Examining Pre-Service Physical Education Teachers' Technological Pedagogical Content Knowledge (TPACK)

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Introduction

Implementing technology within all areas of education is an objective in most schools strategic plan. It appears in mission statements, effective teaching objectives, and student learning objectives (Goktas, 2012). Physical education (PE) needs to integrate technology and, physical educators need to think creatively for opportunities to integrate technology to create more enriching learning experiences for their students (Pyle & Esslinger, 2014).

Physical education teacher education (PETE) programs have become responsible for creating opportunities for PETE candidates to utilize technology within their classes. Previous research has shown that the more exposure to technology the greater the affinity for implementing it (Ince, Goodway, Ward, & Lee, 2006; Kul, 2013) therefore, finding ample appropriate methods for instructing pre-service teachers about technology is a challenge many programs are faced with. The purpose of this study was to investigate pre-service PE teachers' technological pedagogy skills, beliefs about, and implementation of technology in their classes in an effort to assess which methods of instruction about technology might provide the greatest learning.

Method

A modified version of the Pre-Service Teacher's Knowledge of Teaching and Technology (Semiz & Ince, 2011) was completed by 91 pre-service physical education teachers from several universities in the Northeast. The 39 item instrument utilizes a 5-point Likert scale and assesses 7 types of technological knowledge.

Type of Knowledge	Definition
Content Knowledge (CK)	Knowledge about the subject matter that is to be learned or taught.
Pedagogical Knowledge (PK)	Knowledge about the processes and practices or methods of teaching
Technology Knowledge (TK)	Knowledge about both standard and advanced technologies
Pedagogical Content Knowledge (PCK)	Knowledge of pedagogy that is applicable to the teaching of specific content
Technological Content Knowledge (TCK)	Knowledge about the manner in which technology and content influence and constrain one another
Technological Pedagogical Knowledge (TPK)	Knowledge about how teaching and learning change when particular technologies are used
Technological Pedagogical Content Knowledge (TPACK)	Knowledge that emerges from an understanding of content, pedagogy, and technology knowledge.

Source: Koehler & Mishra, 2008

Analysis / Results

Several independent variables were used throughout data analysis including *gender* (male and female), *college year status* (freshman, sophomore, junior, senior, graduated, Post BA), and *enrolled in the program* (yes and no). The dependent variables assessed in this study included pre-service teachers' technological pedagogy skills, beliefs about, and implementation of technology in their classes, and pre-service teachers' perception of professors modeling technology integration.

Frequency and percentage data of the responses indicated that 55 participants were males and 36 respondents were females. Of the 91 students, 44 were enrolled in the program and 47 were not enrolled.

The data analyses revealed that there is a significant association between the amount of TPACK pre-service teachers perceived having, and the technology that physical PETE faculty modeled including various methods for implementation. These results are supported by 50% of the students' agreeing that over 60% of the PETE faculty provide an effective model of combining content, technologies, and teaching approaches in their teaching. Specifically it was found that:

- *t-test* results indicated that students in the program ($\bar{x}$ = 4.21) were likely to perceive higher pedagogical knowledge [$t(89) = 2.667$, $p<.01$] than students who are not in the program yet ($\bar{x}$ = 3.95).
- *t-test* results indicated that male students ($\bar{x}$ = 3.83) were more likely to perceive higher technology content knowledge ($\bar{x}$ = 3.48, [$t(88) = -2.146$, $< .05$] than female students ($\bar{x}$ = 3.43).
- There is an association between the pre-service teachers perception of *TPACK* and the PETE faculty modeling of technology integration [$X^2(12, N=89) = 61.738$, $p<0.01$].

Association between Professors modeling technology integration and pre-service teachers' PK, PCK, TCK, TPACK

Type of Knowledge	N	x^2	%
PK	90	18.99*	40
PCK	89	26.39*	37
TCK	89	52.711**	39
TPCK	90	32.25**	47

*Significant p < 0.01, ** Significant p < 0.001

Open-ended responses were coded for frequency identifying consistent themes.

Type of technology modeled by Professor	Frequency	Percentage
PowerPoint / Prezi	13	41.9
Heart Rate Monitors	7	22.5
Videos	6	19.3
PE Apps	2	6.4
Other (wikis, EMG, music)	5	16.1

Type of technology modeled by Cooperating Teacher	Frequency	Percentage
Video (YouTube , Animation)	5	23.8
PowerPoint	8	38
SmartBoard	3	14.2
Music	3	14.2
Other (Wii Fit, Kinect, IPad)	2	9.5

Type of technology implemented by Pre-service Teacher	Frequency	Percentage
Video (YouTube , animation)	5	20.8
PowerPoint	11	45.8
SmartBoard	2	8.3
Music	3	12.5
IPad	3	12.5

Conclusions

Integrating technology in PE will assist in creating more efficiency and greater understanding of concepts. If a teacher is able to utilize an iPad for assessment, or demonstrate skill analysis in real time on a SmartBoard along with having students practice the skill within progressive learning tasks, and then follow-up with an online learning assignment for homework students will gain a deeper understanding of content. Providing this multi-level learning experience will enhance understanding.

This study has shown that a sample of PETE programs are moving in the right direction, however, more examples of integration, using current technologies, need to be modeled by both PETE faculty and cooperating teachers more readily so pre-service teachers are well trained in implementing a variety of technology within a lesson to enhance both instruction and assessment. This study provides significant findings that technology is being used, however equity is not always represented within implementation. The knowledge acquired during coursework affects the students' preparation to integrate technology. Role modeling of a variety of specific technological skills is essential by both PETE teachers and cooperating teachers during student teaching. New methodologies need to be experimented with so that PETE students are well equipped for provide optimal learning experiences.

Selected References

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