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## Exploring Technology Integration in Canadian Athletic Therapy Education

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# Exploring Technology Integration in Canadian Athletic Therapy Education

## Abstract

There are many potential educational goals for using digital technologies in health professional education programs. Previous studies have suggested that technology can be used in these settings to facilitate knowledge acquisition, improve clinical decision making, improve psychomotor skill coordination, and practice rare or critical scenarios. However, when using technology for educational purposes, many educators do not consider the resulting pedagogical implications of using these tools to teach course content. The purpose of this study was to explore this phenomenon in a sample of athletic therapy educators, by investigating their views and attitudes towards using digital technologies in athletic therapy specific courses. Researchers used a sequential explanatory mixed-methods approach (via questionnaire and individual interviews) to explore this topic. It was found that the majority of athletic therapy educators in this sample ( $n = 21$ ) did not in fact consider the pedagogical implications of technology integration and moreover used technology in rudimentary fashions (e.g., to deliver course content or to provide additional context to explain a topic). Conversely, those educators with higher levels of pedagogical and technological knowledge appeared to use technology in more constructive ways while considering the pedagogical impact of their technology integration decisions. Although this study focused on athletic therapy education, the findings are not unique to this discipline. Carefully designed, pedagogically-sound technologies have very specific and useful ways of empowering learning and have the potential to achieve many educational goals for any educator.

Les buts éducatifs potentiels sont nombreux lorsqu'on utilise des technologies numériques dans les programmes d'enseignement des professions de la santé. Des études préalables ont suggéré que la technologie peut être utilisée dans ces contextes pour faciliter l'acquisition des connaissances, améliorer les processus de décision clinique, améliorer la coordination des compétences psychomotrices et pratiquer des scénarios rares ou critiques. Toutefois, quand on utilise la technologie pour des objectifs d'enseignement, de nombreux éducateurs ne prennent pas en considération les implications pédagogiques qui résultent de l'utilisation de ces outils pour enseigner le contenu des cours. L'objectif de cette étude était d'explorer ce phénomène parmi un échantillon d'éducateurs de thérapie sportive en menant une enquête sur leurs opinions et leurs attitudes par rapport à l'emploi des technologies numériques dans des cours spécifiques de thérapie sportive. Les chercheurs ont utilisé une approche explicative séquentielle de méthodes mixtes (par le biais de questionnaires et d'entrevues individuelles) pour explorer ce sujet. Ils ont trouvé que la majorité des éducateurs de thérapie sportive de cet échantillon ( $n = 21$ ) ne prenaient pas en considération, en fait, les implications pédagogiques de la technologie et de plus, ils utilisaient la technologie de façons rudimentaires (par ex. pour dispenser les cours ou pour fournir un contexte supplémentaire afin d'expliquer un sujet). Inversement, les éducateurs qui possédaient des connaissances plus élevées en matière de pédagogie et de technologie semblaient utiliser la technologie de manières plus constructives tout en prenant en considération l'impact pédagogique de leurs décisions d'intégrer la technologie. Bien que cette étude ait porté sur l'enseignement de la thérapie sportive, les résultats ne sont pas exclusivement liés à cette discipline. Si elles sont soigneusement conçues, les technologies pédagogiques peuvent de manières spécifiques et utiles outiller les apprenants et elles ont le potentiel de répondre à de nombreux buts éducatifs pour tous les éducateurs.

**Keywords**

athletic therapy education, technology integration, TPACK; enseignement de la thérapie sportive, intégration de la technologie, TPACK

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Digital technologies continue to influence the ways that course content is delivered in higher education programs, especially in health professional programs such as athletic therapy (McCoy et al., 2015; Palmer, Edwards, & Racchini, 2014). Educators in athletic therapy programs often use various digital technologies (e.g., high-fidelity simulation manikins, anatomy animation programs) to create contextually authentic learning environments for students. Previous research has shown that technology can be used to facilitate basic knowledge acquisition, improve clinical decision making, promote deeper learning, enhance perceptual variation, improve skill coordination, and practice rare or critical scenarios (Guze, 2015; Hinton, 2018). While working with technology, educators anticipate that students will learn and develop skills that will then transfer to real-life situations (Hopkins et al., 2018; Palmer et al., 2014). However, when using technologies for educational purposes, many educators do not consider the resulting pedagogical implications (Eckleberry-Hunt, Lick, & Hunt, 2018; Mishra & Koehler, 2006). In these cases, technological tools are often thought of as being supplemental to traditional instructional methods, used to simply convey information to students, instead of being considered as transformative tools that can enhance critical thinking and access unique ways of learning (Heinerichs, Pazzaglia, & Gilboy, 2016; Spector, 2015). Although this phenomenon has been observed in other forms of education, no known previous studies have explored this topic in athletic therapy education. Correspondingly, the purpose of this study was to explore athletic therapy educators' views and attitudes towards using digital technologies in athletic therapy specific courses.

### **Pedagogically Effective Technology Integration: A Summary from the Literature**

Previous studies have suggested that educators in higher education often think about educational technology superficially (e.g., using a PowerPoint® presentation to deliver course content), ignoring the affordances that these technologies potentially offer to empower learning (Higgins, Beauchamp, & Miller, 2007; Jonassen, 2000; Voogt & McKenney, 2017). The potential notion of effective technology integration encourages educators to consider digital technologies as “mindtools” that help to facilitate critical thinking (Jonassen, 2000, p.1). This conscious design seems contingent on educators taking a stance of reflective practitioner as they explore new teaching tools (Harris, Mishra, & Koehler, 2009; Pierson, 2001). Since digital technologies are so commonly used within health professional programs (McCoy et al., 2015; Palmer et al., 2014), it is crucial to investigate how health professional educators actually use these technologies to teach.

Given a lack of research in this area, it is beneficial to use a conceptual framework to help explore the effective technology integration phenomenon in athletic therapy educators. The TPACK framework (Figure 1), originally conceptualized by Punya Mishra and Matthew Koehler, is one such model that can be useful when exploring educators' views and attitudes towards using technology (Lu, 2014).

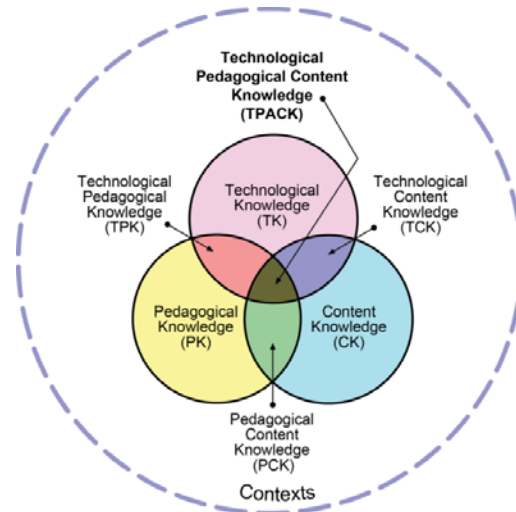


Figure 1. The TPACK Conceptual Framework (Reproduced with permission of the publisher, ©2012 by tpack.org).

The TPACK model was originally constructed as an extension of Lee Shulman’s pedagogical content knowledge (PCK) model. Shulman’s (1986) model was founded on the premise that many educators treated subject matter and pedagogy as mutually exclusive bodies of knowledge. The PCK model encouraged educators to integrate the two knowledge fields by exploring diverse teaching methods for unique educational contexts (e.g. knowing what makes a concept difficult to learn and to use diverse strategies for different situations). According to Shulman (1986), this integrated knowledge was required to effectively implement different teaching strategies to fit specific course content. Mishra and Koehler (2006) added a third dimension to this PCK framework, technological knowledge (and all of the technological overlaps with content knowledge and pedagogical knowledge), because of the absence of a comprehensive framework that considered the complex relationships among students, educators, content, technology, and pedagogy. By considering technology to be a unique third knowledge system, that comes with its own biases and affordances, some educational technologies have been found to be best applied in certain teaching situations more so than others (Mishra & Koehler, 2006). These researchers posited that an understanding of the complex interplay between content, pedagogy, and technology is essential to effectively use technology in pedagogically meaningful ways (Mishra & Koehler, 2006).

By itself, content knowledge (CK) can be defined as the type of knowledge that covers course concepts, theories, ideas, organizational frameworks, knowledge of evidence and proof, as well as established practices and approaches toward developing such knowledge (Koehler & Mishra, 2009). Pedagogical knowledge (PK) is composed of the processes and methods of teaching and learning including understanding how students learn, general classroom management skills, lesson planning, and modes of student assessment (Koehler & Mishra, 2009). Technological knowledge (TK) consists of specific ways of thinking about, and working with, technology, tools, and resources (Koehler & Mishra, 2009). Table 1 provides a summary of each possible domain construct within the TPACK framework, complete with concise definitions and examples from athletic therapy education.

Table 1  
*Definitions and Examples of TPACK Dimensions*

TPACK Constructs	Definition	Example from Athletic Therapy (AT) Education
TK	Knowledge about how to use technological hardware and software	General knowledge of using computers, PowerPoint, Adobe Acrobat, etc.
PK	Knowledge about the students' learning, instructional methods, educational theories, learning assessment	Knowledge about how to use problem-based learning or case-based learning in the AT classroom (and how to evaluate AT student performance/competency)
CK	Knowledge about the subject matter without consideration about teaching the subject	Knowledge about human anatomy (or other discipline specific subjects within AT)
PCK	Knowledge of representing content knowledge and adopting specific pedagogical strategies to make the topic more understandable for learners	Knowledge of using analogies or scaffolding to teach orthopedic injury assessment skills (part of the AT scope of practice)
TPK	Knowledge of the existence and specifications of various technologies to enable teaching approaches without reference towards course content	Knowledge of computer-supported collaborative learning opportunities
TCK	Knowledge about how to use technology to create course content in different ways without considering common teaching methods	Knowledge about Primal Anatomy Software and how to use it to teach Anatomy content (or other discipline specific subjects within AT)
TPACK	Knowledge of using various technologies to teach and to facilitate knowledge creation of specific course content	Knowledge about how to use a multimedia assessment educational tool to enhance collaborative learning/peer-assisted learning opportunities when teaching orthopedic injury assessment content

Note. Adapted from Mishra and Koehler (2006).

Since the emergence of the TPACK framework, researchers have explored its use within a wide range of content, levels of education, and contexts. Previous research ranges from theoretical studies exploring the importance of context when selecting technologies to empower learning (MacKinnon, 2017; Rosenberg & Koehler, 2015) to practical applications attempting to design

valid and reliable tools to measure the level of TPACK in educators (Kadijevich, 2012; Lux, Bangert, & Whittier, 2011; Schmidt et al., 2009). Responding to these possibilities, the current project was designed to use the TPACK framework to guide the analysis of all research data.

### **Describing the Research Context: The Profession of Athletic Therapy**

Before introducing the current research project, it is important to first understand the specific educational context in which the study was employed, including a description of the profession, academic programs, and nature of the curriculum.

Athletic therapy, in a North American context, is a healthcare profession that is dedicated to the health, well-being, and rehabilitation of all physically active individuals, not just athletes. Certified Athletic Therapists can be found working in diverse employment settings including professional sports, private rehabilitation clinics, hospitals, colleges/universities, research institutions, national or international sporting organizations, and even within the performing arts.

At the time of research, there were seven accredited athletic therapy programs throughout Canada. These education programs prepare students with the essential content knowledge and practical skill development from a variety of domain areas that demonstrate an understanding of the human body, how it works, and how injury affects it (Mazerolle & Yeargin, 2010). The Canadian Athletic Therapists Association (CATA) promotes a competency-based educational model and principles of Bloom's hierarchical cognitive taxonomy (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956) to ensure that all its accredited institutions have similar, although not exact, entry-level curriculum design, course content, and clinical/field experiences. The core competencies of the athletic therapy profession are divided into six broad domains, including: (a) prevention; (b) recognition and evaluation; (c) management, treatment, and disposition; (d) rehabilitation; (e) organization and administration; and (f) education and counseling (CATA, 2008). Based on Bloom's taxonomy framework, each of these domains is further subdivided into specific cognitive, psychomotor, and affective competencies (CATA, 2008). When designing academic programs, athletic therapy educators from accredited institutions need to provide evidence that they are delivering and evaluating each of these competencies to their students through a variety of educational experiences.

## **Method**

### **Research Design**

An explanatory sequential mixed-methods approach was used to explore the research topic through an interpretivist lens. This specific type of mixed-methods approach was selected to provide an enriched account of the specific research context by using qualitative interviews to further explore and interpret findings from the quantitative questionnaire (Creswell & Plano-Clark, 2011; Shank & Brown, 2007).

### **Participants**

This study involved athletic therapy educators from all seven CATA-accredited institutions. A purposeful sampling procedure (Palinkas et al., 2015) was used to recruit full-time athletic therapy educators from these accredited institutions who also held the Certified Athletic



Therapist designation. An introductory email was sent to the Program Director from each institution, outlining the purpose of the research and expectations for study participants. These Directors were then asked to forward the information to their eligible full-time athletic therapy faculty (which totaled 26 eligible educators from the seven institutions). Twenty-one of these eligible educators voluntarily responded to the questionnaire (81% response rate) while 15 educators participated in the individual interviews (58% response rate). Table 2 provides demographic information for all participants.

Table 2  
*Demographic Characteristics of Participants*

Participant Pseudonym	Questionnaire/ Interview	Age Range	Years Teaching	Terminal Degree	Type of Athletic Therapy Institution
ATEd-1	Both	51 or older	13	Master's	College
ATEd-2	Both	41-50	10	Master's	College
ATEd-3	Both	41-50	15	PhD	College/University
ATEd-4	Both	41-50	7	Master's	College
ATEd-5	Both	41-50	24	PhD	University
ATEd-6	Both	51 or older	13	Master's	College
ATEd-7	Both	41-50	11	PhD	University
ATEd-8	Both	41-50	7	Master's	College
ATEd-9	Both	31-40	5	Master's	University
ATEd-10	Both	51 or older	38	PhD	University
ATEd-11	Both	31-40	6	Master's	University
ATEd-12	Both	41-50	12	Master's	College
ATEd-13	Both	41-50	15	Master's	University
ATEd-14	Both	20-30	5	Master's	University
ATEd-15	Both	41-50	12	PhD	University
ATEd-16	Questionnaire	51 or older	N/A	PhD	University
ATEd-17	Questionnaire	41-50	N/A	Master's	University
ATEd-18	Questionnaire	31-40	N/A	Master's	University
ATEd-19	Questionnaire	41-50	N/A	Master's	University
ATEd-20	Questionnaire	51 or older	N/A	PhD	University
ATEd-21	Questionnaire	31-40	N/A	Master's	College

Before the study commenced, it was first approved by the Acadia University Research Ethics Board (home university of the primary investigator) as well as the Ethics Boards of all seven CATA-accredited institutions.

### Data Collection

A sequential explanatory mixed-methods approach was employed to collect data through both a questionnaire and qualitative interviews. An overarching interpretive research lens was used to analyze these multiple data sources to gain an enhanced understanding of the phenomenon under investigation: athletic therapy educators' views towards using digital technologies. Collecting



multiple data sources also helped to triangulate the findings to ensure a description that was rich, comprehensive, and well-developed (Patton, 2002).

## Questionnaire

The first data source, an online questionnaire, was designed to explore how familiar athletic therapy educators were with using technology for teaching<sup>1</sup>. The questionnaire was housed on the researchers' university online site and a link was provided to eligible athletic therapy educators. The questions from this questionnaire were adapted from existing TPACK questionnaires (Archambault & Barnetta, 2012; Schmidt et al., 2009), suitably modified to make them more applicable to an athletic therapy-specific context. To assess for face validity, two athletic therapy educators who were experienced with questionnaire development and mixed-methods research were asked to review the objectives of the study as well as the questionnaire itself. Once these experts were satisfied with the questions, the instrument was sent to eligible athletic therapy educators.

Following the main tenets of interpretivist research, the findings were used to identify trends that were further deconstructed during the qualitative interviews. Each question from the questionnaire was matched with a corresponding construct from the TPACK model, as recommended from previous studies (Archambault & Barnetta, 2012; Schmidt et al., 2009). For example, the statement "I only use technology in teaching when it clearly advances a curriculum outcome" was considered as being representative of TCK (technological content knowledge).

## Individual Interviews

Subsequent to the questionnaire, educators were invited to participate in a 60-minute individual phone interview with the primary researcher, following a standardized, open-ended format. As per Patton (2002), the interview schedule (see the Appendix) was developed based on trends that emerged from the questionnaire data. For example, one such trend was that athletic therapy educators felt confident in the range of teaching strategies employed in their teaching. Further probing questions were then asked to explore the specific strategies that were employed and the specific factors that impacted these pedagogical decisions. Verbal consent was obtained from all interviewees at the beginning of each interview. Interviews were audio-recorded (with permission from participants), manually transcribed by the primary researcher, and sent to participants to review for clarity or inaccurate transcription before analyzing.

Individual interviews with athletic therapy educators assisted in triangulating the data by further exploring trends from the questionnaires (Mojtahed, Baptista Nunes, Tiaga Martins, & Peng, 2014). These interviews were particularly useful in gaining access to participants' accounts of their pedagogical approaches to teaching with technology in athletic therapy accredited institutions.

In an attempt to develop a deeper understanding of the factors that impacted the use technology-assisted educational tools in athletic therapy education, an inductive content analysis was used to analyze the qualitative interview data (Hahn, 2008). The first step was to transcribe all interview data. The next step involved reviewing the transcriptions and developing general coding categories. Responses were coded as being representative of TK, PK, CK, TPK, TCK,

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<sup>1</sup> A copy of the questionnaire is available upon request by contacting the corresponding author at [colin.king@acadiu.ca](mailto:colin.king@acadiu.ca)

PCK, or TPACK so that findings could be combined with the constructs from the questionnaires to better describe the current context of technology integration in athletic therapy education. For example, if the participant's response included an example of how technology was used to teach a particular course topic than it was coded as TCK. This approach to data analysis was used to describe how athletic therapy educators viewed themselves in relation to the overlapping constructs of CK, PK, and TK.

During the interview phase, trustworthiness was established through member checks and peer debriefing. Member checks were performed with three randomly selected interview participants to confirm that themes were representative of the shared data (Auerbach & Silverstein, 2003). During this process, transcripts were emailed to participants and the researcher's interpretations of the themes were also shared. Follow up 30-minute phone interviews were then scheduled with these participants to have further conversations on the emerging themes, while identifying any incorrect or misleading information. Peer review of data analysis was accomplished using the second author for comparing transcriptions and thematic analysis notes. No significant changes were made to any of the themes or subthemes as a result of this peer debriefing process.

As an alternative to discussing noteworthy findings from an isolated data collection method, the questionnaire results were blended with the findings from the qualitative interviews to verify and reinforce educators' views towards using digital technologies for teaching in an athletic therapy context (Creswell & Plano-Clark, 2011). To guide this analysis, the TPACK framework helped to organize the empirical findings into unique constructs from the conceptual model.

## Results

Table 3 provides a summary of the questionnaire responses from the 21 full-time athletic therapy educators, beginning with question seven. The first six questions involved demographic information and were used to describe the participants in the Method section.

### General Pedagogical Knowledge of Athletic Therapy Educators

After analyzing the questionnaire, the majority of athletic therapy educators perceived their level of PK to be high. This opinion was formed based on the respondents agreeing with the following statements: (a) "I feel confident in my ability to assess student performance in the classroom"; (b) "I feel confident in my ability to adapt my teaching methodology based on student performance"; (c) "I feel confident in my ability to adapt my teaching to different learning styles"; and (d) "I am confident in my ability to assess student learning using multiple measures".

Although the perception of PK was found to be quite high in the questionnaires, conflicting findings emerged from the interviews. This sample of athletic therapy educators was distinctly divided into two groups, namely those who followed the traditional deductive practice of teaching theory in a passive lecture format followed by practical skills in laboratory settings; and those who had higher levels of PK and incorporated innovative inductive teaching strategies that were more student-centered and fostered critical thinking patterns.

Table 3  
*Summary of Questionnaire Responses*

Question Number	TPACK Construct Subscale	Mean (/5)	SD	Descriptive
7	Technology (TK)	4.29	0.70	Agree
8	Technology (TK)	2.24	1.19	Disagree
9	Technology (TK)	3.38	1.05	Neither Agree or Disagree
10	Technology (TK)	4.14	0.71	Agree
11	Technology (TK)	3.33	0.94	Neither Agree or Disagree
12	Content (CK)	4.71	0.45	Strongly Agree
13	Content (CK)	2.38	1.17	Disagree
14	Content (CK)	4.19	0.66	Agree
15	Content (CK)	3.81	0.66	Neither Agree or Disagree
16	Content (CK)	3.76	0.92	Neither Agree or Disagree
17	Pedagogy (PK)	3.90	0.81	Neither Agree or Disagree
18	Pedagogy (PK)	3.52	1.10	Neither Agree or Disagree
19	Pedagogy (PK)	3.67	0.99	Neither Agree or Disagree
20	Pedagogy (PK)	4.00	0.76	Agree
21	Pedagogy (PK)	4.57	0.49	Strongly Agree
22	Pedagogy (PK)	4.29	0.93	Agree
23	Pedagogy (PK)	4.29	0.55	Agree
24	Pedagogy (PK)	4.14	0.64	Agree
25	Pedagogy (PK)	4.24	0.53	Agree
26	Pedagogy (PK)	2.24	0.92	Disagree
27	Pedagogy Content (PCK)	4.00	0.76	Agree
28	Pedagogy Content (PCK)	4.33	0.64	Agree
29	Pedagogy Content (PCK)	1.86	0.77	Disagree
30	Pedagogy Content (PCK)	4.24	0.68	Agree
31	Technology Content (TCK)	3.48	0.91	Neither Agree or Disagree
32	Technology Content (TCK)	2.14	0.64	Disagree
33	Technology Content (TCK)	3.90	0.87	Neither Agree or Disagree
34	Technology Content (TCK)	4.57	0.73	Strongly Agree
35	Technology Content (TCK)	4.57	0.49	Strongly Agree
36	Technology Content (TCK)	3.33	1.21	Neither Agree or Disagree
37	Technology Content (TCK)	4.33	0.94	Agree
38	Technology Content (TCK)	3.57	1.22	Neither Agree or Disagree
39	Technology Content (TCK)	3.10	0.97	Neither Agree or Disagree
40	Technology Pedagogy (TPK)	3.86	0.89	Neither Agree or Disagree
41	Technology Pedagogy (TPK)	3.27	0.94	Neither Agree or Disagree
42	Technology Pedagogy (TPK)	3.52	0.85	Neither Agree or Disagree
43	Technology Pedagogy Content (TPCK)	2.57	1.14	Disagree
44	Technology Pedagogy Content (TPCK)	2.52	1.05	Disagree
45	Technology Pedagogy Content (TPCK)	2.10	1.02	Disagree
46	Technology Pedagogy Content (TPCK)	3.76	0.92	Neither Agree or Disagree
47	Technology Pedagogy Content (TPCK)	3.81	0.91	Neither Agree or Disagree
48	Technology Pedagogy Content (TPCK)	2.90	1.31	Disagree
49	Technology Pedagogy Content (TPCK)	3.90	0.61	Neither Agree or Disagree

Educators who followed the traditional deductive practice were not as familiar with different pedagogies/teaching methods and were unable to have deeper conversations about how these strategies could contribute to more effective instruction. One educator (ATEd-8) rationalized this lack of knowledge by commenting, “In athletic therapy-accredited institutions, most educators are athletic therapy’s first and educators second. So we teach how we were taught and do not really know any other way.” Comparatively, the other group of educators (the innovative inductive educators) appreciated the use of different pedagogies and understood how using different strategies could enhance learning and benefit students. For example, one educator (ATEd-5) spoke about their introduction to student reflection as a teaching strategy and shared their personal journey of designing, implementing, and evaluating reflection activities into their AT classes. According to this educator,

To me, students need to be able to reflect on their own learning. What they know. What they do not know. And through the years I needed to work with the students so that they knew how to do an actual reflection of learning. What really made it meaningful to you? Was it how it was presented? Was it the way you interacted with the patient? There may be many things along the way that can add meaning to the topic at hand. (ATEd-5)

Another educator described their personal transition from using a content-driven approach to placing a greater emphasis on teaching and learning. According to this educator,

Before, the discipline was the most important thing and I was very content driven. Now I just want to guide and encourage learning and use a more active-learning approach. I want to ensure that learning becomes real to my students. (ATEd-6)

This educator continued by describing how they used specific active-learning examples such as flipped classrooms and reflective activities to stimulate critical thinking. When deciding upon what teaching strategies to use, this educator said,

The content of the course drives my selection of teaching strategies. There are some courses (e.g., therapeutic modalities) that from a safety perspective, I need to teach important pieces of content first so that the students know the basics so they do not harm a patient. In these cases, I still use the traditional lecture to get the content across. But in other courses (e.g., assessment courses), it is useful to implement more flipped classroom models, or learner centred activities to really allow the students to build upon their prior experiences and to integrate what they may have seen at a placement or in other classes. (ATEd-6)

## **Technological Knowledge in Athletic Therapy Educators**

Overall, the collective sample of athletic therapy educators appeared to appreciate the value of using technology as a part of their teaching and many expressed interest in learning more about how advanced digital technologies could enhance the student learning experience. However, the interview findings showed that there was also a wide range in what instructors referred to as “technology integration experiences.” Those educators with higher levels of PK were able to have deeper and more enriched conversations around pedagogical decision making and how these

concepts applied to effective technology integration. As an example, one educator (ATEd-5) who was identified as having a high level of PK, described how they integrated technology into their CATA-accredited curriculum by stating,

I am absolutely a big believer in using technology for teaching but it has to be used at the right time and in the right place. Also, as an educator, I need to know why I am using it. And I think it really is dependent on the topic that I am presenting on. If I am trying to describe how to assess the shoulder, I think about if it is better to show them a video. Would it be better to demonstrate in person? Would it be better to show a picture while discussing relevant anatomy? A combination of all these things? To be used effectively, technology needs to be used in the right place and the educator needs to consider why they are using it...does it fit into their teaching strategy? How does it impact student learning? These are all important questions that should be considered. (ATEd-5)

Overall, the sample of AT educators displayed a perceived high level of TK, especially with common basic digital technologies such as PowerPoint®, word processors, email, internet browsers, images/graphics, videos, animations, and smart phone/iPad applications. If one considered only the evidence from the questionnaire responses, it would appear that athletic therapy educators were well-versed in using a variety of digital technologies to enhance course content. However, when these themes were further deconstructed in the qualitative interviews, it became clear that there was actually a wide range of TK among the sample of athletic therapy educators.

### **Superficial versus Enhanced Technology Integration**

During interviews, educators were invited to provide specific examples of how various technologies were incorporated into their athletic therapy classes and what was considered when making these decisions to integrate technology. Eleven of the athletic therapy educators (ATEd-1, 2, 4, 8-15) appeared to have a more superficial understanding of technology integration and did not reflect on how the content would be impacted through the application of innovative technologies. These educators described basic examples of technology integration (e.g., videos, images) and seemingly used technology to deliver topics or to add context to a particular piece of course content. The most common example referenced in these interviews was using videos or images in a course so that the students could observe how to perform a particular technique, see an anatomical structure, or see a particular sign/symptom. Other educators commented on using technology to simply “break up” a lecture to limit the amount of time that a student had to sit and listen to the educator. Although these practices can be useful approaches for some students, they do not take into consideration how the technology enhances the course content.

Four other athletic therapy educators (ATEd-3, 5, 6, 7) provided more detailed examples of technology integration that considered how technologies enhanced the course content (TCK). One educator (ATEd-7) described how they used digital technologies to create realistic/authentic simulations in the classroom to demonstrate to the students how these injuries actually occur in real-life. According to this educator,

I like to use various technologies to make real-life connections with the students. Because you can tell them over and over again that these scenarios happen but it is harder



for them to make personal connections with what you are saying, if they cannot relate to it. So they may play it off as not being as important or something that they will not need to be prepared for because there is an unlikely chance of them experiencing it. Technologies (especially videos) can be used to create realistic connections instead of just a verbal story. They get to experience the injury and how it actually happened, appeared to a responding therapist. (ATEd-7)

Another educator (ATEd-3) described using high-fidelity training manikins to enhance chest injury content (e.g., pneumothorax, heart conditions, breathing compromise). This educator discussed how difficult it was to mimic abnormal findings such as different breathing patterns, accelerated/decelerated heart rates, and abnormal breathing sounds in the traditional laboratory setting (using student partners as simulated patient models). Students could be told that these abnormal findings were present in a simulated patient, but they would not experience what it felt or sounded like. Therefore, the educator decided to implement high-fidelity training manikins into the course because these technologies could be used to simulate more advanced scenarios. These students were able to further refine their skills and critical thinking abilities while inferring what these findings actually represented.

### **Using Technology to Support Different Teaching Strategies**

Individual interviews also further deconstructed how athletic therapy educators used various technologies to support different teaching strategies. Additional discussions focused on what factors were considered when making these pedagogical decisions to use different technologies. It appeared that many athletic therapy educators used the same teaching methods/pedagogies regardless of what content was being taught in a course. Correspondingly, the same was found with regards to technology selection as pedagogical decisions seemed to be solely content driven. Athletic therapy educators appeared to use the same technologies without considering how these tools could influence the selection of different teaching strategies.

The same 11 educators (ATEd-1, 2, 4, 8-15) identified as having a more superficial understanding of technology integration, also did not appear to pay attention to the pedagogical implications of implementing different digital technologies. These individuals seemed to incorporate technology just for the sake of using it, to deliver content, or to provide context to a particular topic. During the interviews, these 11 educators had difficulties answering questions related to TPK and could not engage in the deeper conversations required to demonstrate a full understanding of this construct. For example, all 11 educators described using an online course management platform (e.g., Moodle) in their courses, but they did not comment on how these platforms enhanced or influenced their preferred pedagogical strategies. Instead, these platforms were used to highlight expectations, submit assignments, provide students with foundational theory lectures, and act as a repository for course readings. Conversely, the four educators (ATEd-3, 5, 6, 7) who demonstrated a higher level of pedagogical decision-making discussed how these same course management platforms had a significant impact on their selection of different teaching strategies and activities. One educator (ATEd-5) gave a detailed example of the creation of a new class activity that asked students to upload a case study description from their field/clinical experiences. Each student had to provide a self-reflective piece that included how the injury presented itself, what management steps were carried out, how they felt it was handled, and a plan for future improvement. Other students were able to see these submissions on the course

management platform and were expected to comment and provide feedback to each other's posts. This educator designed this activity by thinking about the course management platform technology itself and wondering how it could be applied to enhance student learning.

In summary, the majority of athletic therapy educators did not appear to consider the pedagogical implications of technology integration and continued to describe educational technology use in superficial terms (e.g., using technology to simply deliver course content or to add additional context to a topic). Conversely, those educators with higher levels of PK appeared to use technology in more constructive ways while considering the pedagogical impact of their technology integration decisions. For example, one educator (ATEd-5) that was identified as having a high level of PK, described how they integrated technology by stating

I am absolutely a big believer in using technology for teaching but it has to be used at the right time and in the right place. Also, as an educator, I need to know why I am using it. And I think it really is dependent on the topic that I am presenting on. If I am trying to describe how to assess the shoulder, I think about if it is better to show them a video. Would it be better to demonstrate in person? Would it be better to show a picture while discussing relevant anatomy? A combination of all these things? To be used effectively, technology needs to be used in the right place and the educator needs to consider why they are using it...does it fit into their teaching strategy? How does it impact student learning? These are all important questions that should be considered. (ATEd-5)

Another educator (ATEd-7) described their personal four-step process for integrating technology as,

First, I think about the learning objectives/outcomes for the course or unit. Then I think about the depth of content by reflecting on what level of Bloom's Taxonomy does the student need to be at by the end of the unit/course. Then I think about the types of pedagogical strategies/activities that I can use to help facilitate learning the content. And then I think about how technology can be used to enhance those strategies and accomplish those objectives. (ATEd-7)

These examples epitomize a higher level of TPACK thinking while highlighting what should be considered by athletic therapy educators to integrate educational technology effectively. However, this level of inquiry was not present in all athletic therapy educators in the current sample. Rather, it appeared that the majority of athletic therapy educators did not regard the complex interplay between CK, PK, and TK, and instead, thought about each as an isolated construct.

## Discussion

The findings from this study suggest that there is a wide range of PK in the sample of Canadian athletic therapy educators. This sample of educators could be divided into those who followed the traditional deductive practice of teaching and those who incorporated more inductive student-centered teaching strategies. These findings call for the need to improve personal levels of PK and increase awareness of the advantages of integrating different teaching methods. Similar pedagogical development has also been encouraged in other health professional education programs. For example, many medical schools have reacted to changes in medical knowledge,



preferred learning styles of students, and effective teaching practices by decreasing the amount of factual knowledge that is passively lectured to students (Dent & Harden, 2009). As an alternative, these medical educators are fostering more learner-centred approaches by emphasizing self-directed learning, problem-solving skills, and the development of critical thought (Cheng et al., 2016; Ramnanan, Christopher, & Pound, 2017).

The findings from this study can also be used to describe Canadian athletic therapy educators' views and attitudes towards using digital technologies for teaching athletic therapy-specific content. Similar to other health professional educational research (Ertmer & Ottenbreit-Leftwich, 2013; Hunter, 2015; Kim, Kim, Lee, Spector, & DeMeester, 2013), athletic therapy educators from this study with higher levels of TK and PK were also more likely to use more advanced technology-assisted teaching tools as a part of their teaching. Within the current study, these educators also appreciated the potential for innovative technologies to improve athletic therapy education and gave examples of how technology could be effectively integrated into the athletic therapy curriculum. Conversely, athletic therapy educators with lower levels of TK and PK appeared to use digital technologies more superficially, as a means to simply convey information to students. Similar findings have also been found in other educational environments (Cherner & Curry, 2017; Hughes, 2004). When discussing different digital technologies implemented in athletic therapy education, educators with lower levels of TK and PK described PowerPoint®, word processors, spreadsheets, and email as their most commonly used technologies. These educators did not appear to use more advanced technology-assisted teaching tools as a part of their teaching, nor did they consider how technology could potentially enhance their course content or preferred pedagogy. This is not to say that standard office-based technologies cannot be used in creative ways, just that this sample of educators tended to use them for their “designed” purpose.

Based on these findings, the levels of TK and PK in the current sample of athletic therapy educators appeared to be associated with the perceived value of technology integration. Athletic therapy educators with higher levels of TK and PK understood the nature of effective technology integration and valued the role of digital technologies in enhancing learning through higher-level thinking and critical reflection. Athletic therapy educators with lower levels of TK and PK did not perceive technology to be as useful in CATA-accredited programs and instead focused on using technology as a tool to deliver course content to students.

### **Practical Implications for the Scholarship of Teaching and Learning Community**

To integrate technology in pedagogically meaningful ways, educators need to first have a certain baseline level of PK and be familiar with different types of pedagogies (Banister & Vanatta, 2006). Educators should also understand when/why a particular strategy should be implemented, be aware of the important factors that influence these pedagogical decisions, and the resulting impact that these decisions have on student learning (Banister & Vanatta, 2006). With foundational PK being essential for effective technology integration, a lack of knowledge results in using digital technologies superficially (e.g., as a means to simply deliver the content) without considering how these technologies help students to construct knowledge and/or think critically (Jonassen, 2000). The TPACK framework can assist in these situations by encouraging the integration of technology into the content and pedagogy of specific courses.

Understanding the TPACK framework can better prepare educators to effectively integrate technology in pedagogically meaningful ways. Harris et al. (2010) described practical examples

of how TPACK could change the way that educators plan their daily lessons. These researchers recommend starting by choosing specific learning outcomes, followed by the desired activity type(s). Finally, technologies are chosen with careful consideration of how they will support the activity type and aid the students in their learning. To create effective learning environments, educators need to consider this complex interplay between technology, course content, and pedagogy by reflecting on the question, “how does this technology provide unique learning possibilities that could not be accomplished without using said technology?”

### **Implications for Future Research**

The findings from this study can serve as a practical example for any educator, especially those within professional-based programs, to experiment and integrate technology in pedagogically meaningful ways. The educators in this study with higher levels of TK and PK, described innovative ways to integrate technology, offering accounts of how these technologies enhanced the educational experience. Although this study was specific to athletic therapy education, similar findings of effective technology integration have been found in many other educational environments (Higgins et al., 2007; Jonassen, 2000; Voogt & McKenney, 2017). Other researchers interested in this area could design similar action research studies and use the findings to make specific recommendations on how to improve technology integration for their unique educational contexts.

One limitation to this study was that it involved educators’ perceptions of their CK, PK, and TK. There were no observations to show how this sample of educators actually used technology in the classroom. Therefore, future studies could invite students to evaluate their educator’s level of technology integration based on how the technologies are actually integrated in the courses. Alternatively, researchers could observe classroom interactions and evaluate educators TPACK in practice. Another approach would involve athletic therapy educators designing and developing their own technology-assisted pedagogies to see if these tools reflected an increase in TPACK knowledge and effective technology integration principles.

Finally, it is especially important for any educator in the 21<sup>st</sup> century to take a critical stance towards effective technology integration (Koehler et al., 2015). Technology tools have long been thought of as supplemental to traditional instructional methods. However, it is not enough to teach differently with technology by simply using digital technologies to convey information to students. If a particular technology does not enhance instruction, then an educator should re-engage with pedagogical approaches that are tried and true (DiPietro, Ferdig, Black, & Presto, 2010). Future research should continue to explore the use of digital technologies in all educational environments, while evaluating how these technologies actually empower teaching and/or enhance student learning.

### **Conclusions**

This study was designed to explore athletic therapy educators’ views and attitudes towards using digital technologies in athletic therapy specific courses. Generally speaking, the majority of educators from this sample could be described as true content experts who were not as familiar with different pedagogies/teaching methods. However, those educators with higher levels of PK were able to have deeper conversations about how the use of different pedagogical strategies contributed to more effective instruction. Similarly, our findings also uncovered a wide range of

technology integration experience in the sample of athletic therapy educators. The majority of educators held a more superficial understanding of technology integration and seemingly used technology as a delivery medium or to add context to course content. Those with a superficial understanding of technology integration also did not pay attention to the pedagogical implications of implementing different technologies. Conversely, those educators with higher levels of PK and TK, described detailed examples of how educational technologies could be implemented in pedagogically meaningful ways. These educators described how effective technology integration led to enhanced teaching by considering the pedagogical impact of using specific technologies.

The essence of this research is to promote the use of pedagogically-sound educational technologies. Findings from this study posited that when carefully designed, pedagogically-sound technologies have very specific and useful ways of empowering learning and have the potential to improve many educational goals for any educator. Other educators, no matter the discipline, can benefit from these findings by taking a critical stance as to how various technologies are used in their unique context, while thinking about how technologies can be integrated more effectively.

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## Appendix

### Interview Question Schedule

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1. What is your educational background and job title at your institution?
  2. How long have you been teaching within an athletic therapy accredited program?
  3. What courses do you currently teach?
  4. How did you learn how to teach?
  5. What is the most frequent critique you would receive of your teaching?
  6. Describe your personal teaching philosophy
  7. The findings from the questionnaire showed that athletic therapy educators have a self-perceived high level of content knowledge. Why do you think that athletic therapy educators consider themselves to be content experts?
  8. The responses from the initial questionnaire also showed that athletic therapy educators feel confident with the range of teaching strategies that they use in the classroom. What specific teaching strategies do you use most often? Do you reflect on these strategies to see if they can be improved upon? If so, how often? What specific factors do you consider?
  9. How do you incorporate different teaching strategies into different courses? What factors impact these pedagogical decisions?
  10. Another trend in the survey showed that lecture-based learning appears to be the most commonly used strategy in athletic therapy education, followed by problem-based learning and then case-based learning. Why do you think lecture-based is the most popular in athletic therapy education?
  11. How can different teaching strategies be used to deliver CATA competencies?
  12. What digital technologies do you use most commonly as a part of your teaching?
  13. What are some benefits/negative aspects of using technology for athletic therapy education?
  14. What does effective technology integration mean to you?
  15. When do you use technology in your teaching? More specifically, how do you incorporate technology into your teaching? Give specific examples.
  16. Where do you think is the most potential for technology to enhance learning in athletic therapy?
  17. How does technology change the way you think about teaching? Are you apprehensive or excited to try new things?
  18. How and why do digital technologies fit in with the instructional strategies used in your content area of specialization?
  19. If you were to use a multimedia case scenario in your class, how would you go about using it?
  20. What technologies can improve these case scenarios? Give some examples.
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