

METHODOLOGY

Teacher Development During Advanced Master's Coursework and Impact on Their Learning 1 Year Later

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Abstract

Research related to professional development opportunities available to physical education teachers is scarce; what is known shows that career-long professional development opportunities are often limited in scope and are sometimes ineffective or inappropriate (Armour, 2010). Meaningful professional development is critical for teachers if they are to become catalysts for student academic success (Haycock, 1998). Three data sources were used to determine nine physical education teachers development during advanced master's coursework and impact on their learning a year later: pre- and post-self-assessments on program outcomes; five sets of prompted reflections; and follow-up interviews gathered 1 year after teachers' completion of the program. The data were analyzed using qualitative research methods, particularly coding and categorizing (Glesne, 1999; Maxwell, 2005). To ensure validity and reliability, researchers used a variety of methods appropriate for qualitative research, including triangulation. Data showed these teachers had a more refined and more specific understanding of content and pedagogical content knowledge and assessment of learning

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was and remained a low priority. Many teachers indicated barriers that impeded their ability to implement the knowledge learned. The findings from this study indicated that teachers saw themselves as learners; they sought to apply their content and pedagogical content knowledge in such a way that called on them to try new theories and test the results in their schools and classrooms. This study contributes evidence that teachers consider their growth of content and pedagogical content knowledge important and that many effects of coursework, such as empowerment and self-confidence, extend beyond the scope of the program.

Research related to professional development opportunities available to physical education (PE) teachers is scarce; what is known indicates that career-long professional development opportunities are often limited in scope and sometimes ineffective or inappropriate (Armour, 2010). Armour, Makopoulou, and Chambers (2012) expressed concern that PE teachers' learning progression over time and across learning contexts is inadequately planned. As a result, some professional development opportunities may restrict capacity for further learning.

Professional development is delivered in different formats with the literature indicating that sustained and intensive programs seem to produce better results than one-shot workshops (Torff & Byrnes, 2011). A form of sustained and intensive professional development may be found in advanced master's degree programs offered to practicing teachers (Tom, 1999). The program that is the focus of this study is for practicing teachers with 1 or more years of teaching experience who want to continue to grow professionally. This program is aimed at building on teachers' current knowledge and classroom experience to develop their expertise in a chosen content area, deepen their professional knowledge, and support their growth as leaders in their field and their school. Such programs may offer practicing teachers willing to learn an opportunity to develop further content and pedagogical content knowledge in a coherent series of courses that are aligned with a set of standards, two important criteria according to Desimone (2009) for teachers to change their instruction and increase their knowledge and skills. In this particular program, the standards are derived from the National Board for Professional Teaching Standards (NBPTS, 2002).

The purpose of this study was to systematically examine PE teachers' development during advanced master's coursework and study the impact of the program on their learning 1 year after course-

work completion. Studying the professional development of PE teachers may contribute to the literature by addressing questions regarding the effectiveness, coherence, and relevance of graduate professional development programs for experienced PE teachers. More specifically, the following research questions guided the study:

- In what ways do these PE teachers' prompted reflections demonstrate growth and change in their pedagogical content knowledge (PCK) as they progressed through this 12-credit sequence of coursework? (RQ1)
- How do PE teachers enrolled in an advanced master's degree program rate their experience level and understanding as they pertain to the eight program outcomes prior to and following a 12-credit sequence of coursework? (RQ2)
- How do PE teachers perceive their application of PCK to their practice 1 year after completing the master's degree program? (RQ3)

Pedagogical Content Knowledge in Teachers' Professional Development

Content knowledge is recognized in the literature as being immensely important to teaching and its improvement (Ball, Thames, & Phelps, 2008). Shulman (1987) framed the study of teacher knowledge through knowledge teachers need to perform effectively: general pedagogical knowledge; knowledge of learners and their characteristics; knowledge of educational contexts; knowledge of educational ends, purposes, and values; content knowledge; curriculum knowledge; and PCK, "that special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding" (p. 8). Parr and Timperley (2010) indicated that professional development that is focused on improving practice requires the building of knowledge, especially content knowledge, and more specifically for teachers, PCK. You (2011) contended that a major contribution of PCK is the "acknowledgement of the importance of subject specific knowledge in teaching" (p.100). In their framework for analyzing the effectiveness of professional learning experiences, Timperley, Wilson, Barrar, and Fung (2007) noted the integration of theory and practice as a key feature of PCK.

PCK has been widely recognized and studied in subject areas such as science, mathematics, social studies, English, and PE (Ball et al., 2008). In PE, the term *PCK* refers to a teacher's proficiency

in breaking down content and structuring it into meaningful and appropriate learning experiences for students (Chen, 2002; Jenkins & Haefner, 2011; Rovegno, Chen, & Todorovich, 2003). Rink (2010) described PCK as “sequencing movement tasks in a manner that has the potential to facilitate learning” (p. 83). In recent publications in PE, authors have discussed the importance of PCK for its impact on student learning (Ayvazo & Ward, 2011; Creasy, Whipp, & Jackson, 2012), teacher socialization (Chroinin & Coulter, 2012), and teachers’ attitude toward cultural diversity (Choi & Chepyator-Thomson, 2011).

Professional Development in Physical Education

Researchers have given little attention in the literature to the professional development of in-service PE teachers. Within the last decade, Armour and her colleagues have published a series of articles focused on the professional development of PE teachers in the United Kingdom. With the premise that continuing professional development is now an integral part of education policy in the United Kingdom, Armour and Yelling (2004a, 2004b) sought to examine continuing professional development opportunities offered to PE teachers. In an analysis of career-long professional development activities, Armour and Yelling (2004b) found, overall, activities lacked coherence and relevance and did not meet teachers’ needs. In their study in Greece, Makopoulou and Armour (2011) indicated limited PE professional development opportunities, inadequate infrastructure, and a school culture that promotes teacher isolation. Moreover, the limited opportunities had a negative impact on some PE teachers and prevented them from learning and changing their practice.

The opportunities offered to teachers in the United Kingdom or Greece were not in the form of an advanced master’s degree or a long-term professional development program. In the United Kingdom, the Professional Development Programme was organized into stand-alone modules on a range of topics which, according to Armour and Makopoulou (2012), failed to help teachers transfer their learning into practice. In Greece, teachers indicated they were treated as passive participants and considered the professional development activities not challenging enough, not relevant, and lacking continuity (Armour et al., 2012). These types of professional development activities are in contrast to the purposes of an advanced master’s degree for practicing teachers.

In the United States, in a monograph published in the *Journal of Teaching in Physical Education* in 2006, Ward and O’Sullivan

described a 15-month professional development program for experienced PE teachers that may be more comparable to the premise of an advanced master's degree. This program comprised an initial orientation, eight workshops, a mid-term debriefing/training session, and a final debriefing. The workshops varied in length (1 to 5 days) and were focused on PE pedagogical and content knowledge. Participants were paid an hourly stipend to participate in workshops, and sessions were held outside of school time. This structure is clearly different from the design of an advanced master's degree in which participants pay tuition, earn academic credit, and in some instances, receive a pay raise once the degree is completed. Deglau and O'Sullivan (2006) reported that participants' beliefs and practices changed as a result of their involvement. In addition, highly and moderately engaged PE teachers continued to implement content knowledge learned during the workshops more than a year after participating in the workshops.

There is a clear call internationally (Organisation for Economic and Cultural Development, 2005) and in the United States (National Council for Accreditation of Teacher Education, 2008; U.S. Department of Education, 2002) for colleges of education to provide meaningful professional development to ensure highly qualified teachers for increasingly diverse classrooms (Darling-Hammond, 2006; Timperley, Parr, & Bertanees, 2009; Zeichner, 2006). Despite the importance attributed to teachers' professional development, few studies have been focused on advanced master's degree programs or applying learned practices during these programs in participants' settings (Manfra & Bolick, 2008; Tom, 1999).

Method

Program Context

This study occurred in an advanced master's degree program in a large diverse university in the Mid-Atlantic region of the United States. The program comprises 30 credits of coursework in advanced pedagogy, research, teacher leadership, critical reflective practice, and content knowledge. More specifically, the program comprises 18 credits of specialization, known as the concentration, and a 12-credit course sequence of advanced pedagogy known as the core. The program's conceptual framework has eight learning outcomes. The five learning outcomes are the core propositions of the NBPTS (2002): (1) teachers are committed to students and their learning, (2) teachers know the subjects they teach and how to teach those

subjects to students, (3) teachers are responsible for managing and monitoring student learning, (4) teachers think systematically about their practice and learn from their experiences, and (5) teachers are members of learning communities. With input from local school personnel and representatives of the NBPTS, additional outcomes were generated to address the diverse context of regional schools: (6) teachers account for the needs of culturally, linguistically, and cognitively diverse learners; (7) teachers are change agents, teacher leaders, and partners with colleagues; and (8) teachers use technology to facilitate student learning and their own professional development.

Teachers entering the program may select from 12 areas of concentration, one of which is PE. The concentration coursework specific to PE includes courses in research design, analysis of teaching, supervision and mentoring, curriculum and assessment, motor development for special populations, and an elective selected from courses related to health, dance, instructional technology, or kinesiology.

Upon completion of the physical education concentration courses, teachers enroll in the core coursework and become part of a year-long cohort of pre-kindergarten to high school (PK–12) teachers representing content across disciplines. The 12-credit core includes sequenced courses that are focused on reflective practice, education and culture, integration of research into practice, how students learn, design and assessment of teaching and learning, and educational change.

Participants

The first cohort of PE teachers completing their master's degree with a concentration in PE graduated in 2009 and comprised nine participants. The two males and seven females had teaching experience in K–12 schools ranging from 1 to 22 years. Six taught at the elementary level, two at the middle school level, and one at the high school level. Participants agreed to participate in the study and signed an informed consent approved by the human subject review board of the institution. A year after their graduation, all the teachers were contacted to participate in follow-up interviews; two males and four females agreed to be interviewed.

Data Sources and Analysis

The data sources used in this study were pre- and post-self-assessments, sets of prompted reflections, and follow-up interviews

conducted 1 year after completing coursework. Qualitative data were analyzed using qualitative research methods, particularly coding and categorizing (Maxwell, 2005). To ensure validity and reliability, the researchers used methods appropriate for qualitative research, including investigator triangulation, source triangulation, prolonged engagement, and negative case analysis.

Pre- and post-self-assessments. As part of the overall evaluation protocol of the program, participants assigned a numerical value to their perceived level of understanding of the eight outcomes before and after engaging in core coursework. The numerical values ranged from 0 to 3 (0 = *no understanding*, 1 = *minimal understanding*, 2 = *moderate understanding*, or 3 = *strong understanding*). Pre- and post-self-assessments were tabulated, compared, and connected to participant comments. The expanded comments were then analyzed qualitatively. From the nine participants, seven pre- and post-self-assessments were available for analysis.

Sets of prompted reflections. The second data source included sets of five prompted reflections (PR) written by each participant at specific points during the core coursework. Forty-five PRs from the nine participants were available for coding and analysis. PRs were used to encourage participants to reflect on their own learning and growth as a result of participating in the coursework. The PRs were not graded as part of the coursework and averaged two pages each.

Each portion of text conveying an idea or concept became a unit of analysis, referred to as a passage. Four researchers performed three rounds of coding, with the first round initially being focused on passages referring to the eight program learning outcomes. As not all ideas and concepts were captured as anticipated and additional ideas beyond the eight program learning outcomes were identified through analysis, emerging themes were identified in a second round of coding (Maxwell, 2005). A third round of coding resulted in the following themes: Assessment (ASMT), Change Agent (CA), Community of Practice (CP), Empowerment (EMP), Self-Awareness (SELF), and Teacher as Learner (TL). Each researcher coded a sample PR from a participant, noting the number of passages in which each theme was mentioned, reaching a minimum of 85% agreement (85% to 95% depending on the theme) with the other researchers before coding the remaining PRs (Miles & Huberman, 1994).

Once the coding was completed, a frequency count was conducted to determine how often and at what point during the course sequence participants referred to the themes. The frequency counts

allowed the researchers to consider trends that emerged from the data across the coursework sequence. Additionally, a content analysis of the PRs was conducted to examine teachers' thinking across the coursework sequence.

Follow-up interviews. The third data source were follow-up interviews conducted 1 year after teachers completed the program. The interviews and their transcriptions were performed by two research assistants who did not know the participants and had been trained to use the interview guide. Interviews ranged from 20 to 40 min and were conducted at the participants' preferred location.

The four researchers initially coded the interviews with the themes that emerged from the reflections; however, in a second round of coding, themes that emerged were Increased Professional Confidence, Barriers, Assessment/Differentiation, Diversity, and Technology. The researchers coded a sample interview from a participant using these themes and reached 90% agreement before the remaining interviews were coded. Frequency counts and content analysis were then conducted for each theme in the same manner as for the reflection data.

Results

The three sources of collected data will be reported in the order used in the Methods section. Pseudonyms are used when referring to direct quotes from participants.

Self-Assessments

Data demonstrated a general shift across outcomes toward the strong understanding category (rating 3). No teachers indicated minimal understanding (rating 1) of the concepts in the postassessment. The fourth outcome, systematic inquiry, demonstrated the largest shift as only two participants reported a strong understanding during the preassessment and all participants indicated a strong understanding at postassessment. For example, in the post-self-assessment comment section, Mike said, "I am able to reflect on my class environment and management techniques. Make the appropriate changes to be productive in the class setting." All participants indicated a strong understanding for the outcomes student learning and learning community on the postassessment. Stacy shared that she knew "how to look deeper into what kids are talking about when they ask questions."

Although none of the participants indicated no understanding of the outcomes during the postassessment, three of the seven par-

ticipants rated their understanding at a moderate level on three outcomes (monitoring, diversity, and technology). Furthermore, for the monitoring outcome, five participants indicated a strong understanding in their preassessment, with four participants indicating that level of understanding in their postassessment. In their post-self-assessments, two participants noted the difficulty of monitoring students' learning when interacting with many students for a short time in PE settings. In reference to the technology outcome, Nathan shared, "It is sometimes hard in P.E. to incorporate technology, but have learned innovative ways to start to."

Self-assessments indicated participants' perceptions of their understanding of the outcomes of the program before and after coursework. Overall, the majority indicated a moderate to strong understanding at the time of pre-self-assessment and almost all of the participants reported an increased understanding by the end of the coursework.

Prompted Reflections

Analysis of the PRs was conducted to consider the overall trends in the data and investigate the content of the reflective writings by reflection and theme across the coursework sequence. The frequency trends that emerged from the data are presented next.

The raw frequency count of coded passages (by theme) across the five PR points generated 637 units, which were then calculated by percentages. Overall, 37% of the units related to TL, 24% to SELF, and 15% to EMP. CP and CA yielded 9% and ASMT yielded 8%. Based on the percentage of coded units across themes throughout the program (see Table 1), the only theme that did not yield an increase in the number of references in the final reflection compared to the other four reflections was ASMT. The category that indicated the greatest change over the coursework is CA, where teachers rarely referenced it during their first reflection (2%), discussed it infrequently in the second and third reflections (6%, 11%), and then integrated that concept often in their fourth PR (33%). In the summative PR, in which participants were asked to reflect on their learning across the coursework, almost half of the participants' comments related to their role as a CA (49%). Similarly, references to EMP increased dramatically at the conclusion of the program from 9% at the outset to 46% at the end.

Table 1
Number of Units per Theme Over Time (Reflection 1 to Summative Reflection)

| Theme | Ref pt 1 | Ref pt 2 | Ref pt 3 | Ref pt 4 | Sum Ref | Total |
|-----------------------|---------------------------|--------------|--------------|--------------|--------------|---------------------------|
| | <i>n</i> (%) ^a | <i>n</i> (%) | <i>n</i> (%) | <i>n</i> (%) | <i>n</i> (%) | <i>n</i> (%) ^b |
| Assessment | 8 (17) | 17 (35) | 5 (10) | 2 (4) | 16 (33) | 48 (8) |
| Change Agent | 1 (2) | 3 (6) | 6 (11) | 18 (33) | 27 (49) | 55 (9) |
| Community of Practice | 10 (18) | 7 (13) | 3 (6) | 16 (29) | 19 (35) | 55 (9) |
| Empowerment | 8 (9) | 15 (16) | 14 (15) | 14 (15) | 43 (46) | 94 (15) |
| Self-Awareness | 40 (27) | 17 (11) | 24 (16) | 12 (8) | 58 (38) | 151 (24) |
| Teacher as Learner | 59 (25) | 43 (18) | 43 (18) | 12 (5) | 77 (33) | 234 (37) |

Note. Ref pt = reference point; Sum Ref = summative reference. Percentages may not add to 100 due to rounding.

^aThe percentage under each reflection point relates to the total amount of units per theme. ^bThe percentage in the Total column refers to the total amount of units (*n* = 637).

When the six themes were used to analyze each PR, references to TL dominated all but the fourth reflection (see Table 2). The second theme most frequently mentioned was SELF, followed by EMP. ASMT was rarely referenced except in the second PR where it peaked at 17%, following the course in design and assessment of teaching and learning. By examining the content of the PRs, the researchers were able to identify changes in teachers' perceptions and particular aspects of the program that teachers referenced. Not only did TL represent 37% of all coded units, but the theme appeared in 47% of comments at the opening reflection (first PR), followed by 42% in the second PR and 45% in the third PR.

Analysis of the PR content indicated that teachers were aware of learning new concepts and which topics from the coursework influenced their comments. As the development of critical reflective practice is one goal of the program, it was not surprising that some teachers focused on reflection and others wrote about learning influences or theorists. For example, Melissa in the summative PR focused on her learning about reflection and how her perceptions about the importance of reflective practice were changing. She mentioned that in her initial PR she wrote about her lack of reflective practice and that she had now "come to the realization that reflection does play a role in [her] teaching practice more than just preparing lesson plans." Other teachers focused on specific course content, such as multiple intelligences, learning styles, and developmental factors. Megan, for example, talked about how "shocked" she was to learn about these topics after 9 years of teaching.

The PR data indicated a shift in the teachers' writing from more general comments during initial coursework to more specific application of new knowledge at the close of the program. In the early reflections, teachers tended to mention a theme as an idea and often stated they intended to pay more attention in the future to a particular idea. An example of this change is found in Shirley's reflection. For the first PR, she wrote about the importance of identifying development factors to help her discover how her students learn and be able to address their specific needs. Later, she wrote that she "understand[s] how important it is to make sure [teachers] are teaching to all the learning styles in order to reach all students."

Qualitative analysis allowed the researchers to look more specifically at the change in a particular participant's reflections and how individuals articulated their ideas by theme across the coursework sequence. Where a theme, such as ASMT, was addressed less frequently in the general reflection data, the researchers were able

Table 2
Importance of Each Theme per Reflection Point

| Reflection point | ASMT <i>n</i> (%) ^a | CA <i>n</i> (%) | CP <i>n</i> (%) | EMP <i>n</i> (%) | SELF <i>n</i> (%) | TL <i>n</i> (%) | Total <i>n</i> (%) |
|------------------|-----------------------------------|--------------------|--------------------|---------------------|----------------------|--------------------|-----------------------|
| 1 | 8 (6) | 1 (1) | 10 (8) | 8 (6) | 40 (32) | 59 (47) | 126 (20) |
| 2 | 17 (17) | 3 (3) | 7 (7) | 15 (15) | 17 (17) | 43 (42) | 102 (16) |
| 3 | 5 (5) | 6 (6) | 3 (3) | 14 (15) | 24 (25) | 43 (45) | 95 (15) |
| 4 | 2 (3) | 18 (24) | 16 (22) | 14 (19) | 12 (16) | 12 (16) | 74 (12) |
| Summative | 16 (7) | 27 (11) | 19 (8) | 43 (18) | 58 (24) | 77 (32) | 240 (38) |

Note. ASMT = Assessment; CA = Change Agent; CP = Community of Practice; EMP = Empowerment; SELF = Self-Awareness; TL = Teacher as Learner. Percentages may not add to 100 due to rounding.

^aThe percentage under each reflection point relates to the total amount of units per theme.

to follow the theme across the reflections to determine changes in a particular teacher's statements. For example, for the second PR, Beth stated how she used performance-based assessments with rubrics as final evaluations but "would like to use them more often to gauge student progress." In the summative PR, she indicated she employed performance-based assessment during formative skills assessment of her students: "I now use formative assessment to determine skill acquisition and how to proceed if more instruction is needed."

Follow-Up Interviews

The coded themes found in the postprogram interview transcripts generated a frequency count of 171 units and were calculated by percentages as with the reflection data. Overall, 42% of the units were focused on teachers' Increased Professional Confidence. All participants reported an increased confidence in themselves and their teaching practice. The second most common theme, Barriers (25%), was related to factors that prevented the respondents from acting as a change agent. These barriers were primarily associated with their teaching context (e.g., number of students per class or other colleagues). Assessment/Differentiation yielded 16% of the units. The majority of statements referred to participants' assessment practices since finishing their master's degree coursework. Diversity was one of the least referenced themes with only 9% of coded comments. Few teachers (8%) mentioned using technology specific to PE such as heart rate monitors or pedometers.

Qualitative analysis of the interviews provided a more detailed view of the participants' responses. Responses regarding professional confidence were focused on an increased confidence in teachers' ability to teach and on the practices used in teaching. For example, Melissa stated that she did not think she was "equipped to monitor a student teacher or mentor a student that comes and observes me." She said, "Not until the last class I took did I feel I was able to do that." Professional confidence responses reflected participants' belief that this master's degree program helped them articulate why they used particular teaching techniques or indicated leadership roles that they had assumed. Laurie noted, "I present at every conference. And I'm going to be presenting again this November.... What we learned [about a fitness focus], and branching out to show other PE teachers."

The second most common theme, Barriers, was related to factors that prevented these PE teachers from serving as a change agent or

conducting teacher research. The barriers participants mentioned included negative attitude of colleagues toward new ideas, school context, time, and technology. School context responses were focused on student characteristics, lack of interaction with colleagues outside of PE, and lack of interaction or cooperation by PE colleagues. Nathan commented, “I’m the only PE teacher in the school.... I have very few opportunities beyond the school.” The category of time as a barrier included comments referring to the limited time available to work with students and working in two schools.

The majority of statements coded as Assessment/Differentiation referred to the participants’ assessment practices since finishing their master’s degree coursework. Participants’ statements comprised specific references to meeting the needs of students and assessment of student performance related to instruction. Shirley described how she had “created some packets for the kids who are low level English speakers...they’ll just take it back and forth from our class to ...their ESOL teacher.” Comments specific to assessment referred to changes these teachers had made to monitor student learning using different assessments. For example, Melissa explained how she feels more “equipped to monitor the student learning, using different assessments” such as written assessment and peer assessment. Participants also mentioned their use of student self-assessment as a way to encourage (K–12) student reflection and as an alternative to content-based pre- and posttests to assess student participation.

The qualitative analysis revealed that comments specific to the Diversity theme referred primarily to participants’ interactions with diverse students in their classrooms or to an overemphasis on diversity in the master’s coursework. Nathan indicated, “I personally felt that the program spent too much time on it... And I think it’s important but I think for the area that we live in, you’re just automatically involved in being culturally diverse...”

Responses regarding the Technology theme were the least referenced theme. As previously noted, the majority of comments were focused on barriers to using technology in physical spaces such as a gymnasium or in outside environments. These PE teachers indicated that although they see the use of technology as a positive influence on their instruction, they did not feel that they always had the resources and time to use technology in their school contexts. Laurie noted, “We can’t even have laptops in the gym because we don’t get reception...and a lot of the teachers said, you know with a finite amount of time I want the kids to be active.”

Discussion

Using multiple data sources, the researchers investigated (a) how PE teachers rated their understanding of the eight program outcomes prior to and following the sequence coursework, (b) how they grew and changed as they progressed through coursework, and (c) how they perceived applying the program content in their practice 1 year after graduating. When rating their understanding of program outcomes, participants demonstrated an increased level of confidence in their understanding of these outcomes. This increased confidence provides evidence of the influence of their course experiences on their understanding of the content addressed in the courses. Analysis of the PRs during coursework revealed the content that the participants found meaningful and provided examples of how the participants applied the content in their classroom practice. The reflection data also indicated a shift in the teachers' writing from more general comments during initial coursework to more developed application of new knowledge at the close of the program. The coded themes identified in the postprogram interview transcripts (Increased Professional Confidence, Barriers, Assessment/Differentiation, Diversity, and Technology) indicated that participant PE teachers did or did not apply content covered in master's degree coursework 1 year after completing the program. These emergent themes demonstrate how participants think about course content in the reality of their professional settings after finishing an advanced master's degree program.

The following discussion provides a synthesis of these findings across the three data sources. The discussion is focused on content knowledge and PCK, impact of coursework on assessment, and barriers.

Content Knowledge and Pedagogical Content Knowledge

Changes were evident in how the participants articulated their understanding of content and PCK from the outset of the program, as they progressed through coursework, and 1 year after completion. Across the three data sources, the researchers found evidence of more refined, nuanced, and specific understanding of content and pedagogical content knowledge after teachers participated in core coursework. Teachers viewed themselves as learners of new areas of content such as new ways to manage and monitor student learning. The participants provided examples of how they translated this knowledge into instructional practices that reflected practices ad-

dressed in core coursework. These examples included providing opportunities for student choice and differentiating instruction to teach particular skills such as throwing and catching. These examples also provide evidence that the participants developed an understanding of particular principles of content and PCK and then applied them in their own contexts. The experiences specific to content and PCK found in core coursework reflect the contention of Donovan, Bransford, and Pellegrino (1999) that teachers need opportunities to understand and be persuaded of the usefulness of particular learned principles before enacting them in their classroom. The extensive nature and depth of certain course experiences may have influenced the participants' understanding of the usefulness of particular principles of content and PCK.

As indicated in the reflections written during core coursework, participants consistently referred to their own learning. For example, the theme of TL was dominant in all but the fourth PR. Similarly, the PE teachers frequently identified the themes of EMP and Increased Professional Confidence in the follow-up interviews. The high number of references to these themes suggests that as these PE teachers focused on their own learning of content and PCK, they experienced greater self-confidence in their teaching and interactions with learners. Furthermore, the interviewed participants felt empowered to try new teaching techniques and to assume leadership roles and responsibilities 1 year after completing the core coursework. This self-confidence and feeling of empowerment is significant since teachers who feel competent and efficacious about teaching a particular curriculum or teaching behavior (e.g., assessment) will be more likely to demonstrate that behavior than teachers who are less competent (Bandura, 1997).

Impact of Coursework on Assessment

Analysis of the reflections and interview data indicated that these teachers were influenced by the content of the coursework when reflecting on their practice. For these teachers, assessment and "monitoring student learning" were emphasized during the core classes. It was not a surprise that assessment was referenced most frequently for the second PR, which occurred immediately after the course requiring participants to design assessments. However, assessment did not remain salient in reflections that followed or in the postprogram interviews. The lack of reference to assessment during the postprogram interviews, even when specifically asked, was notable and concerning. Given the higher accountability teachers

are responsible for in schools (Makopoulou & Armour, 2011), it is likely these teachers are expected to conduct assessments. However, the way they think about assessments beyond requirements is an area for further research. Increased attention across master's degree coursework may be necessary to ensure the impact of their teaching on student learning is emphasized in their thinking, planning, and teaching practice. As Timperley (2008) indicated, the need for knowledge and skills in assessment is necessary for teachers to identify specifically what students know and can do to facilitate teaching in ways that are responsive to each student's needs. Consequently, increased emphasis on authentic formative and summative assessment practices should be considered when developing advanced graduate courses for teachers and included in ongoing professional development.

Barriers

A recurrent theme found in the reflections and interview data relates to the barriers PE teachers encounter in their attempt to implement content and pedagogical content knowledge learned in the program. According to Armour et al. (2012), barriers such as structural barriers found across career phases and teaching contexts, learning theories and model barriers related to becoming active learners, and subject knowledge barriers related to deepening knowledge within specific areas of subject matter and interests may prevent PE teachers from making progress in their learning. Participants in this study encountered multiple structural barriers (e.g., high numbers of students, short time with students, limited space and/or resources) that appeared to hinder their ability to implement curriculum innovation and pedagogical changes (Fraser-Thomas & Beaudoin, 2002; Gallo, Sheehy, Patton, & Griffin, 2006; Makopoulou & Armour, 2011; Zhu, Ennis, & Chen, 2011).

Another major barrier several participants mentioned is difficulty with implementing technology in the gymnasium. This barrier is structural and related to subject matter knowledge. Teachers indicated difficulties with incorporating technology in PE instruction because of lack of resources or time, and as a result, few mentioned using it during their follow-up interview. Although technology is emphasized for all teachers in this advanced master's degree program (one of the program outcomes), not all educational entities agree that knowledge and incorporation of technology in PE is worth considering and supporting. For example, Gray, Thomas, and Lewis (2010) intentionally left out PE teachers and preschool

teachers in a survey of teachers' use of educational technology in U.S. public schools. PE teachers should be provided with subject matter knowledge and encouraged to implement technology since it has been shown to increase physical activity levels of students and may motivate them to be more active (Cain, 2010; Scruggs, 2007).

Armour et al. (2012) advocated that learning communities are a way to encourage teachers to learn continuously in and through practice. The final contextual barrier the participants encountered is the perceived lack of support and connection to other teachers in their school. For many of these teachers, the collaboration with other teachers in their school was minimal. Professional isolation is not uncommon with subjects that are not considered core or are marginalized, such as PE (Blankenship & Coleman, 2009; Fitzpatrick, 2011; O'Sullivan, 1989). Although these teachers made efforts to connect and support one another during their degree program, they encountered difficulties when working in their schools, such as interacting with colleagues resistant to proposed changes.

Summary

The findings from this study indicate that teachers see themselves as learners, and they seek to apply their content and PCK in ways that require them to try new theories and test the results in their schools and classrooms. This study contributes evidence that teachers consider their growth of content and PCK important and that effects of coursework, such as empowerment and self-confidence, extend beyond the scope of the program. Armour et al. (2012) challenged those who seek to improve professional development to create learning opportunities that are dynamic and fluid to allow teachers to “become” learners over time. This program provided such opportunities. However, barriers remain that will need to be overcome to allow PE teachers to be fully engaged in school-based learning communities and be provided with a context that will allow them to actively incorporate the content knowledge and PCK learned during their professional development. Researchers need to examine the specific strategies that PE teachers who have overcome these barriers have successfully used in their teaching.

The results of this study contribute to the literature on professional development in PE by demonstrating how an advanced master's degree program that aligns with teachers' professional settings in schools is collaborative, incorporates learning communities, and is focused on lifelong learning by emphasizing reflection and leadership. These characteristics appear to influence teachers' growth

and development. Moreover, the results of this study also contribute empirical data to support broader research proposed by Desimone (2009) that calls for systematic ways to capture and assess teachers' professional development.

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