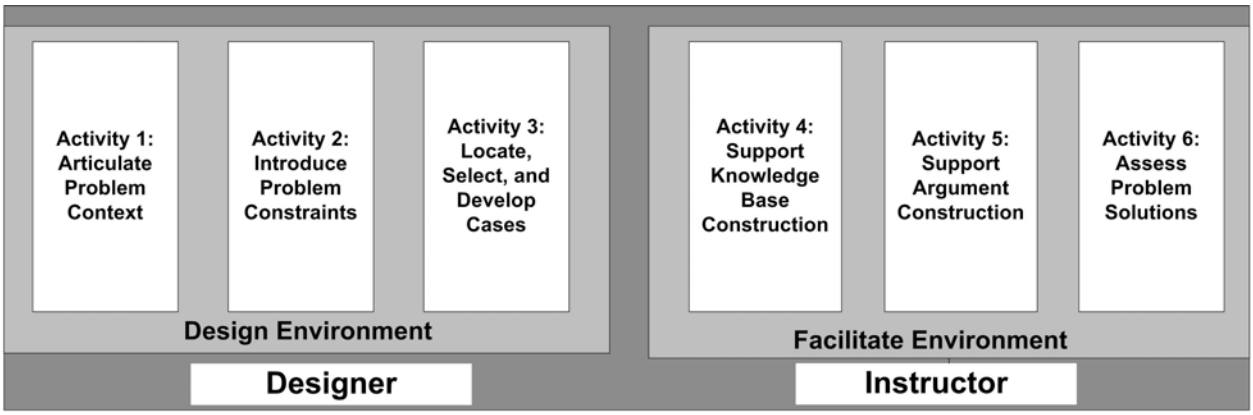

Figure 1: Designing and Instructing Activities (Adapted from Jonassen (1997)).

the problem scenario) we interviewed a subject matter expert (a management consultant who had worked on a similar project 20 years ago) and developed virtual work spaces that are representative of actual real world projects. After we articulated the problem context, we *introduced problem constraints* (Figure 1, Activity 2). Problem constraints in project planning include needs of the various stakeholders who in this case were the seven Trilleum Corporation managers as well as the EMEA and the US FDA. For example, in this case, the Director of Manufacturing is interested in meeting demand, among other things, while the Quality and Safety Manager is interested in assuring that the new integrated processes meet EMEA and US FDA GMP and the VP of Operations is primarily interested in a successful move by the end of the July 4th shutdown.

We further *developed the case* (Figure 1, Activity 3). We did this by determining how the managers at the Trilleum Corporation would be most invested in such a project. Additionally, and based upon feedback from our professional actors in our second pilot, we developed "personas" for each portrayed manager; these personas included detailed job descriptions, "a day in the life of" information for each of the Trilleum managers' roles, information about the managers' genders, ages, hobbies, each manager's last three "positions" accompanied by their affiliated responsibilities, each manager's primary expertise or talent, the biggest crises experienced by each as well as the largest contributions provided by each manager, as well as examples of each of the managers "in action." This contextual information was provided in addition to information about what the professor, alumni/working professional, or professional actor (playing the manager) should indicate when student consultants asked particular questions as well as what the enacted managers' responsibilities were in the geographical transfer and physical integration of three manufacturing operations. Also, to help the students develop their ability to forage information, we built our scripts so that the information that was provided to the students was only provided (by the portrayed managers) if the students requested it, and so that the information would need to be judged, refined, and integrated. For example, some information provided by some managers to student consultants was less than accurate and some information in the case was contradictory (in line with non-virtual reality). We encourage students to develop their abilities to think critically based upon their analyses of their interactions with the manager characters in the case.

Moving from our role as designers to instructors, and to *enable the students' knowledge-base construction*, (Figure 1, Activity 4) we created information artifacts that were embedded within the virtual Trilleum Corporation building. These information artifacts, for example, provided tangible information about the numbers of different types of workstations/fixtures and floor machines within particular current productions lines (dialysis sets, arterial closures, etc.), how maintenance was performed for any particular line, or where production lines would geographically exist before and after their transfer and integration. Supporting the students' *argument construction*, (Figure 1, Activity 5) we provided educational scaffolds within the Consulting Firm's (as opposed to the Trilleum Corporation) virtual building (Linn 1995, Ge and Land 2003, 2004). Note that part of the architecture of the virtual case was supporting problem identification activities in the Trilleum Corporation virtual building while supporting solution generation and consideration abilities in the Consulting Firm's virtual building. Example educational scaffolds (primarily for solution generation and consideration) included sample WBS, schedules, and budgets. Further, other step by step protocols were provided, such as the prescribed steps to develop a proposal. Finally as the students present their solutions to the Trilleum Corporation manager characters towards the end of the case, these characters, represented as avatars played by professors, alumni working professionals, or professional actors, *assess the problem solutions*, (Figure 1, Activity 6) using a rubric provided by the authors.

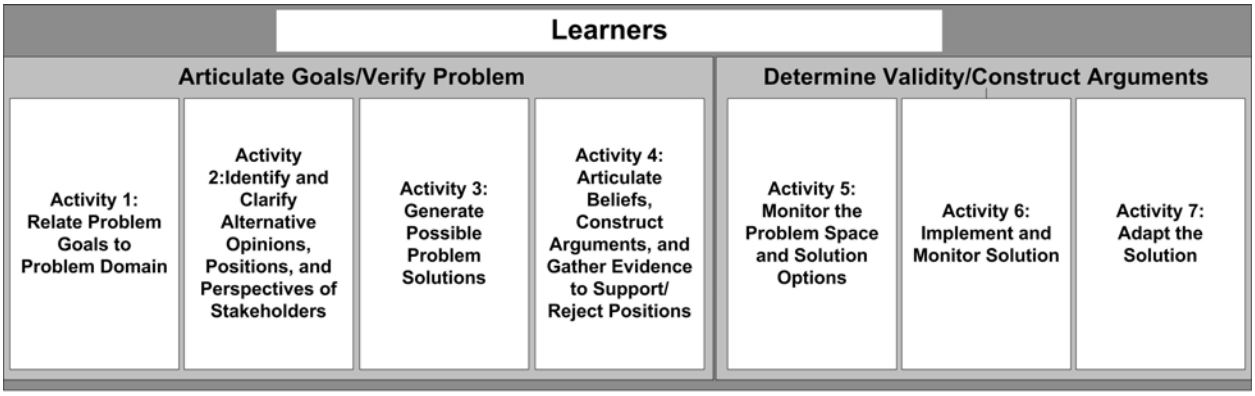

Figure 2: Student Learning Activities (Adapted from Jonassen (1997)).

Moving to Figure 2, Activity 1, we purport that students *relate problem goals* (plan scope, schedule, and budget) *to a problem domain* (the Trilleum Corporation which seeks to geographically transfer and operationally integrate three manufacturing processes by the end of the July 4th shutdown week in order to acquiesce the EMEA and the US FDA. The students also *identify and clarify alternative opinions, positions, and perspectives of stakeholders* (Figure 2, Activity 2) after the student consultants interview up to seven portrayed managers and review GMP as indicated by the EMEA and the US FDA. The students, then, collaboratively, using tools such as private/public text or audio chat, MS Word, MS Excel, Whiteboards, and Shared Desktops provided in our chosen virtual world platform, *generate possible problem solutions* (Figure 2, Activity 3). These include planning activities on weekends, outsourcing the move to professional movers, and focusing on high risk activities first. Then using the information they have gathered from their interviews, interacting with information artifacts, and clarifying their understanding via educational scaffolds, the students *articulate beliefs*, (Figure 2, Activity 4) such as the importance of focusing on project planning as opposed to operational quality, *construct arguments*, (Figure 2, Activity 4) by referring to the [given] fact that their consulting organization that was engaged by the Trilleum Corporation has experience with project management but not with the assurance of quality in medical device manufacturing, and *gather evidence to support or reject positions* (Figure 2, Activity 4) by interviewing Trilleum Corporation manager characters (Andriessen 2006). The case is also designed so that the students can *monitor the problem space and solution options* (Figure 2, Activity 5) by interacting with characters, information artifacts, and educational scaffolds, *implement and monitor a solution*, (Figure 2, Activity 6) by presenting a plan which includes a prospective WBS, schedule, and budget, and *adapt the solution* (Figure 2, Activity 7), when Trilleum manager characters use a rubric provided by the case authors in order to indicate areas in student consultant plans that can be considered or developed further. Finally, at the end of the virtual case, the students learn about one ideal solution to the case, developed by the case authors.

Research Measures for Teaching Case Quality

Our plan for measuring the case's quality is based on Choi and Lee (2009) and Chou and Liu (2005). Choi and Lee (2009) report the design, implementation, and evaluation of an online case-based learning environment for enhancing ill-structured problem solving, and their research model is based on the same instructional design model (Jonassen 1997) that we have used (Figures 1 and 2). Our research questions are in Table 2. The experiment control group will be composed of students learning (by practicing) using written cases as teams. The treatment group will be composed of students learning (by practicing) using the virtual teaching case as teams. Note that Research Questions 1 and 2 focus on understanding whether the virtual teaching case is effective in phases or when comparing the students' learning as a whole to a control, and more traditional, case-based learning environment. Both Research Questions 1 and 2 will be addressed by asking instructors and project managers to apply rubrics (Tables 3 and 4) as expert judges/informants across the treatment/control teams and virtual case stages. We will then compare the degree to which the teams of students in the treatment and control groups applied concepts/skills they learned prior to the experiment, and which are the basis for the rubrics and hence the instructors' and project managers' judgments. Note that Research Questions 3 and 4 are focused on the learning environment and learning satisfaction and therefore these questions are addressed by students completing evaluation surveys and our subsequent analyses of their answers. Research Questions 3 and 4 control/treatment measures are in Tables 5 and 6. Some student teams will be assigned the virtual case treatment condition and others will be assigned to the written

case control. Upon completing the case, all participating students will complete an evaluation survey using a 1-7 Likert scale, including the questions in Tables 5 and 6. The mean answers for students in treatment/control groups will be compared.

Table 2. Research Questions Adapted from Choi and Lee (2009) and Chou and Liu (2005).	
RQ1	Do particular learning activities and the affiliated learning objects in the virtual case improve students' ability to plan scopes, schedules, and budgets? (We will test the gain effects associated with each stage.)
RQ2	Does the overall learning experience (using the VW and the embedded case) improve students' ability to plan projects in a transfer test, when compared to classroom discussions of the written version of the case?
RQ3	Do students who learned in the virtual world report higher levels of satisfaction than their counterparts in classroom discussions of written cases solved by teams of students?
RQ4	What do students who learned in the virtual world report with regards to their learning environment when compared to their counterparts in classroom discussions of written cases solved by teams of students?

Table 3. Rubrics for Research Questions 1 & 2: Learning Efficacy (To Assess Impacts on Students)	
1	To what extent did the students recognize/implement concepts affiliated with the PMBOK Process Groups?
(a)	And concurrently user multiple perspectives? (repeats for #2 through 18 below)
(b)	And concurrently justify their identification of a problem or a solution? (repeats for #2 through 18 below)
(c)	And concurrently think critically? (repeats for #2 through 18 below)
2	To what extent did the students recognize/implement concepts affiliated with PMBOK Knowledge Areas?
3	To what extent did the students recognize/ implement concepts affiliated with the 42 PMBOK processes?
4	To what extent did the students recognize and as appropriate, implement industry specific concepts?
5	To what extent did the students recognize and use WBS Components?
6	To what extent did the students recognize and use WBS Work Packages?
7	To what extent did the students recognize and use WBS Codes?
8	To what extent did the students implement appropriate size activities?
9	To what extent did the students recognize and use Schedule Activities?
10	To what extent did the students recognize and use Schedule Activity Dependencies?
11	To what extent did the students recognize and use Lag and Lead times as appropriate?
12	To what extent did the students recognize and use Schedule Activity Effort and Duration as appropriate?
13	To what extent did the students recognize and use Human Resources?
14	To what extent did the students recognize and use Material Resources?
15	To what extent did the students recognize and attach Human Resources to Schedule Activities?
16	To what extent did the students recognize and attach Material Resources to Schedule Activities?
17	To what extent did the students recognize and set a Baseline?
18	To what extent are the students' WBS, Schedule, and Budget appropriate in terms of scope, time, and cost?

Table 4. Rubrics to measure RQ 1 Gains across VW Case Phases Adapted from Choi and Lee (2009).	
1	To what extent do students justify problems after viewing the initial presentation in the virtual case?
2	To what extent do students use multiple perspectives represented by the characters interviewed in the case?
3	To what extent do students apply theory represented by educational scaffolds that exist in the case?
4	To what extent do students think critically as they collaborate to meld problems, perspectives, approaches?
5	To what extent do students provide a project management plan solution in response to feedback?
6	To what extent are students presented with and discuss an ideal (but non-unique) solution?

Table 5. Measures for Research Question 3: Learning Satisfaction (to be completed by students) Adapted from Chou and Liu (2005).	
1	I am/was satisfied with this learning experience.
2	I am/was satisfied with how I was able to acquire information in this experience.
3	I am/was satisfied with the flexibility in how I could learn in this experience.
4	I am/was satisfied with the level of independence I had in this experience.
5	I am/was satisfied with the instruction provided with this experience.

Table 6. Measures for Research Question 4: Learning Environment (to be completed by students) To what extent did you, as the student…		
1	Find materials that helped you develop the WBS, schedule, and budget?	Williams, 1992
2	Find that the materials helped you develop a strategy to plan the project?	Williams, 1992
3	Receive feedback to assess how well you were learning?	Williams, 1992
4	Provide the teacher with information to assess your learning?	Williams, 1992
5	Find that this case was realistically complex?	Williams, 1992
6	Think that the complexity in the case was manageable?	Williams, 1992
7	Experience "bite-size" pieces of the case when creating your solution?	Williams,1992; Nelson et al. 2008
8	Find the case setting rich and detailed?	Williams, 1992
9	Have the opportunity to actively engage solving problems?	Hackney et al., 2003
10	Find the case authentic?	Hackney et al., 2003
11	Have the opportunity to identify the underlying issues?	Stepich et al., 2001
12	Have the opportunity to clarify the problem(s) in the case?	Stepich et al., 2001
13	Consider multiple factors in tandem?	Stepich et al., 2001
14	See multiple perspectives from various characters?	Stepich et al., 2001
15	Allowed to evolve your solution?	Stepich et al., 2001
16	Consider potential consequences and the implications these might have?	Stepich et al., 2001
17	Develop your ability to reason through a problem to a solution?	Hackney et al., 2003
18	Consider potential impacts upon the client organization?	Hackney et al., 2003
19	Required to make your own decisions?	Keefer, 2005
20	Self-reflective, as you completed this case?	Keefer, 2005
21	Collaborate with your team?	Keefer, 2005
22	Motivated to seek out new knowledge and develop new skills?	Law, 2007
23	Empowered to use alternative means to complete tasks in the case?	Law, 2007
24	Have opportunities to learn from other students' solutions?	Law, 2007
25	To what extent did this questionnaire assess this case?	Williams, 1992

Implications, Limitations, and Future Research

This research, when complete, will represent a prototype of the development of a virtual teaching case and the use and assessment of the initial versions of research instruments whose aim is the assessment of this new form of teaching case, or any type of teaching case, with regards to learning efficacy, gains (across stages of interaction with a case), satisfaction, and environment. While similar cases have been developed, we are unaware of any that will have gone through this intense scrutiny. We contemplate that this paper provides a method for evaluating teaching cases of any form. Perhaps with tools represented in this paper, scholars will continue to evaluate their teaching cases, in order to assure the best possible student learning.

We hope that this virtual case, as has been intimated in three pilots (not reported here), proves to be efficacious. However, this case, as with any teaching case is limited (or not limited) by the abilities of the teachers and students that use that case. As this project closes, we will report this research and provide and disseminate a written teaching case as well that will be used as an experimental control during our data collection and analysis. We also plan to begin developing a second virtual case–a project that was recently funded by our provost. This second virtual case will focus on helping undergraduate students in our introductory management information systems course learn to understand business processes, identify opportunities to use IT to improve/eliminate these business processes, and build arguments that will allow them to obtain financial support for their own (in the future) identified IT opportunities. Finally, we seek to merge the first author's and his colleagues' software agent and online teaching case research with this project (Robbins, 2005; Robbins and Wallace, 2007; Robbins et al., 2009). We would appreciate any suggestions. The materials for this case are freely available. Please contact the first author.

Acknowledgement

We thank Dean John T. Delaney for financial support via the Katz Team Technology Innovation project. We thank the anonymous undergraduate and MBA students at two universities that have participated in three pilots.

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