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PEDAGOGY

Examination of Student Cognition and Instruction of Domain-Specific Lesson Goals

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Abstract

This study examined preservice teachers' instruction of goals in specific learning domains in physical education class and students' interpretation of these goals. Four preservice physical education teachers (all male) from a large urban university taught two lessons to eight sixth-grade students at an urban K–6 elementary school. The theory of cognitive mediation was the framework for this study. Piloted qualitative methods included video recordings of each lesson, stimulated recall, two 20-to-25-min semistructured interviews, and collected lesson plans. Data were analyzed through the constant comparative method. Three major themes emerged: goals for incorporating skills into game play were difficult to identify, affective goals were not explained, and cognitive goals were not implemented. Results indicate that teacher-training programs should develop strategies that will assist students to identify the domain goals of the lesson. This study indicates specifically the areas in which domain goals are lacking during the instructional process.

Lessons including all three learning domains in physical education (PE) can contribute to the student learning experience during PE class. These domains include psychomotor, affective, and cognitive (Ayers, 2004; Holt & Hannon, 2006). The cognitive domain

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consists of knowledge and the development of intellectual skills; the affective relates to areas of feelings and emotions, individually and socially; and the psychomotor refers to physical movement or motor skills (Anderson & Bloom, 2001; Baker & Rozendal, 2019). When preservice teachers (PST) incorporate all three domains into their lessons, learning tasks may become more meaningful and may assist students in developing the competencies needed to become physically educated individuals (Sun et al., 2017). These competencies may create a foundation for future movement and participation in physical activity (Mullins et al., 2019) and may be associated with activity when students enter middle school (Pate et al., 2019).

PST, however, may not implement activities to meet objectives in all three domains. They may highlight skill development and game play rather than incorporate affective or cognitive domains during instruction (Bernstein & Phillips, 2015; Hung et al., 2017). Students should clearly understand all domains (Ayers, 2004; Placek & Dodds, 2001). Yet this may not be the case, because PST may assume skill-based activities accomplish many of these domain-specific goals (Law et al., 2018).

The theory of cognitive mediation (Lee & Solmon, 1992; Solmon, 2006; Solmon & Lee, 1997) grounded several recent studies in student learning, motivation, and participation during physical activities, and it served as the framework for this study (Hodges et al., 2014; Jin & Yun, 2013; Lodewyk & Gao, 2013). This theory highlights that teacher instruction is a mediating factor, only to the extent that students are actively engaged in that instruction. Therefore, students' perceptions and actions during instruction and practice have a profound effect on students' potential to learn. It is not only teacher cognition and implementation of domain-specific goals that are important but also students' perceptions of these goals. According to this framework, teachers should structure lessons that encourage students to learn. If students are not clear on the goals of instruction and activities the teacher presents, there is a chance that learning will not occur to the extent the teacher anticipates. Students often perceive and understand activities differently from the teacher, and it is imperative teachers recognize students' understanding of domain content (Dodds et al., 2001).

Students bring their own ideas and thoughts about subject matter; therefore, it is important to look at their perspective (Sun et al., 2017). If students do not understand or perceive activities as teachers intend, learning is less likely to occur. Having instruction that students understand and that incorporates all domains may create a more productive instructional base. This is especially necessary when students transition into middle school, where physical activity often declines (Sallis et al., 2000). Successful instruction in PE may counter this trend. Identifying misconceptions between preservice teaching and student learning is an area needing exploration (Hushman et al., 2013). Therefore, the connection between teachers' incorporation of domain learning and their understanding of the role of domain learning is crucial for effective instruction and for students to participate actively in their learning (Solmon, 2006).

The purpose of this study was to examine the goals PST develop in the different learning domains and students' perceptions of these goals through the activities the teachers implemented. The questions guiding this study were, first, are teachers imparting different types of goals, within the three domains, to elementary school students, which they are learning in their coursework? Second, are the preservice PE majors able to impart instructional goals that students understand?

Method

Procedure

This study used interpretive qualitative methods to understand both student experience and translation of this experience into the specific learning domains of psychomotor, affective, and cognitive. The study received both University Institutional Review Board and New York City Department of Education Institutional Review Board clearance. The piloted methods were semistructured interviews, field notes, and observations, and stimulated recall brought forth information on domain learning during instruction and on students' understanding of those domains. Both the teachers and the students were interviewed regarding the taught lesson, and their answers were compared to see if the instructional domain goals were met.

Participants and Setting

Four male preservice PE teachers who were enrolled in an Introduction to Teaching PE course in a large public, urban university consented to participate in this study. The PST taught their lessons at a local, urban, K–6 public school. Eight sixth-grade students, six male and two female, were randomly selected from the 15 students who returned consent forms and volunteered to participate. These students participated in the PE class the PST taught in the public school. The school administration gave permission for two students from each group to be interviewed after each lesson; therefore, two for each of the four teachers, eight students in total, were allowed to be interviewed. The volunteer PST and the participating urban school's administrator signed consent forms. The parents of the students signed consent forms and the students signed assent forms to participate in the study. All participants, students, and teachers chose pseudonyms.

Semistructured Interviews

The piloted semistructured interview guide (Patton, 2002) was developed after an extensive review of literature focusing on student and teacher cognition and domain-specific learning (Allison et al., 2000; Dodds et al., 2001; Lee & Solmon, 1992). These questions were then further developed and discussed with teacher educators in the field of PE. The questions focused on the taught domain-specific content, as related to the observed lesson goals. The PST completed two 10- to 15-min semistructured interviews (Seidman, 2012). The questions were asked before each of the two observed lessons. The questions related to the types of goals for each lesson and the activities the teachers intended to use to help students understand and identify the goals for the lessons. The PST were asked, "What are your goals for this lesson? How do you intend for the students to learn about those goals? Specifically, what activities are you using to teach about the different goals?" Two students for each PST were then interviewed after each videotaped lesson.

Lesson Plans

PST, prior to the initial interview and before teaching the lesson, submitted written lesson plans. In their teaching course, PST were

taught to write observable and measurable goals and objectives for students in the sixth grade. They then developed activities through which they could determine whether students, after practicing the activity, met the objectives of the lesson. The goals and objectives were reviewed often throughout the first weeks of the semester. When the PST taught at the schools, the lesson plans required goals and objectives for each domain, a detailed explanation of the activities intended to meet the goals in each domain, and the cues that the PST were to use to teach the content. In addition, the connection between both the state and national standards and the domain-specific goals were also highlighted. PST in this teacher education program were assessed on the connections between the standards, objectives, and activities used during each lesson.

Nonparticipant Observations and Field Notes

For each teacher, we observed two class sessions. During this time, we recorded nonparticipant observations and field notes (Patton, 2002). The PST taught volleyball, floor hockey, and basketball, using the multiactivity model. Each class lasted for approximately 1 hr.

Stimulated Recall

We reviewed literature on stimulated recall (Calderhead, 1981; Ericsson & Simon, 1980; Keith, 1988) to capture the reflections of students regarding the lesson they had just experienced (Forman, 1999; Morgan, 2007). The PST were videotaped teaching lessons to the sixth-grade students. The videos were used for stimulated recall. All volunteer participants gave consent for videotaping. Two lessons were videotaped. The students were given the opportunity to watch a video recording of the lesson in which they had participated. While students watched the lesson, they were able to recall their experiences in the activities and were asked questions focused on domain learning (Calderhead, 1981; Forman 1999; Morgan, 2007). The students were then asked questions about the sections of video the teacher had highlighted. This helped us to understand if the students' domain learning experience was the same of the goals of the lesson.

The focus of the interview was the students' ability to describe the goals of the lessons and make the connection between the activities they had performed and the goals the PST had intended through those activities. The students were interviewed for approximately

30 to 40 min, during which time they watched the recorded lesson. During the interview, the recording was occasionally stopped for the students to comment on what had occurred related to the goals and activities of the lesson. The same students were interviewed after each of the two lessons taught by the same PST. The questions to which the students responded included What were the goals for the lesson, according to your experience? Why do you think these were the goals? What activities/actions did the teacher do to make you think those were the goals or what strategies/tactics did the teachers use to highlight the goals of the lesson?

Data Analysis

Ariela Herman collected all the data, which were transcribed. The volunteer PST and the students member checked the data. Changes were noted and immediately implemented. Data from semistructured interview transcriptions, teacher lesson plans, and observation and field notes were entered into NVivo 10 (QSR International, Victoria, Australia). The data were coded for each lesson observed. Teachers' responses for domain goals and students' responses of their understanding of those goals were coded separately for each lesson. Teachers' responses were also compared to their lesson plan domain learning objectives. The teachers' responses for domain goals were then compared to the students' responses. These data were then analyzed through the constant comparison method (Glaser & Strauss, 1967) for emergence of patterns and themes. The analysis focused on the teachers' presentation of the goals for the three domains in their PE classes and whether students understood the activities were intended to meet different goals in the different domains.

A peer reviewer, Eve Bernstein, read all the transcripts and reviewed all the data including lesson plans, observations, and field notes. At this time, she made notations regarding the generated conclusions. Next, she shared insights about the teachers' instruction of domain-specific learning and students' interpretations of the teaching, on the basis of the data, and themes were modified when necessary. The themes went through several rounds of review before being finalized. For further trustworthiness and credibility of the results, all data were triangulated and the finalized themes were

checked for negative cases. The teachers reviewed the themes and agreed with the conclusions reached.

Researcher Background

Both Herman and Bernstein are professors in a large, public, urban university. They both have over 20 years of experience teaching PE with diverse populations in large urban settings. Herman, who collected the data, has extensive experience working with PST in the development of objectives and activities to meet the needs of students in all learning domains.

Results

In many cases, the teachers' instruction did not match students' understanding of the domain goals. Three themes emerged in terms of student and teacher cognition and lack of understanding of specific learning domain goals. The first theme was goals for incorporating skills into game play, specifically related to the psychomotor domain, were difficult to identify. The second theme was affective goals were not explained. The third theme was cognitive goals were not implemented.

Goals for Incorporating Skills Into Game Play Were Difficult to Identify

During the observed lesson, the teachers utilized drills to focus practice time for the students on the specific skill. Teachers were very clear about these isolated goals in the psychomotor domain. One example happened during the instruction of the use of a forearm pass/bump in volleyball. Alan described his drill: "I plan on having them pair up and just bump the ball to each other with one toss, then after five minutes step two steps back the distance, change it a little bit." When asked about the goals of the lesson, the students responded that "[Alan] taught [them] how to pass the ball . . . [they] practiced how to pass the ball to each other." When asked to identify the activities, the students, while watching the tape after the lesson, continued by saying, "He taught us that . . . if you bend your elbow, it will just go back and hit your face, but if you have your arms straight, then it will just go straight up." The cues given and the activities implemented assisted the students in their understanding of the goal of the lesson.

Isolated skills, although incorporated in modified game play, were not often understood in authentic game situations by the students. In many cases, the goals of the modified game-play situations in which students used these psychomotor skills were very clear to the teacher; however, to the students, the goals of the modified game were not defined. For example, for his volleyball lesson, Bob stated, in his interview and his written lesson plan, he wanted the students to be able to "perform the overhead pass correctly." He further explained this goal, saying he would modify the game

> [for students] to use at least two overhead passes, [hitting] the ball a maximum of six times. I want them to set up for their teammates and complete at least two overhead passes before bumping or setting it over the net. So that would be another goal.

This goal did not translate to the students. While watching the video of the lesson, one student in the group responded,

> We did setting across, over the net, back and forth, and then he made [us] do this strategy that when he passes the ball over the net, then I have to pass it to him, then [my friend] has to pass it back, and I have to hit it over the net to see if I could get a point.

Although this student was able to describe the activity and the use of the overhead pass, the goal was not connected to simulating a game situation; rather, the goal was to use the skill to score a point in the activity.

Similarly, David stated, "Basically . . . I'm teaching a new [hockey] skill today, backhand passing, so my goal for them is to be able to pass to their partner for a distance of ten to fifteen feet accurately." This was also stated in his lesson plan. When asked after this lesson about the specific goals, the students responded that "the goals for [the] lesson were to learn how to do a backhand shot and to learn to pass." The students were able to describe the goal of passing and the specific backhand movement they were intended to learn. The isolated skills in the context of game play, however, were not as clear. Although in David's lesson plan the activity was written in specific terms, David was not able to impart this to his students:

> I'm just going to let them play a game and have fun and hopefully I will see the skills that we taught over the past four weeks or so, and I want to see those skills used in the game. Including a forehand pass, a backhand pass, a slap shot . . . I just want to see them pass to their teammates which we haven't seen during the last week.

When asked regarding the goals of the lesson, one of the students responded, "To learn how to shoot [and] pass . . . learn how to shoot the three shots we learned . . . there were three different shots. There was a slap shot, there was a wrist shot and a backhand." The students were able to describe the isolated skill of shooting, but neither student in the group was able to connect learning the isolated skill of shooting to the incorporation of those skills into game play, after watching the playback of the video.

In one case, however, the students were able to identify the goals during game play. The teacher, Chris, stated that his "goals [were] to go through the skills, hopefully they improve on them, restate the [basketball] rules to them, and hope they can take that to a game." He was not specific what he wanted the students to "take" to a game. He stated he would focus on isolated skills through station work and then have small-sided game situations. During the lesson, the students did exactly what he intended. They practiced isolated skills during the early parts of the lesson and engaged in game play toward the end. When asked after the conclusion of the lesson about the goals, the students described what they did and said, "And then we got to a game." When asked about the goals of the game, one student mentioned "[they] combined all the lessons [they] learned in the game." Although these students could not specify the specific goal of the game, they did, in their own words, describe that the goal was to use all the skills they had learned during game play.

Affective Goals Were Not Explained

For the various sport activities, teachers stated their goal of teamwork and described specific activities. When asked during their interviews about the goals of the lesson, the students mentioned the goal of teamwork; however, the reason was not based on the activities the teacher presented, but rather the general need of completing the necessary skill to play these sports. Affective goals were identified

primarily by the teachers, who used the words "teamwork" and "cooperating." Affective goals were not specifically mentioned. These terms focused on affective behaviors expected from the students during the activity or competitive sport. Often, the teachers utilized these terms without any additional explanation of their meaning. For example, in one of his lessons, Alan stated, "We are going to work on shooting, [using] teamwork to achieve a basket." He went on to say, "Well, also I have a social goal for them . . . just basically to see if they interact well with one another."

Alan used the rule of passing a minimum of two times so students would use that skill. During the lesson, Alan required the students to pass so they could work on the psychomotor goal of passing, rather than the underlying affective domain of teamwork. When asked about his plan to get this goal across to the students, Alan said he required them to pass the ball, a psychomotor skill. He made no connection to the affective outcome of passing the ball. One student stated that the goal for the lesson was "teamwork, [because they] had to pass to each other. [They] had to pass it two times before [they] could [shoot]." Passing is an important component of team sports, and the teachers and students typically associated this skill with teamwork. It is unclear, however, whether the teachers or students were highlighting the affective domain with the goal of teamwork or simply the psychomotor skill of passing. In addition, an activity related to the affective domain was not clearly stated in the lesson plan.

One of the students, when watching the video, was unable to define these terms such as teamwork. This student stated, "I just learned it . . . because in order for everything to work properly you have to form a good alliance with your partners." There was no mention of highlighting the affective domain or activities implemented during the lesson, but rather a general understanding that team games need players to work together.

Bob mentioned, "One of the affective goals is for [students] to be able to show sportsmanship during the [game]. I'm going to have them playing a game, which will include . . . to cheer on teammates as well as opposition." He gave no specific example of how this was going to be done, other than it is something that children do during game play. When asked about the goals of the lesson, however, the students did not identify a goal in the affective domain, although

the teacher expected the students to describe sportsmanship as his goal for the lesson. Their answers only focused on the psychomotor domain: "We did setting across, over the net, back and forth."

This lack of attention to the affective domain might have occurred because the only activities the teacher required during the lesson involved partner work. No game was implemented during this lesson, which would have allowed for the typical experience of sportsmanship associated with game play. Because the use of the affective domain was not clearly defined, students were also unclear in their description of the teachers' goals.

Cognitive Goals Were Not Implemented

In their lesson plans, the teachers used cognitive objectives. Teachers asked questions about the activity to determine student understanding. Often, however, this closure activity was not implemented during the lesson. When asked during his interview about his goals, Bob explained, "My cognitive goals are . . . for the students to be able to answer the questions after I complete the lesson on how to demonstrate an overhead pass." When asked about the cognitive goals, Bob stated,

> I am going to ask them questions about the proper form . . . what's the starting position for the overhead pass. If they tell me their thumbs should be aligned with their eyebrows, which is correct, I'll know they know the proper form.

Although Bob's intention before the lesson was to focus on this cognitive piece, it never materialized during the lesson itself. In this instance, when interviewed, the students could not identify this as one of the goals of the lesson, because the PST did not ask questions at the end of the lesson. The students did not mention that this goal had occurred. In another lesson in hockey, Chris' goal was "to make sure [students] understand penalty calls." He intended the students to understand that goal by having "the two people that are not playing [sit] on the side talking to the assistant teacher [and] letting him know what's a penalty and what's not, so they have their cognitive learning." In observing this lesson, the teacher sat with the students on the side and discussed the activity taking place but did not focus on occasions when penalties occurred, rather on the game itself. The

students, however, were unable to determine that knowing different penalties was a focus of the lesson. It was not a clear focus of the lesson. One student described the focus of the lesson this way: "You really needed to get into position to shoot it in. If not, the other player would take the puck away from you."

In one case, rules were clearly highlighted. Chris explained that "one of his goals [was] to go through and [restate] the rules to the students and hope that they can take that into a game." He stated "the basic rules like double dribble, traveling, take the ball back [in half court situations]." When asked about the goals of the lesson, the students responded, "Shooting, passing, dribbling . . . and the rules." One of the students in the group was able to recall that the rules were an important component of game play. The student continued, "At the start, [the teachers] pointed us to those things . . . and if we double dribbled, they would tell us that we doubled dribbled." The students, in this case, were able to describe the rules as an important cognitive goal because that had been the teacher's focus. They described the goal in specific ways, focusing on exactly what the teacher did to relay this information to them.

Discussion

The purpose of this study was to examine PST goals in the different learning domains and the extent to which their sixth-grade students were able to identify these goals. In this study, students expressed their thoughts about their understanding of learning domains in PE class.

This study shows that some domains teachers present during instruction do not translate as clearly as teachers intend. Moreover, the importance of the psychomotor domain may exceed the cognitive and affective domains (Bernstein et al., 2013; Harvey & O'Donovan, 2011). The theory of cognitive mediation suggests that activities students participate in during class are a mediating factor between what teachers plan and what students learn (Lee & Solmon, 1992; Solmon & Lee, 1997). The students may come to class with preconceived notions about what they are to learn regarding goals in all the domains (Dodds et al., 2001). In this case, students did not understand or identify cognitive and affective goals, and PST did not always consider their students' interpretations of the goals of the different activities (Fletcher et al., 2018).

Elementary school is when students start to have insight regarding PE class. In middle school, however, physical activity often declines (Kercood et al., 2015; Phillips et al., 2019; Phillips & Silverman, 2015). This decline in physical activity may result in obesity and other health problems (Geva et al., 2019). Because schools are funding PE programs with staff and resources, it is important to understand how PST interpret and plan instruction. Part of this planning involves examining students' understanding of goals in all learning domains (Ayers, 2004; Griffin & Placek, 2001). Especially for beginning teachers, managing the students and the activity is generally the focus, rather than student learning (Ntoumanis, 2001). Experienced teachers plan with specific instructional strategies that will help students succeed, whereas those with less experience tend to focus on the activity itself and the behavior of the children (Brown & Cox, 2014). To create a productive learning environment in their gymnasium, inexperienced PE teachers need to be aware of all learning domains during their lessons (Walls et al., 2002).

Although teacher preparation programs teach PST to plan goals and objectives in all three learning domains (Bailey, 2006), this does not always translate to the actual lesson. PE teacher candidates need to consider and apply domain goals throughout the activity. Thus, providing students with a fuller understanding of affective and cognitive goals during the learning process may give them a fuller understanding of the activity (Hung et al., 2017). Teachers need to structure lessons by incorporating a deeper understanding of learning domain–centered goals so students have a fuller learner experience (Solmon, 2006). This includes both cognitive goals and affective goals.

Understanding cognitive goals can increase student motivation and self-regulation during activities (Ommundsen, 2003). Cognitive understanding positively relates to a continuation of physical activity (Sibley & Etnier, 2003). Scaffolding these cognitive tasks with written assignments may be more useful than relying on the activity itself (Zhu et al., 2009). In addition, affective goals play an important role in learning (Wright & Irwin, 2018). Students share these goals with other students during the class; however, it is important they understand this goal of sharing them (Koekoek & Knoppers, 2015). During PE class, affective goals affect motivation and continuation

in the activities (Xiang et al., 2006). Teachers play a crucial role in shaping the activities and linking those activities with the affective component (Garn & Cothran, 2006).

The teachers in this study were not aware the planned activities did not meet the goals in the affective and cognitive domains. This finding aligns with other research that highlights the activity is the focus, rather than careful outlining of domain-specific instruction (Bernstein et al., 2021; Harvey & O'Donovan, 2011). Approaches on incorporating affective and cognitive domains are being reexamined (Casey & Fernandez-Rio, 2019), as well as some development of frameworks and curricular models for use by teachers (Dudley, 2015). This study specifically outlines how teachers can approach their instruction in a more effective manner.

Although this study has a small number of participants focuses on one grade level, it takes an important step in understanding the approach of PST to incorporate domain learning and students' perceptions of that instruction. Future research can focus on understanding of goal domain information presented through activities (Dudley & Burden, 2020). This may allow teacher preparation programs to better educate PST about the methods and strategies that work well for teaching in the affective and cognitive domains. If the goal of PE is to have students continue in physical activity, it will be necessary to explore their understanding in all three domains of learning. Further research needs to investigate the types of specific goals teachers have in the cognitive and affective domains and students' understanding of that instruction. Both domains need to be incorporated for the students to have a fuller learning experience (Demetriou & Wilson, 2009). Teachers can use this information to develop meaningful activities that allow students to truly understand goals in those domains.

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