Portraying Physical Education-Pedagogical Content Knowledge for the Professional Learning of Physical Educators

JeongAe You

Abstract

Pedagogical content knowledge (PCK) is one of the most critical components in teaching expertise. It helps understand the crucial points that teaching is more than just delivering subject content knowledge to students, and that student learning is considerably more than absorbing information. Since the seminal studies of Shulman (1986, 1987), a number of scholars have worked on the definitions of PCK as well as on the components or elements, but these scholarly examinations of definitions and elements have not considered the nature and characteristics of each individual subject matter field included in the school curriculum. Thus, this paper tries to redefine pedagogical content knowledge in physical education (PE-PCK) and to identify the components of PE-PCK through synthesizing related literature on PCK in education and physical education. This paper will be meaningful, first, to the teaching community by providing practical insights that will guide teachers along the road toward professional learning in the development of PE-PCK and, second, to the research community by facilitating research agendas in the areas of teaching and teacher education.

How do teachers teach content or a subject in a way that enhances student understanding of that content? This is not a new or innovative question for teachers. However, a conclusive answer to this question is difficult to find. Most teachers have tried to acquire knowledge that is needed for effective teaching, and there is no doubt that future teachers will do so as well. Most teachers try to expand their knowledge in order to do a good, successful, or effective job of teaching. We know that students' learning is the central focus of good teaching.

Recently, in the educational community, there has been a paradigm shift from 'teaching' to 'learning' that actively engages students as well as uses effective teaching; this paradigm shift has significantly impacted successful teaching-learning. Among teachers, there is a growing concern with regard to how to increase students' active engagement in learning. Teachers should develop their expertise in teaching, especially in pedagogical content knowledge (PCK), because there is a relationship between PCK and students' learning (Dijk & Kattmann, 2006; Griffin, Dodds, & Rovegno, 1996; Housner, 1992, McCaughtry, 2005; Tsangaridou, 2006).

PCK is one of the most critical components in teaching expertise (Gess-Newsome & Lederman, 1999; Schempp, Manross, Tan, & Fincher, 1998). PCK was first introduced by Shulman (1986, 1987) as a perceived cornerstone of professional expertise (Loughran, Berry, & Mulhall, 2006). According to Loughran et al. (2006), PCK is part of the teachers' knowledge that is needed for excellent teaching. It helps teachers understand the crucial points that teaching is more than just delivering subject content knowledge to students,

and that student learning is considerably more than absorbing information.

Since the inspired works of Shulman (1986, 1987), many studies on PCK have appeared in education and content areas of mathematics (i.e., Kinach, 2002; Mark, 1990; Shushua, Julm, & Wu, 2004), science (i.e., Barnet & Hodson, 2001; Dijk & Kathmann, 2007; Johnston & Ahtee, 2006; Loughram, Mulhall, & Berry, 2004; Magnusson, Krajcik, & Borko, 1999), social studies (i.e., Bullough, 2001), and physical education (i.e., Amade-Escot, 2000; Graber, 1995, 2001; Griffin, Dodds, & Rovegno, 1996; Jenkins & Veal, 2002; McCaughtry & Rovegno, 2003; McCaughtry, 2004, 2005; Rovegno, 1992, 1994, 1995; Rovegno, Chen, & Todorovich, 2003; Tsangaridou, 2002, 2006). Even if numerous research studies exist in the subject matters, previous research on PCK has been overlooked in order to modify what PCK means in each subject matter area. That is, most previous studies on PCK in a specific subject matter rarely identify and clarify how the concept or definition of PCK in education could be applied to each subject matter area, and what PCK looks like in each subject matter.

In fact, a number of scholars have worked on the definitions of PCK (Cochran, DeRuier, & King, 1993; Grossman, 1990; Hashweh, 2005; Loughran, et al., 2004; Marks, 1990; Magnusson et al., 1999; Shulman, 1986, 1987; Van Driel, Verloop, & De Vos, 1998) as well as on the components or elements (Cochran et al., 1993; Grossman, 1990; Marks, 1990; Shulman, 1987; Tamir, 1998), but these scholarly examinations of definitions and elements have not considered the nature and characteristics of each individual subject matter field included in the school curriculum. When one considers the obvious fact that PCK differs considerably, depending of the specific subject matter field or topic within which it applies (Dijk & Kattmann, 2006; Hashweh, 2005; Marks, 1990; McCaughty, 2005; Tamir, 1988; Van Driel et al., 1998), an effort to portray the definition and components of PCK in each subject matter field is clearly invaluable.

To date, only one study by Magnusson et al. (1999), has attempted to describe the components of PCK for science teaching: however, this study does not provide the definition of PCK as it applies specifically to science education. As in other subject matter areas, the field of physical education has devoted little effort and attention to research on pedagogical content knowledge in physical education (PE-PCK as I will henceforth refer to this concept in this paper) that would serve to depict the concept and components of PE-PCK. Thus, this paper attempts to define pedagogical content knowledge in physical education (PE-PCK) and to identify the components of PE-PCK through synthesizing related literature on PCK in education and physical education. It will be meaningful for physical educators to understand the definition and components of PE-PCK by providing them with insights on the road to professional learning in the development of PE-PCK. That is, it offers a significant conceptual tool for helping teachers construct specific knowledge that they need to be effective teachers. In addition, acquiring PE-PCK will help them make decisions about planning, enacting (or implementing), and reflecting on teaching.

Where Did PCK Come from?

At the beginning of the 1980s in the U.S., there were many arguments for change in public schools. At the same time, there was a strong agreement about the need for the improvement of teacher professionalism in order to improve public schools (Bullough, 2001). Neither the status of teaching in public schools nor the quality of teacher preparation programs in teacher education was positive at this time. That is, the criticism was made that teachers did not meet higher standards in teaching and that the teacher preparation programs focused primarily on 'educational methods' courses. This was because most teacher education programs rejected the tradition that focused on content knowledge and supported a

new trend that emphasized the application of general pedagogical practices in the classroom, which were isolated from any relevant subject matter (Veal & MaKinster, 1999). To solve these problems, 'teaching as a profession' needed to be recognized as possessing and acting on unique intellectual knowledge and skill.

PCK was described for the first time in Shulman's research (1986, p. 9) as "the particular form of content knowledge that embodies the aspects of content most germane to its "teachability." Also in this study, PCK was described as "the most useful forms of [content] representation..., the most powerful analogies, illustrations, examples, explanations, and demonstrations...in a word, the ways of representing and formulating the subject that makes it comprehensible for others" (Shulman, 1986, p. 9). One year later, Shulman (1987) defined PCK as "that special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding" (p. 8).

Shulman's research on PCK has been motivated by two political concepts or convictions (Bullough, 2001; Carlsen, 1999). The first conviction is that, by defining teacher knowledge in disciplinary terms, teachers could possess stronger status in teaching so that they would be able to claim their rights, privileges, and responsibilities like other disciplinary specialists. Enhanced professionalism would make it possible to establish teaching standards at the national level and would provide the basis for developing teacher assessment based on teaching practice. The second political concern is a market strategy that makes teaching a more prestigious and rewarding career choice in society. This strategy requires teachers or future teachers to meet the recognized level of quality as a teaching professional. That is, not only does it become difficult for unprepared people to enter teacher preparation programs, but also many teacher preparation programs have reformed their curriculum to enhance the quality of future teachers. As a result, Shulman's (1986, 1987) seminal work on PCK has stimulated a trend to systematically identify teaching as a profession and to describe what teachers should know and do in their profession. While insisting on a 'missing paradigm' on educational research, he argued that teachers should not only know about what content to teach but also how to teach that content. That is, the latter knowledge is a construct that can distinguish a content specialist from a pedagogue (Gess-Newsome & Lederman, 1999).

A major contribution of PCK was its acknowledgement of the importance of subject-specific knowledge in teaching. PCK is a teacher's professional understanding of how to help students understand specific subject matter (Magnusson et al., 1999). PCK was accepted as an academic construct that has greatly impacted educational research and practice (Loughran et al., 2004). However, depending on researchers' perspective in regard to PCK, its conception or component differs (Van Driel et al., 2000). According to educational scholars, the PCK is called by other names such as content-specific pedagogy (Marks, 1990), pedagogical content knowledge (Grossman, 1990; Marks, 1990; Shulman, 1987), pedagogical content knowing (Cochran et al., 1993), subject-specific pedagogical knowledge (McDiarmid et al., 1989), subject matter-specific pedagogical knowledge (Tamir, 1988), content-specific cognitional knowledge (Peterson, 1988), subject matter pedagogy (McCaughtry, 2005), and teacher pedagogical constructions (TPCs) (Hashweh, 2005).

In earlier research on PCK, the PCK was simply perceived as the combination of content knowledge and pedagogical knowledge. That is, the PCK was perceived as ways of meaningful representation. Early research on PCK consisted of case studies to identify teachers' PCK for different topic areas across disciplines. Except for one study (Marks, 1990), most of the early studies on PCK have used the original concept of Shulman (1986, 1987) and proved the

characterization of PCK. According to Morine-Dershimer and Kent (1999), those studies were criticized because they viewed PCK in a way that only focused on one method of content representation without considering classroom contexts.

Subsequent studies were more theoretical in defining PCK and more active in renaming its definition (Barnett & Hodson, 2001; Cochran et al., 1993). Cochran et al. (1993) emphasized the socially constructed aspect of PCK and renamed PCK as PCKg (Pedagogical Content Knowing) that have reflected the dynamic nature of knowledge. On the other hand, Barnett and Hodson (2001) renamed it as PCxK (Pedagogical Context Knowledge) because they viewed PCK as greatly dependent on the classroom context. Kinach (2002) mentioned that the earlier studies on PCK viewed PCK as only transformed subject matter knowledge or a combination of pedagogical knowledge and content knowledge, while subsequent works on PCK perceived it as integrated with other teacher knowledge. In addition, Magnusson et al. (1999) also presented PCK as more than the sum of its parts and more than simply fitting together bits of knowledge from different sources.

In sum, PCK is perceived as newly reformed knowledge that is made by integrating various sources of teacher knowledge. However, many people still view PCK as one type of teacher knowledge that is interactive with other types of teacher knowledge. To facilitate making PCK more meaningful and useful, both to the teaching community and the research community, there is a pressing need to deliberate on what PCK is and what it means in terms of a wide range of school subject matter fields, including physical education.

What is the Meaning of Physical Education-Pedagogical Content Knowledge?

Little attention is given to the concept and components of PE-PCK, even though there are some studies on PCK in physical education. According to Loughran et al. (2006), there is a need to articulate and document PCK in science teaching so that the teachers are able to access and use PCK in shaping their own practice. As with science teaching, portraying what PE-PCK is and what components PE-PCK has is also important. Unfortunately, we have little accumulated knowledge about what PE-PCK means and what is distinctive about the concept. In a sense, understanding and identifying PE-PCK and its components challenge educators in the area of physical education to figure out and design a conceptual tool that helps students in the field understand not only what the concept entails but how to apply this understanding effectively in the learning process. In addition, a visible map for professional learning in the kind of expertise essential to teaching excellence in the area of physical education can be offered.

The efforts to portray the concept of PE-PCK in this section result from the nature of PCK. There is an additional reason why the original PCK needs to be re-interpreted and re-evaluated since the concept was first introduced in 1987. Regarding the nature of PCK specific to content, it is necessary to portray the concept of PCK in each school subject. Physical education is no exception. PCK in education comes from the significance of the content to be taught. Shulman (1986, 1987) criticized most teacher preparation programs for being mainly weighted on methods courses rather than content-specific courses (Bullough, 2001). According to the second work on PCK by Shulman (1987), content knowledge should be given much more weight. Regarding this point, we need to go back to the ground-breaking research on PCK by Shulman (1986). Based on the first definition in 1986, the core of PCK is content. Hashweh (2005) explained that PCK was first introduced as a subcategory of teacher content knowledge. It is also supported by most research on PCK conducted by various scholars with different backgrounds (Amade-Escot, 2000; Bullough, 2001; Johnston & Ahtee, 2006; Loughran et al., 2006; Magnusson et al.,

1999). Without adequate content knowledge, effective teaching in all subject matters cannot be guaranteed (Johnston & Ahtee, 2006).

Thus, before portraying PE-PCK, 'Content in Physical Education' should be discussed. What is 'Content' in physical education? Unfortunately, it is hard to find the definition of content in physical education. Recently, in *JTPE* (*Journal of Teaching in Physical Education*), there were papers about content in physical education conducted by two well-known scholars, Siedentop (2002) and Tinning (2002). First of all, Siedentop (2002) argued his view as follows:

> The content knowledge domain for physical education is not so easily identified. In fact, it continues to be a source of serious controversy in our field. What I will argue this morning is that we, and by "we" I mean particularly the teacher educators in physical education, have largely given up the historical content knowledge of our field, and, in so doing, have virtually eliminated the possibility of developing a serious body of pedagogical content knowledge for teaching physical education. (p. 368)

Tinning (2002) has explained one of the reasons why content knowledge in physical education is difficult to define, unlike other school subjects such as Math, Art, Music, or English, is due to inconsistent goals of achievement in physical education. Additionally, this paper has employed terms such as sports performance (Siedentop, 2002), physical activity (practical physical activity), kinesiology (Tinning, 2002), practical knowledge and knowing how (Wright, 2000) but still has not determined what content in physical education should be. Additionally, You (2007) has confirmed that 'physical activity' could be the essence and tool of physical education content, and has also suggested that physical education is a school subject that teaches 'physical activity' (including sports) such as 'knowing that' and 'knowing how' about physical activity. In physical education, while experiencing, performing, and appreciating a variety of physical activities, ultimately students should see, move, and understand 'all about physical activities' that encompass theory and practice of physical activity, kinesiology or human movement, etc.

Another important aspect of PCK seeks to effect student learning by understanding, not just knowing. Shuhua, Kulm, and Wu (2004) have stressed the differences between learning as knowing and learning as understanding. If a teacher holds the belief that the purpose of learning is knowing, he or she is likely to teach disconnected knowledge that emphasizes remembering facts or skills. On the other hand, a teacher with the belief that the purpose of learning is to enhance understanding will pursue the teaching of more connected and internalized knowledge that can facilitate both conceptual understanding and procedural development and consistent inquiry. Ultimately, the latter belief makes it possible to substantially enhance students' learning and lead to content mastery. As the study mentioned, it is meaningful for teachers to have the belief that the goal of learning is understanding so that they will not just deliver content knowledge, but will facilitate the change of cognitive structure. For this, teachers should have a more profound knowledge and understanding of the students themselves as well as a thorough and comprehensive mastery of the content of the course. Otherwise, an emphasis on content is like simply giving knowledge to students, without considering them as learning subjects.

Based on the two aspects of the concept mentioned before, PE-PCK is viewed as synthesized knowledge embodied in various functioning facets of teachers' knowledge and can be defined, "PE-PCK is an action-based knowledge of how to meaningfully teach intended educational contents in physical education so that students could holistically understand, perform, and appreciate physical activity." In sum, PE-PCK is not perceived as "one" meaning, a single type of knowledge that physical education teachers should acquire as necessary for teaching physical education content, but the highest level of

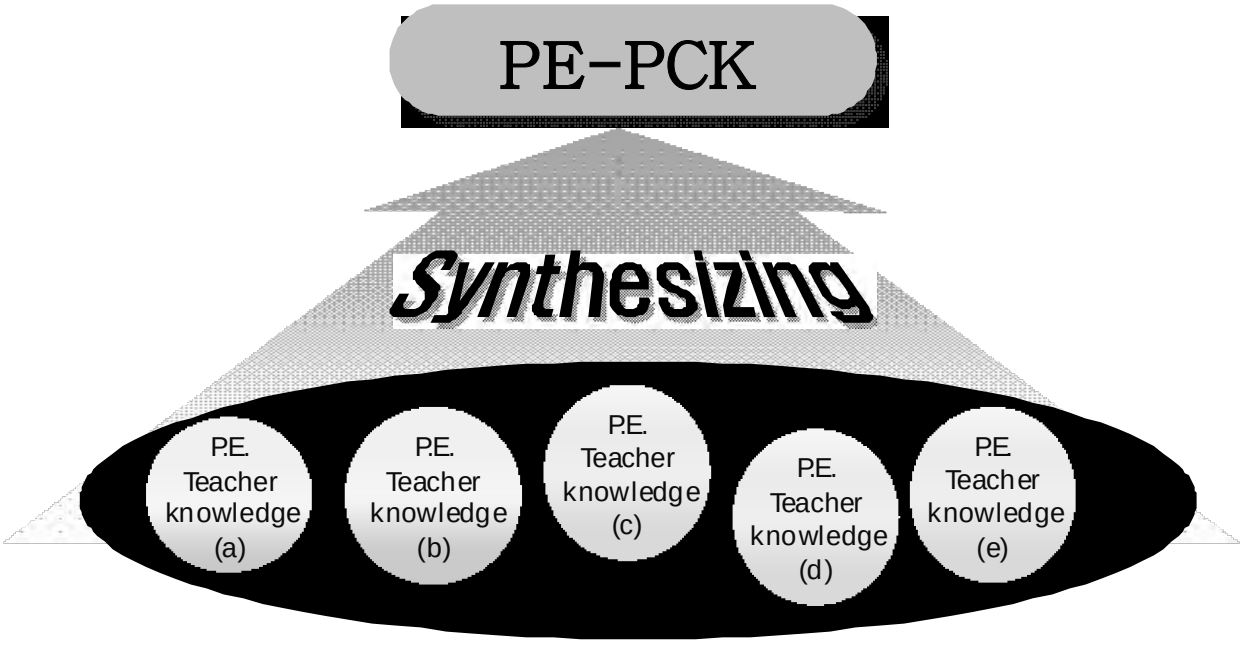

Figure 1. Relationship between teachers' knowledge and PE-PCK.

knowledge that all teachers should pursue through the effort and experience of teaching. That is, PE-PCK is a collection of professional teacher constructs, a form of professional knowledge that preserves the wisdom of practice that all teachers require. Figure 1 shows that PE-PCK is a synthetically embodied knowledge derived from several types of physical education teachers' knowledge. Additionally PE-PCK has its own components consisting of PE-PCK's representation in class.

What Does Physical Education-Pedagogical Content Knowledge Make?

In general education, Shulman (1987) and other scholars (Cochran et al., 1993; Grossman, 1990; Gudmundsdttir, 1990; Marks, 1990; Tamir, 1988) sought to identify specific and concrete categories of teacher knowledge. Shulman and three other educational researchers—Grossman, Gudmundsdttir, and Tamir—aimed to show the relationship between teacher knowledge and PCK and then to describe PCK as one of teacher knowledge. On the other hand, two studies by Cochran et al. and Marks attempted to define the components of PCK in education. Only Magnusson et al. (1999), in science education, made an effort to describe five components of PCK for science teaching: (a) orientations toward teaching science, (b) knowledge of science curriculum, (c) knowledge of students' understanding of science, (d) knowledge of assessment in science, and (e) knowledge of instructional strategies. These efforts have contributed to an understanding of what teachers should develop in order to teach effectively.

In this paper, six components of PE-PCK and the meaning of each component are provided. These components interact in highly complex ways, meaning that it is crucial to understand that a teacher's knowledge of a particular component may not predict her teaching practice (Fermandez-Balboa & Stiehl, 1995). Regardless of the topic or themes to be taught, all components of PE-PCK

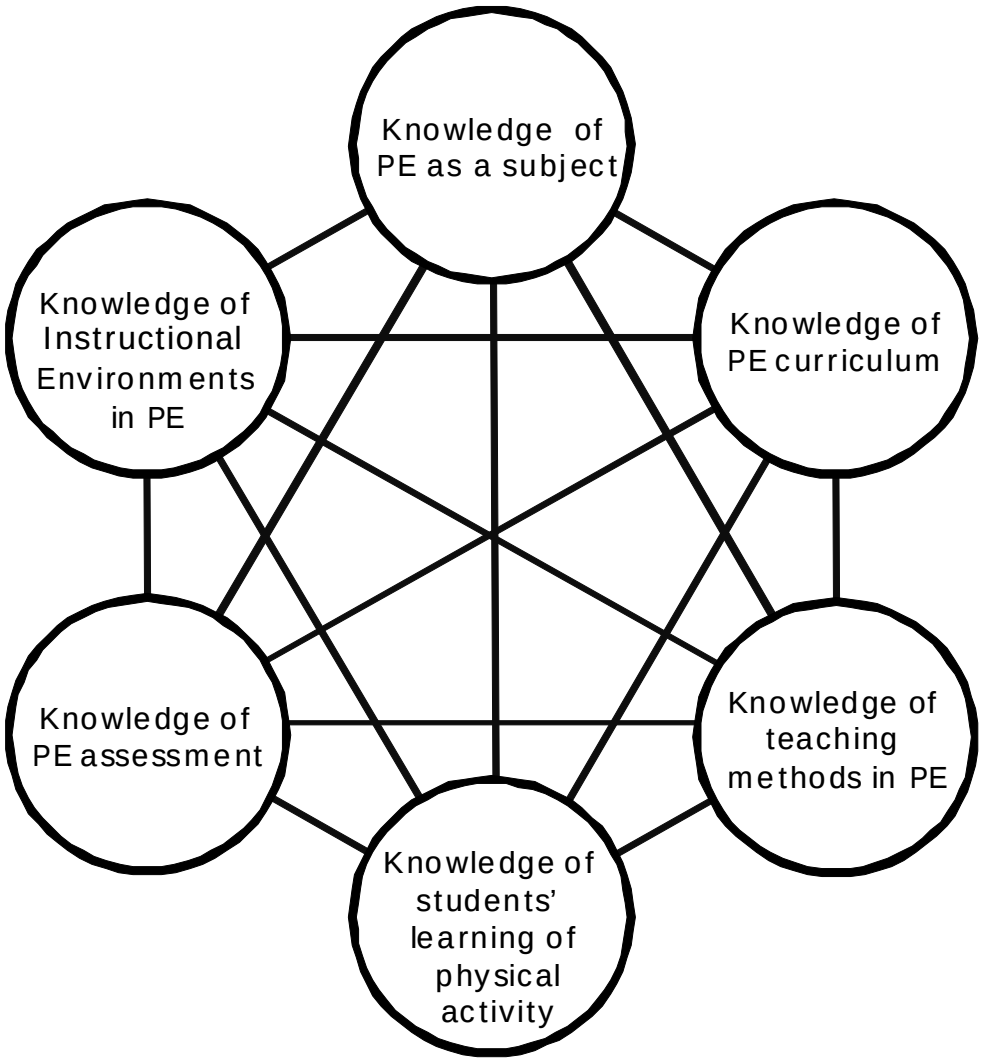

Figure 2. Components of PE-PCK.

function in practice, but the role and weight of each component may differ depending on the topic or theme. Thus, physical education teachers need to develop knowledge of all components of PE-PCK, and particularly those having to do with the topics or themes that they teach.

Knowledge of Physical Education as a Subject

This component refers to knowledge of physical education goals as a subject, and its relation with other subjects in schools. That is, teachers should know the role and accountability of physical education as a school subject as well as the orientation and characteristics of physical education as a discipline. Fernandez-Balboa (1997) has also explained that teachers should critically examine the purposes of physical education in terms of ethical, economical, and political viewpoints as well as bio-scientific perspectives in different cultures. In addition, physical educators should be aware of the relationship between physical education and other school subjects in schools and the relation with a variety of additional physical activities and sports

being performed outside of regular classes or the school system.

Knowledge of Physical Education Curriculum

This component consists of knowledge of the national (or state, district etc.) physical education curriculum and curriculum models in physical education. This knowledge enables teachers to understand the scope and sequence of contents at each grade level, and thus to design and organize learning tasks and select appropriate learning activities and materials for student learning that maintains a focus on understanding.

In addition, a teacher's knowledge of curriculum models in physical education is helpful in making curriculum decisions and enhancing program coherence because the models represent a general set of beliefs. Whenever teachers design a school-based physical education curriculum, the models can guide them in what to do and how to do it, offering perspectives on content sequencing and delivery to learners in a manner that ensures meaningful learning (Ennis, 2003).

Knowledge of Teaching Methods in Physical Education

This component refers to the physical education teachers' knowledge of specific teaching models, strategies, styles, and techniques that are useful in helping students comprehend content. For example, teaching methods in physical education include instructional models (Metzler, 2005) and Mosston's teaching styles (Mosston & Ashworth, 2002). Teachers who have a variety of teaching repertories are more flexible about changing learning activities whenever appropriate and are therefore able to run their classroom smoothly (Schempp et al., 1998). Effective teachers need to judge whether or not and at what time a teaching method will be useful in supporting and extending students' comprehension in a particular teaching situation.

Knowledge of Students' Learning of Physical Activity

This component includes physical education teachers' knowledge of both the students themselves and students' learning. Types of knowledge include information on students' developmental levels and ability levels as these affect participation in learning. That is, teachers should know the reasons for learning difficulties and common sources of students' errors in learning physical activities (Schempp et al., 1998).

For some topics or movements, learning is difficult because the concepts or movements are abstract and complex or they lack any connection with the students' common experiences. Teachers should know which topics or tasks fall into this category and what aspects of these topics or tasks students will find most inaccessible. On the other hand, knowledge of students' learning includes knowledge of students' learning styles or modes of cognitive processes, their affective dimensions, and the nature of their social lives. Thus, teachers need to be aware of students' emotions and their lives (McCaughtry, 2004, 2005) and of typical patterns of understanding.

Knowledge of Physical Education Assessment

This component consists of knowledge of the principles, characteristics, and methods for assessing student learning in physical education. Physical education teachers should be knowledgeable about procedures, approaches or activities in order to assess important dimensions in physical education, as well as the advantages and disadvantages associated with employing a particular assessment device or technique (Fernandez-Balboa, 1997).

Of particular importance is the fact that physical education assessment requires rational decision making in terms of what and how to assess within a particular unit of study. Even though similar units are taught in many physical education classes, the contents, methods, and instruments used to assess the unit might differ. Drawing on Schwab (1964), Novak (1993)

pointed out, "every educational event has a learner, a teacher, a subject matter, and a social environment. I would like to suggest a fifth element – evaluation" (p. 54). In accordance with this significant observation, knowledge of physical education assessment has to become one component of PE-PCK that is separate from knowledge of the physical education curriculum and knowledge of the teaching methods commonly used in physical education.

Knowledge of Instructional Environments in Physical Education

This component refers to knowledge of the uses and safe functions of facilities and equipment, and knowledge of managing teaching space and arrangements of learning materials and tools. Among school subjects, physical education is significantly determined by available facilities and equipments. Effective use of facilities and equipment promote students' learning of physical activities, whereas ineffective use does not. For instance, the teaching space (the width and/or the distance) in the gym or playground where students move can influence learning of physical activities. Efficient use of instructional technology can be of benefit to the teaching-learning process in various ways: providing demonstrations, facilitating interactive learning activities, monitoring students' activities, and giving feedback for teachers and students (Fernandez-Balboa,1997; Silverman, 1997). Also, determining when and for how many students the teachers can provide learning materials and tools is crucial. Thus, physical education teachers should be keenly aware of the appropriate use of instructional environments for the right purpose and at the right time and place during classes.

Why is PE-PCK important for the Professional Learning of Physical Educators?

In this paper, PE-PCK is represented as a form of communicative discourse or as a practical construct. In order for excellent teaching to occur, Griffin et al. (1996) suggested that physical educators should acquire PCK, because it can provide everything needed to help students learn. Magnusson et al. (1999) also explained that possessing subject matter knowledge did not guarantee or necessarily accompany PCK. Additionally, the teachers should make efforts to employ the type of PCK that is being used in teaching a particular content area in particular ways in order to enhance student learning. Because PCK is a type of advanced or high level knowledge that should be achieved by teaching professionals, it needs to be developed through professional learning.

In a sense, the definition and components of PE-PCK can play an important role in guiding teachers and teacher educators in ongoing professional learning in physical education. Wood (2007) argued, '[teachers] need to be knowledgeable and they need to know how to use their knowledge'(p. 281). In order for students to achieve more valuable learning outcomes in PE, teachers should be professional learners as well (Armour & Yelling, 2004; Wood, 2007). Professional learning enhances teachers' desire to continually improve their instruction in physical education.

The components indicated here inform teachers and teacher educators of the types of knowledge that are required or developed in pre-service and in-service physical education teacher education. In particular, a visible map of teachers' professional learning in the area of expertise essential to teaching excellence in physical education can be offered. In addition, addressing these components challenges teacher educators to figure out and design a conceptual framework that helps future teachers in the field to understand not only what the concept entails but how to apply this understanding effectively in the teaching-learning process.

Recently, Rink (2007) addressed the issue of the irrelevance of disciplinary knowledge in teacher preparation. Most argue that many PETE programs currently lack appropriate contents or have difficulty applying disciplinary knowledge in

complex PE contexts. The failure to select and deliver that knowledge in teacher training in a manner that is meaningful to future teachers is a long-time problem in PETE. First, the direct cause of the failure is the lack of exemplary teacher preparation programs in physical education (Fernandez-Balboa, 1997). Rink (2007) asked a thought-provoking question, "how do we do give pre-service teachers the knowledge base they need and the skill to apply it and use it effectively in their work?" (pp. 104-105). To answer this question, we should review two works that are relevant to the PETE knowledge base. First, Fernandez-Balboa (1997) proposed an alternative knowledge base in physical education teacher education that includes five general content areas and 16 components as follows:

1. Education and physical education: (a) Motor skills, sport, and the human body, (b) traditional, critical, and transformative educational theories and methods, and (c) traditional and alternative assessment-evaluation procedures
2. Knowledge production and access: (a) Diverse research methods, (b) creative, critical thinking, and innovation skills, and (c) information access and technology
3. The person in/and society: (a) Child and adolescent psychology, (b) history, sociology, and philosophy, (c) self-knowledge, (d) cultural and human diversity, (e) communication skills, and (f) human relations
4. Politics, leadership, and ethical and moral values: (a) political and leadership skills, (b) ethical and moral values
5. Cross-boundary field experiences: (a) cross-curricular themes, (b) social and professional service

According to Fernandez-Balboa (1997), this proposal is in line with NASPE (1995), which suggested the national standards for beginning physical education teachers, but sought to emphasize two perspectives (critical pedagogical orientation and teachers as transformative intellectuals) into the PETE knowledge bases.

In the meantime, NASPE's guidelines for beginning teachers were revised in 2003 to include 10 standards: content knowledge, growth and development, diverse learners, management and motivation, communication, planning and instruction, student assessment, reflection, technology, and collaboration. Beginning teachers should acquire these standards before entering teaching contexts, and teacher educators should be guided by the standards as they prepare future teachers to become qualified teachers in physical education. These two different frameworks can contribute to reconstructing current PETE programs, so that they prepare better teachers. That is, current knowledge bases or standards tend mainly to limit the qualifications of pre-service or novice teachers to meeting minimum standards for getting teaching certifications and hence are likely to focus heavily on the breadth rather than depth of teacher knowledge. Moreover, these two works have not addressed PE-PCK directly as one of the knowledge bases or national standards. This phenomenon might result in disregarding the existence of PE-PCK or weakening its importance for professional learning of preservice and inservice teachers in teacher education.

In a sense, the components of PE-PCK may represent a feasible framework for presenting what and how both pre-service and in-service teachers might embark on the road to professional learning. Furthermore, the framework can be addressed in a manner that may guide teacher educators in making pedagogical decisions about educational objectives and learning experiences in PETE programs. For example, an independent course like 'understanding and developing PE-PCK' needs to be provided to preservice teachers before they begin student teaching. This course might give the teachers the opportunity to develop an understanding of and to practice PE-PCK in depth before student teaching practicum. That is, this course would depict the nature and

purpose of PE-PCk for professional learning of all physical education teachers and deal with six components of PE-PCK indicated in this paper as the main components of the course. Also in this course it could be emphasized that the components of PE-PCK intersect with and overlap each other and thus need to be implemented in an integrated manner. Ultimately, professional learning that leads to PE-PCK in this course should be simultaneously focused on the whole scope as well as on each component of PE-PCK, because the development of a component simultaneously encourages the development of other(s), and eventually enhances PE-PCK.

In PETE programs, two components, 'early field experiences' and 'student teaching,' are representative programs that could mingle between content and pedagogy in physical education (You & McCullick, 2001). Also, the programs that form or comprise subject-specific methods classes have provided the only opportunity that preservice teachers have been given that enable them to reflect upon the actual use of their content knowledge within a specific context. The reason this course is needed as a precursor to student teaching is that it would serve to correct the current shortcomings in teacher preparation. Preservice teachers tend to enter a real teaching field without the awareness of PE-PCK in PETE programs. Within the short period of their student teaching practicum, most student teachers are likely to finish field experiences with the realization of the importance of PE-PCK, but have seldom had the chance to implement or develop PE-PCK during the practicum (Gess-Newsome & Lederman, 1999; Rovegno, 1992). Thus, the course allows preservice teachers to be aware of what PE-PCK is, why it is important, and how it develops.

Summary and Suggestions

The primary aim of this paper is to define pedagogical content knowledge in physical education (PE-PCK) and to identify the components of PE-PCK by synthesizing the related literature on PCK in education and physical education. PE-PCK is defined as synthesized knowledge as it is embodied in the various functioning parts of physical education teachers' knowledge; the concept is further explained as an action-based knowledge of how to teach meaningfully intended educational contents in physical education so that students may holistically understand, perform, and appreciate physical activity. In addition, six components consisting of PE-PCK were presented: (a) knowledge of physical education as a subject, (b) knowledge of physical education curriculum, (c) knowledge of teaching methods in physical education, (d) knowledge of students' learning of physical activity, (e) knowledge of physical education assessment, and (f) knowledge of instructional environments in physical education. While these components are not mutually exclusive in teaching contexts or practices, it is, nevertheless, conceptually helpful to consider them as distinct components. That is, defining PE-PCK and depicting its components can play a significant role in guiding pre-service and in-service teachers toward progressive professional learning.

Recently, Tsangaridou (2006) has argued that research on PCK in physical education needs to continue to develop, unlike other disciplines such as science and mathematics. First of all, research on PCK in physical education is neither extensive nor diverse. Most of them have focused on exploring how in-service or pre-service physical education teachers acquire, elaborate, and transform their PCK (Amade-Escot, 2000; Graber, 2001; Rovegno, 2003). Recently, only a few studies (McCaughtry & Rovegno, 2003; McCaughtry, 2004, 2005) addressed the emotional dimensions of PCK, while previous research was mostly oriented to understanding the cognitive dimensions of PCK.

Several suggestions are made for future research on PCK in physical education. First, more research on the definition of PE-PCK and its components should be conducted in order to

facilitate advanced researches on PE-PCK from various perspectives and approaches. For example, further research on students' and/or teacher educators' perspectives of PE-PCK will be useful to testing and revising the definition of PE-PCK and its components. Also, research on the effectiveness of PE-PCK needs to be conducted in order to analyze student learning using quantitative approaches.

Secondly, a number of studies on exemplary and extensive case studies of PE-PCK need to be conducted to facilitate articulation and documentation. Studies of outstanding cases of PE-PCK enable physical educators to access easily what has been discovered through experience and to use effectively concepts and methods that have proven workable for others in shaping their own practice. In particular, preserving and passing on expert teachers' PE-PCK using qualitative approaches will be useful to beginning teachers as they come to understand the multiple components of PE-PCK and how they function in various teaching contexts and in guiding the acquisition of correct and workable ways to apply this understanding. Moreover, depicting multiple cases or examples within a given unit of study will influence beginning teachers positively by encouraging them to apply an effective approach at the right time and in the right context to ensure effective teaching.

Finally, future self-studies (Samaras & Freese, 2006; Wilcox, Watson, & Paterson, 2002) of the development of PE-PCK are needed to obtain processes or strategies through which novice teachers or experienced teachers can effectively acquire an understanding of PE-PCK and its application. For example, the self-study genre of research enables the teachers with the highest level of PE-PCK to engage in practical inquiries that contribute to their own capacity for expertise and lead to professional practice while facilitating their professional growth. The systematic engagement in the self study of PE-PCK is a valuable approach for teachers who are striving to better assess their teaching knowledge in their own teaching practices. Just as quality student learning is essential to our students, knowledge of quality teaching and teacher education practices is also absolutely necessary to our current and future teachers.

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Dr. JeongAe You is an associate professor at Chung-Ang University, Korea.