Are Athletic Training educators ready for the digital age? Attempting to understand the connection between technology and pedagogy

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Abstract: This paper reports the research sequence leading to the formulation of conceptual and practical models for using technology-assisted case studies with applications to biology instruction, anatomy studies, and ultimately athletic training classrooms. This research also has direct implications for teacher educators who wish to capitalize on the benefits of both case-based learning and technology integration. Using a mixed-methods action research approach, two research studies have been completed in an effort to design a multimedia sports injury assessment educational tool that can give students anytime access to practicing sports injury assessment scenarios. Results from these studies have led to the development of a refined instructional model for using media-enhanced electronic case studies within the classroom. Current ongoing research is examining the influence a consideration of the TPACK model may have on future versions of the hybrid teaching tool.

Introduction

The central aim of this ongoing research plan is to provide an effective instructional model for using technology-assisted case studies in athletic training education programs. This research also has direct practical implications for teacher and teacher educators that use case-based learning (CBL) or educators attempting to integrate technology into their classrooms. The underlying approach used in this research is an action research methodology (Costello, 2003) with the ultimate goal of improving athletic training instruction. In addition, an interpretative framework will also be used to assess how the nature of student learning is modified with the intervention of certain educational technologies.

While new technologies tend to attract educators to explore functionality, the potential for empowering pedagogy is sometimes a secondary consideration (Mishra & Koehler, 2006). Given that students live in a culture of emerging technologies, it is incumbent on educators to critically assess the role of technology in classroom learning (Liang, Walls, Hicks, Clayton, & Yang, 2006). However, this is not a trivial task, especially when one considers the complexity of classroom interactions. To that end, much effort has been expended in trying to understand the interface between technology and pedagogy (Jonassen, 1996; Carr, Jonassen, Litzinger, & Marra, 1998; Jonassen, 2000; Mishra & Koehler, 2003; Mishra & Koehler, 2006).

Attempting to understand the interaction between technology, pedagogy, and content knowledge (TPACK) is especially important in the health professions, such as athletic training. Many of the educators in health professional programs are competent practitioners with vast amounts of content knowledge but few have actually studied the art and science of medical education, meaning they have little to no pedagogical knowledge (McLeod et al., 2009). This lack of pedagogical or technological knowledge is also apparent when the same educators attempt to use technology for educational purposes. According to Abbitt (2011), many educators who attempt to integrate a
specific type of technology into their classroom, focus only on learning about how to use the piece of technology (technological knowledge) without thinking about how it relates to course content knowledge or specific pedagogical strategies. Therefore effective athletic training educators should be knowledgeable in all areas (content knowledge, pedagogical strategies, and technological knowledge), as well gain an understanding between the complex interactions of each overlapping area.

Case-based learning (CBL) is a particular pedagogical strategy that is commonly used in health professional education programs, especially within the field of athletic training (Berry, Miller, & Berry, 2011). The formal adoption of CBL as a pedagogical strategy can be traced back to Harvard Law school in 1870 (Merseth, 1991), with the main emphasis being placed on analyzing and discussing actual cases to learn the necessary skills/demeanors that were required to become a lawyer. CBL is often used in athletic training education programs because it provides a safe, dynamic, and simulated learning environment for students to acquire, analyze, and judge the appropriate clinical decision-making skills to learn how to properly handle injury situations (Berry et al., 2011).

With advancements in technological efficiency and accessibility, several researchers posit that multimedia technology can be combined with CBL to present learners with a more complete and accurate description of the necessary complexities that are required to simulate a case scenario (Han, Eom, & Shin, 2013; Kurz & Batarelo, 2010). Research by Bolitz (2002) also suggests that technology can also be used to create a more authentic, realistic, and complex case scenario which could have a positive effect on student factors such as: critical thinking ability, cognitive learning objectives, student motivation, and positive attitudes towards learning. Based on these recommendations, a multimedia case-based learning educational tool was created for this research project to provide simulations of athletic injuries that would allow the student to practice their injury orthopedic assessment skills. This educational tool was meant to be used as a supplemental resource to allow students to practice sports injury assessments both inside and outside of the classroom.

**Multimedia Case-Based Learning Sports Injury Assessment Tool**

The multimedia case-based sports injury assessment tool allows a student to work through an injury case-study scenario by: 1) answering brainstorming questions, 2) using the multimedia technology to answer questions and review anatomy, and 3) ultimately deciding upon a possible index of suspicion for the possible injured structure(s) based on assessment findings. An example of the multimedia sports injury assessment tool template is included in Figure 1.

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

For the first phase of this research project, a pilot action study was carried out on a sample of 14, 3rd and 4th year students (4 males and 10 females) from the Sports Injury Assessment and Management Program at Acadia University in Nova Scotia, Canada. The main goal of this action research study was to make improvements to the multimedia educational tool, based on comments, opinions, and suggestions from the course instructor and the sample of students.

This research study elicited student feedback (through surveys, interviews, and focus groups) to provide suggestions of how to best incorporate the educational tool into a meaningful case-study exercise. The participants from this study described some of the potential benefits of using technology for CBL but posited the importance of increased interaction between the instructor and student while working through these case studies. Specifically,
students wanted the instructor to “walk” through a typical case analysis so they could observe the process of critical reflection; a snapshot of the teacher’s thought process. In addition, students saw opportunities to practice process skills by implementing a purposeful educational component that had them employing injury assessment techniques with a peer. Based on this participant feedback, a process-oriented instructional model was created as shown in Figure 2.

![Figure 2. Improved Instructional Model for Using Multimedia Sports Injury Assessment Tool](image)

**Purpose of the Research**

The purpose of the second phase of this research project (that will be described in detail in this paper) was to explore the impact of using the multimedia case-based learning educational tool and new instructional model with a sample of Athletic Training students from the University of Technology (UTECH) in Kingston, Jamaica. In this specific context, it was proposed that this educational tool would be useful to this group of students because the school lacked the additional educational resources to buy expensive textbooks, software programs, and hands-on anatomy models, all of which could arguably be mitigated with our multimedia teaching tool. In addition, all students did not have unlimited access to high quality internet (e.g. many did not have a quality connection at home) so they were often unable to do a simple online search if they had a question about a particular anatomical structure (e.g. where a structure attaches, the action of a muscle, what the muscle looks like, etc.). Therefore, an educational tool that is embedded on a DVD would allow the students to practice sports injury assessments and have access to interactive anatomy videos inside and outside of the classroom setting. It is important to note that both students and instructors in the Jamaican context were aligned with the same systematic sports injury assessment protocol adopted by the lead researcher (Magee, 2008).

**Methods**

As a type of action research, the primary objective of this study was to improve instructional practices in an athletic training program by using an evidence-based approach. Participants for this study included a sample of 15, 2nd and 3rd year students (8 males, 7 females) and two course instructors from the Bachelor of Science in Sport Sciences (Sports Athletic Training) program at the University of Technology Jamaica (UTECH).

Quantitative data was collected in the form of a 30 question, electronic questionnaire that was designed to obtain information regarding students’: 1) comfort level with common computer technology, 2) previous experiences with using technology for educational purposes, 3) comfort level with using the multimedia sports injury case study DVDs, 4) the quality and relative scope of the multimedia sports injury case study DVDs, and 5) the effectiveness of the proposed teaching model. The questionnaire was field-tested for question ambiguity with an instructor from the UTECH as well as one Sports Athletic Training student from the study sample. All 15 students from the Sports Athletic Training program were invited and completed the questionnaire.

Qualitative data was collected through individual interviews and small focus groups. A standardized open-ended interview schedule was developed based on trends that emerged from an analysis of the questionnaire results.
This schedule was also field-tested with the same instructor and a different randomly selected student from the sample to ensure that interview questions were clear and easily understood. From the study sample, all 15 students were invited and participated in a 30-minute audio-recorded interview. These interviews were transcribed and coded (Auerbach & Silverstein, 2003) in an iterative process and compared to the questionnaire results to discover possible emergent themes. Two small focus groups (made up of two students in each group) were invited to respond to the immediate results in an effort to corroborate the results. An interview was also conducted with the course instructor to probe areas of: 1) informal student feedback on the quality and format of the case study DVD; 2) use of multimedia technology in the classroom; 3) use of case-based learning in the classroom; 4) level of difficulty of the cases; and 5) effectiveness of the proposed teaching method.

Results

The discussion of the results is based on a careful grounding of findings in both quantitative and qualitative indicators. This study showed that the sample of students from UTECH found the multimedia CBL educational tool to be effective in helping them to think critically about how to assess and react to realistic injury situations. The students proposed that multimedia case studies are more interactive than traditional text-based cases and provide a more accurate simulation of an injury scenario. They suggested that they were able to “connect more” to the multimedia case and it engaged them more than just using a text-based case.

Students also described the importance of using a defined instructional model to accompany the multimedia CBL educational tool. The student sample posited that the proposed instructional model was an effective way to teach them how to use the educational tool, as well as to learn how to take a systematic approach to completing an orthopedic injury assessment. One student commented that “often people use technology just for the sake of using it. They think it will automatically improve learning just because it is new and advanced. But that is not always the case. We need to also have the opportunity to learn from our instructor, our friends, etc.…”

Other themes that emerged from the interviews included: 1) the importance of peer interaction activities within the instructional model, 2) allowing for adequate student/instructor interaction (e.g. to see how the instructor would work through an assessment), and 3) learning the systematic approach to interpreting information. Based on these suggestions for increased peer interaction and student/instructor interaction, specific improvements and activities were created and added to the educational tool and instructional model. These suggested improvements and peer interaction activities are displayed in Table 1.

Table 1. Peer Interaction Activities for Multimedia Sports Injury Assessment DVD Sections

<table>
<thead>
<tr>
<th>Multimedia Sports Injury Assessment DVD Section</th>
<th>Peer Interaction Activity</th>
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<tbody>
<tr>
<td>Scenario Description Brainstorming Question</td>
<td>Answer the question individuially then discuss as a group. Come up with collective answers based on group discussion.</td>
</tr>
<tr>
<td>Anatomy Model</td>
<td>Take turns pointing to different anatomical structures to quiz each other. Answer 3 structures each.</td>
</tr>
<tr>
<td>Further Injury Information (More detailed information about the injury)</td>
<td>Answer the question individuually then discuss as a group. Come up with collective answers based on group discussion.</td>
</tr>
<tr>
<td>Orthopedic Injury Assessment Range of Motion Tests</td>
<td>Perform the active, passive, and resisted range of motion tests on your partner. Explain what you would find and why.</td>
</tr>
<tr>
<td>Orthopedic Injury Assessment Special Tests</td>
<td>Perform the orthopedic special tests on your partner. Explain what you would find and why.</td>
</tr>
<tr>
<td>Treatment Plans</td>
<td>Answer the question individuially then discuss as a group. Provide rationale explaining why the other treatment plans are incorrect.</td>
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</table>
Conclusions

This action research study has determined, through quantitative and qualitative evidence, that the Multimedia Sports Injury Assessment DVD is an effective supplemental educational tool to use in courses related to sports injury assessment and rehabilitation. It appears to be especially useful for students in developing countries that have access to computers but do not have constant access to a high speed internet connection. It is also clear from this study that multimedia technology can be used to create a more accurate and realistic simulation of a sports injury when compared to text-based cases. Improvements to the educational tool should be further addressed so that additional media can be used to recreate an even more accurate injury simulation. Feedback from the surveys, interviews, and focus groups also indicated the importance of using the proposed teaching model. Even though this was thought to be effective by the sample of students, improvements were suggested to increase the amount of peer interaction. Peer learning activities have been proposed to furthermore build upon established principles of quality instruction.

This work contributes to teacher education in posing two succinct questions: 1) how do we develop in educators, a critical stance to the potential of technology within strong pedagogical frameworks? and 2) how do we develop multimedia tools that are flexible enough such that teachers can hybridize their use in real classrooms with unique objectives? (Squires, 1999).

Future Research

Future research seeks to improve the instructional model and multimedia case based learning educational tool by using Jerry Willis’ R2D2 model of instructional design. This instructional model, which is based on constructivist learning theories, treats instructional design as an iterative process that allows the developer to make revisions/additions at any time. It also encourages reflection that is based upon feedback and ideas from multiple stakeholders, not just the instructor/developer (Willis, 2009). This model has been shown to be effective in developing many multimedia instructional tools in varying educational settings (Colon, Taylor, & Willis, 2009; Sadik, 2006; Chen & Toh, 2005) and has the potential to develop effective instructional design models for use in athletic training education.

The ultimate aim of this ongoing work is to develop a theoretical and/or conceptual framework for using technology in athletic training classrooms. The TPACK framework will be used to explore the complex roles and interactions between the main components of current learning environments (Mishra & Koehler, 2006). These researchers feel the articulation of this interaction is instrumental in the posing of pedagogical models that better prepare athletic training educators to teach in this digital age.

References


