A Sports Injury Case Study Model – Capitalizing on Virtual Reality Technology

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Abstract: Virtual reality anatomy models were created to support an online case study approach to sports injury assessment and treatment in an undergraduate kinesiology program. Mixed method research established that while the case study was designed to supplement classroom experiences, students preferred to engage in the cases with selective scaffolding from the instructor. This has led to a refined instructional strategy based on student feedback. The virtual reality models and case-based learning were found to be particularly effective for anytime — any place access to solving injury scenarios. This action research study has direct implications for the teaching of teachers who wish to capitalize on the benefits of both problem-based learning and technology integration.

Research Context

Acadia University is primarily an undergraduate liberal arts university of approximately 4000 students and 250 faculty members. As the first true Canadian laptop university, this particular institution has extensively explored the potential of technology to empower education. All classrooms on campus are fully equipped with multimedia presentation hardware and internet access. As a result of this, students and instructors routinely use laptop computers for most classroom activities.

It is important for educators to use technology for a specific purpose. Researchers have called for renewed efforts to explore both what types of knowledge should be taught using technology, and how to best prepare teachers to use technology to support teaching and learning. Case-based learning can be used to prepare teachers from all levels, for the realities of a classroom. Recent research has placed a considerable amount of effort to examine the challenges of incorporating technology into pedagogically sound teaching models (Mishra & Keohler, 2006). The following action research account provides a specific example of how computer technology can be used to offer case studies in a unique electronic format. This context offers sport therapy educators a new and innovative means to “teach with technology”.

Research Problem

Acadia University’s Bachelor of Kinesiology degree has a specialized area of interest known as the Sports Injury Assessment and Management (SIAM). Students in this program work with varsity sport teams (in the role of therapy assistant) and also complete courses in sports injury assessment and rehabilitation. Although this program is not an accredited Athletic Therapy program by the national governing body in Canada — the Canadian Athletic Therapists Association (CATA), many of these SIAM students move onto further graduate degree programs in athletic therapy, physiotherapy, medicine, or other health professional fields after graduating with their Kinesiology degree.
For SIAM students to become more proficient when performing injury assessments, they need to continually practice their skills both in and out of the classroom. Content theory learned in lectures needs to be integrated with practical skills so that the student is able to assess an injury while working as a sport therapy assistant and covering actual athletic events. One of the greatest challenges for student learning is the absence of structured injury scenarios to enable a student to practice injury assessments outside of the regular face-to-face classroom setting.

Case-Based Learning can be used to provide organized scenarios that allow for students to practice required injury assessment skills both in and out of the classroom. This type of learning originated in law school education in the late 1800’s and is still commonly used in various professional schools including medical, teacher, and business education (Dunn & Brooks, 2007). A ‘case approach’ essentially supplies students with an authentic scenario, provides supporting detailed information, and asks an open-ended problem for the student to solve. By using this pedagogical tool in professional programs, allows students to ‘perform’ and provide solutions to scenarios similar to real-life situations when they graduate.

Proponents of case-based learning posit that this form of learning allows for an improvement in critical thinking ability, encourages growth in judgment, enables students to practice evidence-based analysis, and advance motivation to learn through the integration of theory and practice. One of the critiques of case-based learning questions how authentic these artificial scenarios actually are and how realistic these simulations are when compared to real life situations. Innovative multimedia technology can provide a response to this type of critique in sports injury courses because various forms of media can be used to create more realistic injury simulations. Technology can also be used to increase accessibility so that the students can access interactive cases anytime-anyplace.

**Purpose of the Research**

The purpose of this research study was to develop a multimedia case based learning educational tool that could be used as a supplement to in-class activities and allow a student to practice sports injury assessment outside of the classroom. Specifically, the main aim of this action research project was to elicit student feedback on how to best incorporate the technology in a meaningful case study exercise. The research study was not designed to compare courses with and without technology use but rather to establish a better way to use case studies in a sports therapy curriculum.

For this research, a multimedia sports injury assessment tool was designed around a template which included: an ankle injury scenario, timeframe photos that demonstrated the mechanism of injury, interactive 3-d anatomical models (created using Object2VR® software), an information section (e.g. athlete history with probing questions, orthopedic assessment questions), the problem to be solved, and proposed treatment (rehabilitation) plans. The student was expected to work through the case study, use the multimedia technology, and come up with indexes of suspicion for the possible injured structures. Figure 1 shows the multimedia sports injury assessment tool template.

![Figure 1. Multimedia Sports Injury Assessment Tool Template](image-url)
Methods

The study sample included 14 students (4 males and 10 females) from the Sports Injury Assessment and Management Program at Acadia University. An electronic survey was designed to obtain quantitative information regarding students’: 1) comfort level with technology, 2) relative ease of accessing the case study online, 3) opinions about the structure of the case study educational tool, and 4) the reaction to using the 3-d anatomical models. The survey results were analyzed for emergent trends and based on these results, a standardized open-ended interview schedule was developed.

From the sample, six students (4 female and 2 male) were invited to participate in a 30 minute audio-recorded interview. Interviews were also conducted with the course instructor at the beginning, middle, and end of the research process. These instructor interviews probed areas of technical challenges for students, informal student feedback on the quality and format of the case study educational tool, level of difficulty of the tool, and reaction to the Object2VR® anatomy models. The interviews were transcribed and coded in an iterative process which incorporated tallied notes regarding the earlier survey results.

Finally, a single focus group of three students was invited to respond to the immediate results of the survey and interviews in an attempt to corroborate the results.

Explanation of Results

The results from the surveys and interviews showed that this sample of students enjoyed using the multimedia sports injury assessment tool but suggested that it would be more effective if there was increased instructor involvement. Students recommended integrating the multimedia case-study into a face-to-face lecture because this increased instructor interaction is an important component of student learning that was missing from the current model. These results confirm the findings of Clarke and Mayer (2011) that “from the plethora of multimedia comparison research conducted over the past sixty years, we have learned that it’s not the delivery medium, but rather the instructional methods that cause learning” (p. 14). Good pedagogy must lead technology and not vice-versa.

The students also made several suggestions about how to streamline the multimedia technology that was used in the assessment tool. They advocated for the incorporation of more media so that future students could have an enhanced representation of the exact mechanism of injury and how the injury appeared at the time of assessment. For example, videos could be added to demonstrate what exactly happened to the athlete. It was also suggested that the entire educational tool should be placed on a DVD so that the students would not be required to have access to high quality internet in order to use the program. By having a DVD copy, a student could truly have extended access outside of the classroom and be able to practice scenarios without being dependent on the internet.

As an action research study, the primary aim of this project was to improve instructional practices by using an evidence-based approach. Based on the quantitative and qualitative feedback received from the sample of students, we posited a process-oriented instructional model that encourages improved interaction between students and the instructor. This improved instructional model is presented in Figure 2.

![Figure 2. Improved Instructional Model for Using Multimedia Sports Injury Assessment Tool](image-url)
In this improved instructional model, the first case study should take a Socratic approach to teaching and be instructor-led within the classroom. This would allow the students to ask questions and see the systematic approach used by the instructor when completing an injury assessment. The next two case studies would be completed by the students in the classroom in small peer groups. This would allow the students to practice techniques on each other while still having access to the instructor for questions and feedback. The final case study in the proposed instructional model is to have the students complete an independent case study assignment.

This proposed instructional model includes the need for four unique case-study scenarios and was developed based on Chickering & Gamson’s (1987) seven principles of good practice in undergraduate teaching. Table 1 summarizes these effective undergraduate teaching principles and also shows how our proposed instructional model addresses these principles.

<table>
<thead>
<tr>
<th>Principles</th>
<th>Model Response</th>
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<tr>
<td>Contact between faculty &amp; students</td>
<td>Instructor involvement in case study analysis; Socratic</td>
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<td>Cooperative student learning processes</td>
<td>Students working on practice cases together</td>
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<td>Active Learning</td>
<td>Demo &amp; practice of diagnoses techniques</td>
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<tr>
<td>Prompt Feedback</td>
<td>Q/A with professor; online feedback in practice cases</td>
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<td>Time on Task</td>
<td>To succeed at diagnosis &amp; suggested protocols requires dedicated practice</td>
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<td>High expectations</td>
<td>Expectation that students will practice cases &amp; submit the final case analysis based on their mastery</td>
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<tr>
<td>Respect for varied learning style</td>
<td>Demos of techniques, cooperative learning, text-based case materials, audio-visual support materials</td>
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Table 1. Seven Principles of Good Practice (Chickering & Gamson, 1986)

Feedback from this research study clearly shows that this sample of students enjoyed using this injury assessment educational tool and found that it was beneficial to their learning of injury assessments. Technology can be used to provide flexible access to other tools such as interactive anatomy so that the student is then not dependent on using actual anatomy models in a school or resorting to studying with inaccurate depictions that are commonly found on the internet. This increased access will allow a student to practice structured injury assessments outside of the classroom setting.

Future research should evaluate the effectiveness of the proposed instructional model in making students more confident and competent while completing sports injury assessments. Future studies could also examine other forms of technology to see if there are additional components that could make the multimedia sports injury assessment tool more useful for student learning. Finally, it is important to research other student samples (e.g. from other universities, programs, or countries) to see if there is a similar student response to emerging technology and case-based learning models.

References


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