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Service-Learning: A Venue for Enhancing Pre-ServiceEducators' Knowledge Base for Teaching

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Scholarship of Teaching and Learning research examining the impact of service-learning on student's personal qualities has shown positive results. Findings indicate that students participating in high quality service-learning programs show increases in their perceptions of self-efficacy, civic responsibility, social justice, and diversity awareness. Less information regarding the effect of participation in service-learning on student's intellectual and knowledge outcomes is known. This case study examined the influence of participation in a service-learning program on pre-service educators' knowledge base for teaching. Participants included 31 undergraduate physical education majors enrolled in a Motor Skill Development for Children course at a large state university in the southwestern United States. Findings from multiple data sources (i.e., journals, interviews, and observations of instruction) revealed that pre-service educators participating in a service-learning program enhanced their pedagogical content knowledge. Teacher education programs should enhanced their pedagogical content knowledge. Teacher education programs should enhanced their pedagogical content knowledge. Teacher education programs should consider implementing service-learning programs within the curriculum to benefit pre-service educators' knowledge base for teaching.

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Introduction

Service-learning is a pedagogy that bridges academic study and civic engagement. Students participate in meaningful community service that is directly linked to academic course content. Learning occurs in an authentic setting that enables students to validate theoretical and often times complex principles. Service-learning provides a venue for students involved in experiential learning to meet genuine community needs. These experiences are then reinforced through critical reflection activities, both written and oral, which also help ensure and highlight the service-learning program's relevancy to academic course content (Cress, 2005).

Faculty and students in the sciences, humanities, arts, education, and engineering have narrowed the gap between theory and practice through service-learning. The well-documented benefits of student participation in service-learning include favorable influences on student's personal outcomes such as heightened levels of self-efficacy, identity, and moral development; and social outcomes including reducing stereotypes and enhanced diversity appreciation (Eyler, Giles, Stenson, & Gray 2001). Findings are mixed however, in regards to benefits directly linked to student's academic learning outcomes through participation in service-learning. While many studies have documented enhanced student academic learning, other investigations have reported little or no gain to students' academic knowledge (see Eyler et al., 2001).

The practice of service-learning is founded on John Dewey's work in the early 1900s that initiated dialogue examining the role of higher education in citizenship development (Dewey, 1938). In 1984, David Kolb transformed Dewey's six-step inquiry process into a four-component learning cycle for experiential learning, and his model has been used widely to develop service-learning curricula (Kolb, 1984). In addition to experiential learning models, theoretical constructs such as critical pedagogy (Ruiz & Fernandez-Balboa 2005), social re-construction (Bondy & McKenzie, 1999), and civic responsibility (Wade,1997) have been used to investigate service-learning.

Service Learning and Teacher Education

Teacher education programs have utilized service-learning to prepare future teachers in numerous settings and academic disciplines (for a review see Anderson, Swick, & Yff, 2001). Investigations examining the impact of service-learning on pre-service educators in a variety of content areas have revealed advantageous outcomes in regards to pre-service educator's self-esteem and self-efficacy for teaching (Wade, 1995), dedication to the teaching profession (Green, Dalton, & Wilson, 1994), increased diversity awareness (Tellez, Hlebowitsh, Cohen, & Norwood, 1995), and overall affirming learning experiences (Wade & Yarbrough, 1997). In regards to assessing the relationship of service learning and academic outcomes, evidence supports the positive impact service learning has on critical thinking skills and academic engagement; however, empirical data are limited supporting service-learning as a means of increasing student's intellectual and academic knowledge outcomes directly related to the service-learning course (Root & Swick, 2001).

Scholars in the discipline of physical education teacher education have also examined service–learning curricula (Cutforth, 2000; Domangue & Carson, 2008; Kahan, 1998; LaMaster, 2001; Meaney, Bohler, Kopf, Hernandez, & Scott, 2008; Watson, Crandall, Hueglin, & Eisneman, 2002). Findings from these studies have shown that pre-service educators' participation in physical education service-learning programs resulted in increased perceived competence for teaching (LaMaster, 2001), developed moral reasoning (Cutforth, 2000) and increased cultural competence (Domangue & Carson, 2008; Meaney et al., 2008). Two studies described self-report data supporting pre-service educators' enhanced teaching skills, however, intellectual and knowledge outcomes were not directly assessed (Kahan, 1998; Watson et al., 2002).

Research has been scarce exploring the relationship of participation in service-learning programs and participants' intellectual outcomes (for a review see Eyler, 2000). Eyler (2000) suggests that service-learning research must address the issue of the relationship between a student's participation in service-learning and the effect of this participation on his/her intellectual development. A critical intellectual outcome for students enrolled in teacher education programs is acquiring knowledge specifically related to teaching content

and instructional strategies relevant to their discipline (National Association for Sport and Physical Education, 2004). A knowledge base for teaching has been outlined to help define qualities for an expert teacher, and to advance the facilitation of a sufficient knowledge base for pre-service teachers and school-aged students (Metzler, 2000). Knowledge base encompasses the wide-range of information an educator must know in numerous areas of teaching. According to Shulman (1987), the knowledge teachers possess is categorized in the following areas: 1) content knowledge, 2) general pedagogical knowledge, 3) curriculum knowledge, 4) pedagogical content knowledge (PCK), 5) knowledge of learners, 6) knowledge of educational contexts, and 7) knowledge of educational purposes. Shulman highlights the importance of PCK in terms of the distinct roles PCK has in weaving content and pedagogy. The manner in which teachers understand learners, curriculum, varied school contexts and teaching strategies is revealed in one's abilities to use PCK to create successful learning environments for all students (Griffin, Dodds, & Rovegno, 1996). Teachers with in depth levels of PCK are able to vary instructional strategies, provide feedback, and adjust goals to better meet the needs of diverse learners.

Given the broad range of knowledge teachers must possess it is important for teacher education programs to provide meaningful avenues for pre-service educators to acquire sufficient knowledge base for teaching to meet the needs of today's ever-changing and diverse student population. Numerous teacher education programs have embraced service-learning as a pedagogy to groom future teachers (Anderson, Swick, & Yff, 2001). Research exploring the relationship between pre-service educators and the influence of the experience specifically on their knowledge base for teaching is scarce. Given the importance of pre-service educators acquiring such knowledge, and the increased utilization of service-learning in teacher education programs this investigation was designed to examine a physical education service-learning program's impact on pre-service educators' knowledge base for teaching.

Theoretical Framework

Recent service-learning investigations in the discipline of physical education have used Bandura's (1986) Social-Cognitive theory as the construct to investigate the impact of participation in the service-learning programs on pre-service educators (Massey-Stokes & Meaney, 2006; Meaney, et al., 2008; Meaney, Hart, & Griffin, in press). Social-cognitive theory suggests that human learning occurs within a dynamic framework and initiates interaction between one's personal factors, environment, and behaviors. These dynamic relationships constitute an interactive model referred to as triadic reciprocality (see Figure 1).

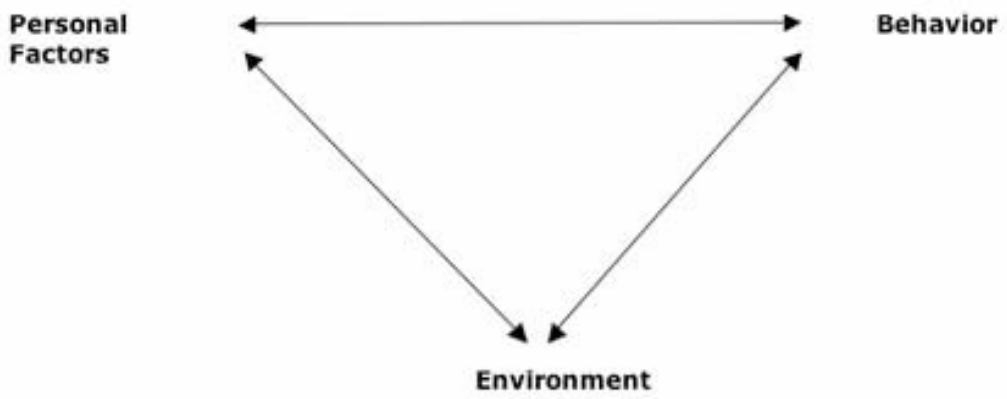

Figure 1. A model diagramming triadic reciprocal causation. (Adapted from [Schunk 2004])

Within the model of triadic reciprocality, personal factors may often encompass one's motivation, self-efficacy, knowledge, fears, and expected outcomes. The environment can be perceived in three stages: imposed, selected, and constructed (Bandura, 1999). One's imposed environment includes the way things are, that is situations an individual must interact with on a daily basis (i.e., school, work, family). While individuals may have minimal influence over imposed environmental factors, they do have choices in how they interpret and react to imposed factors. These choices regarding how one reacts to the imposed environment constitutes the selected environment. The resulting behaviors, the third aspect of triadic reciprocality, become one's constructed environment. Construction of one's environment demands actively engaging in one's surroundings and may often result in the acquisition of new knowledge, beliefs, behaviors.

Triadic reciprocality provides an optimal construct to explore the dynamic relationships between pre-service educator's personal actions (i.e., knowledge base, self-efficacy) environment (i.e., imposed, selected, and constructed) and behaviors (i.e., teaching strategies, communication techniques). Social-cognitive theory provides researchers a lens to examine service-learning experiences. This investigation was designed to investigate the dynamic interactions between and among pre-service teachers, their knowledge base for teaching and instructional strategies, and the kindergarten children who they were instructing.

Method

Participants

Permission from the University Human Subject's Review Board was obtained prior to data collection. At the beginning of the semester the university students enrolled in a *Motor Skill Development for Children* course were informed of the nature of the study and asked to participate. All the potential participants were informed that their participation was voluntary and negative consequences would not result if he/she chose not to take part in the investigation. Undergraduate physical education majors (N=31; 9 males, 22 females; M age = 21 years, 9 months; sd = 13 months) enrolled in the *Motor Skill Development for Children* course, offered by the Department of Health, Exercise, and Sport Sciences at a major university in the southwestern United States served as participants in this investigation.

Service-Learning Program

Service-learning programs should not be confused with traditional undergraduate teacher education field experiences. Field experiences enable future teachers to interact in school environments, generally include observation and practice teaching, and serve as a pre-requisite to student teaching. It is important to note that field experiences are designed to primarily benefit and enhance the undergraduate student's education and knowledge in the area of teacher education. Service-learning programs are designed collaboratively to meet both the community and students. Community partners and agencies have a voice in setting the goals and designing the service project, In addition all service learning programs must include critical reflection components to assist students in linking academic content to their service experience (Anderson, Swick, & Yff, 2001).

The service-learning project was developed from the Professional Development School Collaborative (PDSC) initiative between the university and local school district. The PDSC proposed that university and local school district students, teachers, administrators and families would all benefit from increased collaboration between the two educational

institutions. Interested university and school district participants were invited to discuss innovative and non-traditional partnerships. As a result of these initial conversations, the principal at Wallace Elementary (Pseudonym) and university faculty in the Health, Exercise, and Sport Sciences Department at the university agreed to explore viable and meaningful methods of increasing elementary school children's participation in quality physical education.

The Motor Skill Development Program (MSDP) was created as a means of providing kindergarten children with weekly physical education while simultaneously serving as a forum for pre-service educators to plan, design, implement, and assess their authentic instruction. At the time the MSDP was created, kindergarten children at Wallace were not receiving physical education instruction from the school specialist. Limited financial resources within the district and school were cited as the primary reason for the lack of physical education instruction for the kindergarten children. Additionally, time and space commitments in the Wallace gymnasium did not enable university instruction to occur at the school. Consequently, arrangements were made and resources allocated to transport the kindergarten children from Wallace Elementary to the university twice a week for a period of eight weeks during the fall and spring semesters.

The Course

The *Motor Skill Development for Children* course is designed to provide pre-service educators with a theory-to-practice approach to teaching elementary physical education. Early in the semester the university students are introduced to theory, curriculum, instruction, and methodology as it relates to physical education instruction for children. The service-learning component of the course provides an opportunity for the pre-service educators to engage in physical education lessons while simultaneously offering kindergarten children the opportunity to participate in developmentally appropriate physical activity instruction.

Procedure

During the sixth week of the semester the pre-service educators began instruction of children. Kindergarten children from Wallace Elementary were transported twice a week for a period of eight weeks. Throughout this eight week period the undergraduate students provided the kindergarten children with individualized and group motor skill instruction. The curriculum was based on a mastery motivation approach to learning (Valentini, Rudisill, & Goodway, 1999). Additionally, the curriculum incorporated the instruction of skill themes and movement concepts (Graham, Holt/Hale, & Parker, 2007).

During the second week of the semester the participants engaged in an activity designed to assess and explore their comprehension of Pedagogical Content Knowledge (PCK). Each student was asked to write their definition and/or explanation of PCK on an individual note card. Following their individual recordings of their perception of PCK students then shared their thoughts within small groups, followed by groups sharing with the entire class. Assessment of the written and oral responses indicated that the students had little, if any concrete idea of what PCK meant. While the students acknowledge that PCK may be remotely related to teaching physical activity to children; there was no understanding that PCK was specifically related to knowledge and information regarding the instruction of particular content and subject matter to meet the needs of specific students in varied contexts.

As a part of the service-learning experience the pre-service educators completed eight weekly written journals. The journals were written in the format of a triple entry journal (Collier & Williams, 2005). Pre-service educators recorded events they participated in or observed during the lesson in the first paragraph. The second paragraph revealed specific feelings the pre-service educators may have experienced prior to, during, or after the lesson. The third and final paragraph explored the pre-service educator's perceived connections, or perhaps lack of connection, between the service-learning experience and academic class content discussed during the lecture components of the course. The participants were also informed that the content of the journal responses would not be graded, rather each participant received full credit for the journal as long as the journal included responses for the guidelines outlined above.

In addition to the journal entries, a random selection of participants (N = 16) individually took part in semi-structured interviews. On pre-selected days, during the last two weeks of the semester, all participants were invited and agreed to participate in the interviews. Random selection occurred by day and within teaching groups. For example, participants did not know on which day their group or who specifically from their group would be selected (via random numbers) to respond to the interview questions. The interviews were administered at the end of the semester. Interview questions were based on social-cognitive theory and were designed to ascertain information regarding student perceptions of their experiences in the service-learning program. Sample questions are displayed in Table 1.

1. Can you identify and describe what you were doing and thinking when you were teaching physical education to the kindergarten children? (personal factors and behaviors)
2. Was there ever a time when your child could not successfully complete a task? If so, what did you do? (knowledge, behaviors, environment)
3. How did you feel prior to, during, and after you instructed a physical education lesson? (personal factors)

Table 1. Sample interview questions.

Observation of instruction

Eyler (2000) suggests that research examining the impact of service-learning on student's academic outcomes must include measures designed to allow students to demonstrate their knowledge. Observing and calculating teacher and student behaviors during physical education instruction is a viable means of evaluating pre-service educators competence and knowledge in regards to designing effective lessons (Metzler, Tjeerdsma, & Mozen, 2000). A total of 12 randomly selected lessons (1 Teacher per lesson, 4 students per lesson) were coded during the kindergarten children's physical education instruction via the Computerized Observation System (COS). Random selection of lessons occurred by pre-selecting dates prior to the start of the semester. Consequently, the instructor and the pre-service educators had no prior knowledge of who would be teaching and what would taught on the days that had been selected to code prior to the study. The COS enables trained observers to code teacher and student behaviors by categories and calculate total percentages. Behaviors coded were: 1) student moderate to vigorous activity time (SMVPAT), 2) student

wait time (SWT), 3) student transition time (STT), 4) teacher management time (TMT), and 5) teacher knowledge time (TKT).

An integral component of a high quality physical education program includes engaging students in moderate to vigorous physical activity the majority of time during each lesson (United States Department of Health and Human Service 2000). Consequently, pre-service educators need to increase their PCK specifically related to designing lessons to promote students engagement in high amounts of moderate to vigorous physical activity. Leading scholars in elementary physical education recommend a minimum of 50% of moderate to vigorous activity during every class. SMVPAT was coded when the randomly selected kindergarten student was engaged in moderate to vigorous physical activity (i.e., walking, jogging, running, hopping, skipping (McKenzie, Sallis, & Nader, 19910). Activities as those listed above all qualify as MVPA according to NASPE (2004b). Specifically, moderate physical activities are those activities that require moderate intensity for relatively long periods of time without experiencing undue fatigue. Vigorous activity is described as "movement that expends more energy or is performed at a higher intensity than brisk walking" (Corbin and Pangrazi, 2002). SWT was identified when the observed kindergarten child was waiting for opportunities to participate in SMVPAT. STT coded occurrences of the observed kindergarten child changing from one activity to the next. TMT coded behaviors related to the observed teacher organizing children, equipment, and task involved in the lesson. Finally, TKT coded time the teacher spent communicating information directly related to goals of the lesson.

Two trained observers assisted with the COS data collection. Prior to coding the data for this investigation, the observers participated in instructional and practice coding sessions. The first session was designed to acquaint the coders with the software and process for entering data into the computer. Three additional sessions enabled the observers to code teacher and student behaviors during elementary physical education instruction. Inter-rater reliability between the coders at the end of the training period was r = .97. The random selection of lessons resulted in observing two male and 10 female teachers, and 48 kindergarten children.

Data Analysis

Weekly journal reflections and interviews

Content analyses were conducted to identify major categories from the journal and interview data (Patton, 2002). Three researchers independently read the journal entries and interview transcriptions numerous (5-7 each) times individually identifying and highlighting recurring statements. The recurring statements were then used to develop lower and higher order themes and finally major categories. The researchers then discussed their independent findings and collectively came to consensus on the most salient themes which formulated the major categories. Major categories met the following criteria: a) each researcher independently identified the category, b) all three researchers identified the same category, c) the category was identified in the weekly logs and the interviews. The integrity of this process was assured via a confirmability audit by an external reviewer. The external reviewer was given specific quotes from the journals and interviews and asked to place the quotes in the themes previously established by the researchers. Inter-rater reliability of the confirmability audit was .87

Results

This synopsis of information including selected quotes and paraphrases from the weekly journal reflections and interviews highlight the main findings. Participation in the service-learning experience provided the pre-service educators with multiple opportunities to increase knowledge encompassing developmentally appropriate physical activity instruction for young children. Analyses of the journal and interviews demonstrated that PCK for the participants. The increase in PCK represented constructive and positive changes in the participants. Increasing PCK enabled the participants to adapt and modify motor tasks for the kindergarten children. Modification of the tasks resulted in providing the kindergarten children with high percentages of engagement in moderate to vigorous physical activity. Specifically, participation in the service-learning program enhanced the pre-service educators' pedagogical content knowledge (PCK) and revealed that pre-service educators experienced a wide array of positive and negative emotions during their service-learning teaching sessions. Data from the COS suggests that pre-service educators designed lessons that promoted children's engagement in high levels of SMVPAT which is a reflection of their PCK.

Weekly Journal Reflections and Interviews

Results of the content analyses of journal entries and interviews revealed that the pre-service educators reported gains in PCK. PCK enables teachers to utilize educational techniques specifically related to particular students and content matter in varied contextual settings. Physical education teaching strategies that were consistently identified by the pre-service educator's included: teacher's use of modeling and demonstrations, visual and verbal cues, increasing and decreasing task difficulty, and providing the kindergarten children with positive corrective feedback. These strategies are all examples of PCK.

Modeling and demonstrations

All participants reported that modeling, or visually demonstrating the skills to kindergarten children was a valuable instructional strategy. One student commented:

> For me the best thing for Virginia was to show her, because if I tried to tell her sometimes I don't think she understood what my words meant and so if I would actually show her it would help a little bit and sometimes it would take showing her over her over and over.

Another student stated:

> If I just said can you show me how to hop, he would hop on his foot once or twice and then he'd like fall over; but if I showed him kind of how to keep his balance he could really do it…I showed my kid how he was supposed to be doing the activity. He seems to grasp it better than if I just told him how to do it…He seemed… He was like, oh that's how you do it and then I thought that worked really well!

Cues

Twenty six of the 31 participants revealed that using visual and verbal cues during instruction assisted the kindergarten children's motor skill performance. One student stated:

> The cues helped…going over the cues for throwing, like telling her step with the other foot and then aiming with the pointer finger; for each part of the

> throw we had different cues..the cues were helpful because they could say it to themselves and had something to remember to go over it. Kind of like when they hear songs they remember because of the words and the different things and this way they have something to say while they are doing it "step and throw."

Another student wrote:

> Anna was having trouble keeping her hands in the right position for a high catch. I told her to pretend she had Mickey Mouse ears, despite showing her the drawings on the wall,. Every time I said "show me your Mickey Mouse ears" she understood to keep her fingers and thumbs together.

Task Extension

Twenty-nine of the 31 participants communicated that learning how to increase and decrease the difficulty of the task was a critical teaching tool.

One student reported:

> I made sure to increase the difficulty at each station. I could see he (the kindergarten child) did better when he was challenged. We started out jumping over the blue boxes and then we used our arms so we could jump higher.

Another student commented:

> I also think I could better understand how my child likes things by making the skill more difficult or easy for him..like take walking on the balance beam…how to make that more difficult, you know. Have them do it backwards, do it sideways. If it was too easy, balancing something on their head, or I would throw a yarn ball to her and she would have to catch it as she was going …it helped challenge her to do something harder.

Feedback

Twenty-eight participants revealed that providing the kindergarten children with positive and corrective feedback was an important instructional strategy.

One student commented:

> As a lead teacher it was helpful just kind of getting in there and giving encouragement and maybe a little background help. Kind of some hints for the kids.

Another student wrote:

> I saw how much positive feedback really does make a difference in the way Eric acts. The better he is at a skill, the more fun the lesson will be for him and me. When I am more attentive to what he is doing he seems to try harder.

In addition to reporting the teaching strategies learned and utilized during participation in the service-learning program the pre-service educators also communicated the influence participation in the program had on their affective domain.

Affective Orientations
All of the pre-service educators wrote about experiencing both positive and negative emotions throughout the lesson; one student wrote:

> I loved this lesson! Usually I get a little winded from the activities that are planned, but this week it was a nice change. I am getting a little frustrated with Tanisha because she had a hard time listening to direction. She often rushes to an activity without even knowing what is expected. I did feel very happy though and proud when I got the opportunity to help her learn to swing a bat, I stood behind her and helped her swing, I felt sort of like a parent..it was nice. I think I am beginning to understand the true meaning of patience though.

Examples of students experiencing negative emotions came through in this students' journal:

> I felt a little frustrated because my child would start an activity and then get embarrassed half way though and want to quit. I tried to let him know that it was going to be o.k. I thought if I encouraged him enough he wouldn't want to quit. I learned that children can change their mind in the blink of an eye.

All of the students revealed experiencing positive emotions; one female student reported:

> I felt great to be a teacher, or maybe big sister. I love to see Michael having fun! I love it when he does well, I am so excited that I helped Michael throw a ball properly, I react with enthusiasm and excitement, I like to know that I am there for them and that the kids feel like they can come up to me and ask me questions on how to do something, I have also learned that just because children come from a low socio-economic school doesn't mean that they can't have the same education. I assume these children will grow up and remember what a great time they had here—and I hope they will remember me as well.

In addition to the qualitative results collected via the interviews, quantitative data were gathered to assess teacher and student behavior during physical education instruction. The assessment of teacher and student behaviors during instruction time was used as an indirect measure of pre-service educator's PCK (Metzler, 2000).

Observation of Instruction
Teacher and student behavior data collected through the COS demonstrated that pre-service educators designed and implemented lessons that promoted student activity time, minimized teacher management and student transition time, and communicated knowledge

encompassing skill instruction. Means and standard deviations for the coded behaviors are displayed on Table 2.

Observed Behavior	Percent Time of Lesson	
	Mean	SD
SMVPAT	65.56	3.87
SWT	.31	.13
STT	12.77	1.75
TMT	10.18	1.97
TKT	11.13	2.88

Table 2. Means and standard deviations for observed student and teacher behaviors.

Discussion and Implications

PCK has been described as the interaction between the unique pedagogical knowledge of subject matter, curriculum, pedagogy, and the process of learning (Shulman, 1987). In addition, PCK encompasses information related to a particular subject matter (e.g., physical education, skill themes & movement concepts) to a particular group of students (e.g., kindergarten children) in a specific context (e.g., service-learning program). Scholars in the discipline of physical education teacher education have explored PCK as a multifaceted construct in a wide array of settings (Graber, 1995; McCaughtry & Rovegno, 2003; Metzler, Tjeerdsma, & Mozen, 2000; Rovegno, 1993, 1994, 1995). How to teach specific subject matter given the diversity of learners, school contexts, teacher values, and curricula has been and is widely debated in the discipline of physical education (Fernandez-Balboa, Barret, Solomon, & Silverman 1996). Scholars do agree however, that a pivotal area of expertise for successful teachers is their understanding, scope, and proficiency in pedagogical content knowledge (Griffin, Dodds, & Rovegno, 1996). The ability to integrate knowledge of learners, teaching strategies, and curricula promotes student learning; consequently PCK development is crucial not only to pre-service physical educators but to all pre-service educators in all academic disciplines.

Social Cognitive theory provides an avenue to investigate the development of PCK in pre-service teachers. This theory incorporates behavior, environment and personal factors as a means to investigate PCK. Specifically, when investigators can place pre-service teachers into an environment (imposed environment), they may be able to examine those themes that may become more salient to the teacher in light of their personal factors and behaviors. This process may then compose their interpretations of their selected and constructed environments.

In this investigation, the interaction of the environment, personal factors and behavior afforded the pre-service educators multiple opportunities to increase their knowledge base for teaching. Specifically, the imposed environment of the service-learning program required the pre-service educator to instruct physical education lessons to kindergarten children. Results from the content analysis of the journal entries and interviews suggest that participating in the service-learning program increased the pre-service educators PCK. Repeatedly students reported gaining an understanding of the importance of using modeling

and demonstration strategies during instruction. Additionally, results highlighted the salience of verbalizing developmentally appropriate cues to enhance kindergarten children's performance and learning. The increase in PCK emphasizes the fact that these pre-service educators, through the imposed environment, helped form their selected and constructed environments. Specifically, the imposed environment, (service-learning program), required the pre-service educators to process, understand, and respond to the kindergarten children. The choices the pre-service educators made during this time period comprised their selected environment. The resulting behaviors, acquiring and utilizing PCK and feeling positive and negative emotions became the pre-service educators constructed environment (see Figure 2).

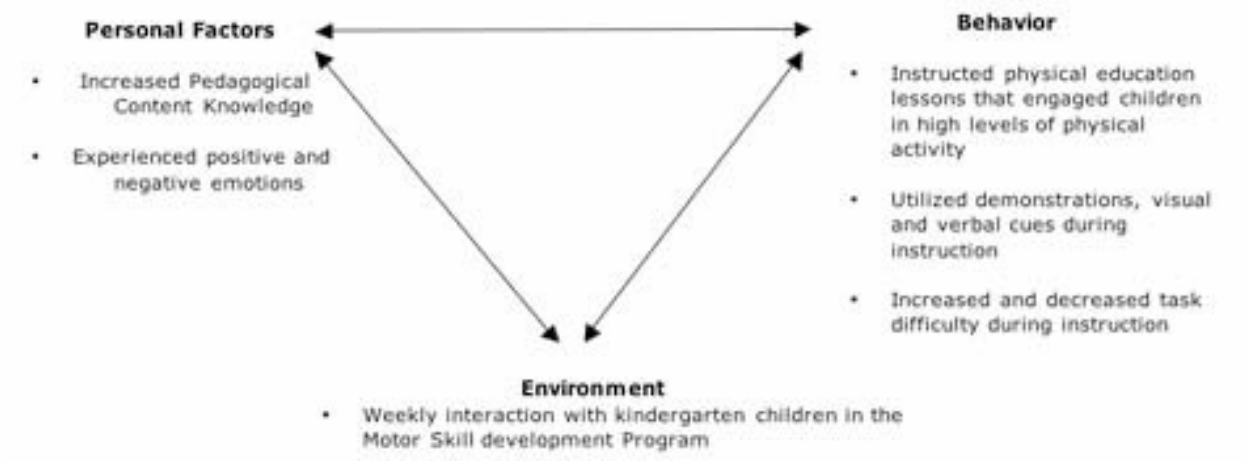

Figure 2. A model diagramming triadic reciprocal causation explaining pre-service educators' knowledge base for teaching (Adapted from Schunk [2004])

Examination of the themes that were garnered from the journal writings lend further support for the importance of the interaction between the environment, behavior and personal factors. One of the important themes that may impact the environment is that of emotion. While this study focused on examining acquisition of knowledge in pre-service teachers it became evident that emotion was a strong theme. In particular, preparing, implementing, and reflecting on their lesson and instruction prompted a wide array of emotional reactions from the pre-service educators. Students consistently reported feelings of extreme nervousness and high anxiety prior to teaching. This may be important information for faculty who work with future teachers and who work from an imposed environment.

A second factor to consider when trying to enhance PCK that occurred as a result of this study, was the pre-service teachers' ability to learn to communicate via learning strategies. For example, several of the students learned to use cues to enhance motor skill learning. According to many of the responses from the pre-service teachers, the cues acted to provide the kindergarten children with verbal information. The pre-service teachers also reported the importance of providing learners with demonstrations of the movement to be acted out (modeling). In some instances, the pre-service teacher reported that some of the children seemed to not understand the movement via verbal cues but responded instead to visualization/demonstration. Other important teaching strategies include task extension,

and feedback. Task extension is the concept of changing the difficulty (harder/easier) to match the learning of the individual. Feedback, when it is positive and corrective can have a profound effect on a learner. Utilization of these teaching strategies may also be a reflection of the pre-service educators understanding of the cognitive developmental levels of the kindergarten children. Using cues and demonstrations enhances young children's processing of information during motor skill instruction (Meaney, 1994).

Finally, students enrolled in the service learning class in this study demonstrated an increase in PCK through their ability to engage kindergarten children in SMVPAT. The engagement in SMVPAT lowered SWT, STT and TMT. Without any gains in pre-service teachers PCK, the students would likely have demonstrated the opposite. Student wait times, transition times and time management would have increased while student moderate to vigorous physical activity time would have decreased. Utilizing PCK enabled the pre- service educators to provide specific feedback to the kindergarten children to increase or decrease the level of task difficulty and engage the children in developmentally appropriate motor tasks. Lack of engagement could have resulted in children's off-task behavior which may have impacted the amount of time the pre-service educator devoted to management and instruction time which ultimately could have detracted from SMVPAT.

Previous research has demonstrated differences in student wait time and management time due to teacher experience (Griffey & Housner, 1991). Findings showed that the experienced, as compared to inexperienced teachers, minimized wait and transition time which resulted in greater moderate to vigorous participation time for students. The researchers suggested that the experienced teachers in depth procedural knowledge of classroom strategies and instructional routines contributed to the observed student behaviors. The results of the present investigation suggest that pre-service educators participating in a service-learning program may develop PCK strategies that result in the promotion of SMVPAT. Given the important role SMVPAT has in the development of high quality physical education programs (Graham, Holt/Hale, & Parker, 2007; USDHHS, 2000) future service-learning research should be conducted to replicate this finding.

Student time on task is a significant predictor of student performance (Parker, 1989). Again, this may be important information for others who incorporate service-learning into their pre-service educators' experiences. If pre-service teachers do not increase their PCK, they will likely have more time spent in management, student wait times and student transition times. This information is may also be important due to the time constraints that teachers in all content areas struggle with.

While this study demonstrated the benefit pre-service educators gained from participation in a service-learning program, future studies may wish to address limitations occurring during this investigation. Ideally comparing students engaged in this service-learning course with undergraduate students enrolled in a similar course with no service-learning component would be optimal. Unfortunately at the time of this study an experimental design was not viable. Although COS data was used as a measure of pre-service educators knowledge base we also relied on self-report data. Future studies may need to implement other measures that may be directly observable regarding PCK in the imposed environment. In addition to using self-report data, the length of the class (8 weeks) poses constraints. If these same pre-service educators were to teach across an entire semester would they continue to make gains in their PCK? Third, the age of the learners could impact the outcomes as reported by the pre-service teachers. For example, when teaching adolescents, gains in PCK could be influenced by other mediating variables (i.e., student behavior and attitude. Examining

factors that impact pre-service teachers PCK during instruction of secondary students is critical. In addition, pre and post assessment of the kindergarten children's motor performance would also be a valuable measure to include in future service-learning studies. Acknowledgement of these limitations should not minimize the profound impact service-learning programs have on pre-service educators knowledge base for teaching. Faculty instructing in teacher education programs in all academic disciplines should consider implementing service-learning programs in their respective disciplines.

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