



Pre-Service Teachers' Subject Matter Competency and Quality of Teaching Practices: An Exploratory Case Study

Wei Yun Chen¹ and Kristin Hendricks¹

¹School of Kinesiology, University of Michigan, 1402 Washington Heights, Ann Arbor, MI 48109, USA.

Authors' contributions

This work was carried out in collaboration between two authors. Author WC designed the study. Authors WC and KH designed the AQTR and BOGPI and carried out all qualitative and quantitative data collection. Author WC performed the statistical analysis and wrote the first draft of the manuscript. Author KH managed the literature searches and edited the manuscript. All authors read and approved the final manuscript.

Article Information

DOI:10.9734/BJESBS/2015/13306

Editor(s):

(1) Ali Kazemi, Department of English, Yasouj University, Iran.

Reviewers:

(1) Anonymous, State University of Padang, Indonesia.

(2) Chi Cheung Ruby Yang, The Hong Kong Institute of Education, China.

Complete Peer review History: <http://www.sciencedomain.org/review-history.php?iid=693&id=21&aid=6749>

Original Research Article

Received 12th August 2014
Accepted 5th October 2014
Published 24th October 2014

ABSTRACT

Aims: This study examined how the pre-service teachers with strong subject matter competence quantitatively and qualitatively differed from their counterparts in teaching practices.

Methodology: Thirteen pre-service physical education teachers (8 females and 5 males) who enrolled in one secondary methods course voluntarily participated in this study. The data were collected through videotaping and coding 13 pre-service teachers' playing two basketball games and teaching seven lessons with two instruments, writing descriptive lesson vignettes, and conducting formal interviews. The quantitative data was analyzed by using descriptive statistics, MANOVA, and ANOVA methods, whereas, the qualitative data was analyzed using the constant comparison technique. The mean score of the pre-service teachers' overall game performance index was calculated to classify the participants into above-average group and below-average group.

Results: The results of the MANOVA yielded a significant difference on the overall teaching

practices between the above-average and the below-average groups ($\lambda = .858$, $F = 2.534$, $df = 65$, $p = .049$). Subsequently, ANOVA revealed that the high-game performance participants scored significantly higher than their counterparts with low-game performance on Task Presentation and Instructional Responses, but not on Task Design and Class Management. Analysis of qualitative data indicated that the pre-service teachers who had high game performance competency presented precise and relevant learning cues within the context of authentic game, showed ability to quickly detect students' problematic learning responses, and provided students with tailored guidance for helping fix their mistakes. In contrast, the pre-service teachers who had low game performance competency focused on presenting procedures of a learning task rather than key points, and barely provided any specific feedback for students even though off-task behaviors and incorrect learning responses became apparent. However, the pre-service teachers designed sequential learning tasks in their lessons and smoothly used instructional routines to organize the class for learning and practicing.

Conclusion: The pre-service teachers' subject matter competency plays a critical role in their Task Presentation and Instructional Responses.

Keywords: Game performance competency; quality teaching practices; task design; task presentation; classroom management; and instructional responses.

1. INTRODUCTION

The central mission of a physical education teacher education program is to equip pre-service teachers with sound subject matter knowledge and competent subject matter performance as well as solid pedagogical skills necessary for enacting quality teaching practices in physical education [1,2,3]. The unique nature of physical education subject matter demands that the teacher knows physiological, psychological, biomechanical, and motor developmental principles and concepts related to skillful movement, physical activity, and fitness performance. It also requires that the teacher should be able to demonstrate physical activity, sport skills, and healthy fitness levels [1,2,3]. Recently, the NASPE Beginning Physical Education Teacher Standards [2] addressed the growing consensus that pre-service teachers' demonstration of skill competence in a variety of sports and physical activities is the "central core of our content area" in teacher education [3,p. 373].

Researchers stated that the teachers' subject matter knowledge and expertise played a paramount role in shaping their quality of teaching practices [4,5,6]. They reported that the subject expert teachers were better at organizing learning tasks and topics into a meaningful and connected progression, building learning tasks on students' prior knowledge and life experiences, and linking all learning activities to a critical point within the discipline. In contrast, the teachers with weak subject matter knowledge designed learning activities and topics at a

superficial level. They were interested in choosing learning activities and tasks that were less academically and cognitively challenging and demanding. Due to the lack of content-specific richness and rigor, the learning tasks and activities merely kept students busy and happy [4,5,6,7].

It was empirically evident that teachers with high subject matter knowledge and expertise used flexible and multiple ways to present the information to students. The subject expert teachers used examples, metaphors, and scenarios to activate students' prior knowledge while presenting new information to students. They used relevant learning cues along with appropriate and accurate demonstrations to draw students' attention to key points of the learning task and skill. They carefully used the right terms to explain the topic and concept. Conversely, the novice teachers merely informed the students what they are going to do without using metaphors and/or examples. Although they used learning cues while demonstrating a skill, the novice teachers used pre-determined learning cues which sometimes were not related to the nature of the learning task. They frequently presented the information with errors and poorly used language [4,5,6,7].

Teachers with high subject matter knowledge and expertise were better able to diagnose what factors really caused students' misunderstanding of new concepts/topics and what made students have difficulty performing the skill correctly. Based on their "on the spot" analysis, they were better able to respond to students appropriately

and contextually. They skillfully steered the lesson's task-oriented course and kept students focused on quality learning. On the contrary, teachers with low subject matter knowledge focused more on getting the students through all the activities they had planned. When responding to students' confusion and questions, they rarely asked thought-provoking questions to engage the students in a conceptual understanding of the topic. They provided students with more general feedback than specific feedback [5,6,7].

In physical education pedagogy, scholars and teacher educators have increasingly acknowledged that pre-service teachers' insufficient subject-specific knowledge and lack of competence in sports and physical activities will contribute to teaching an introductory unit cycle, which will eventually constrain K-12 students from meeting the content standards responding to this major concern faced in physical education teacher education [3], this study aimed at examining how the pre-service teachers' subject matter specific knowledge and competency influenced their teaching practices during a basketball instructional unit. The study specifically examined how the pre-service teachers with stronger subject matter knowledge and competent game performance quantitatively and qualitatively differ from their counterparts in teaching practices. The significance of this study is to provide the empirical evidence as to how pre-service teachers' subject matter competence influences their quality of teaching practices in a regular lesson. The insightful results of this study will be helpful for teacher educators to reconsider how to embrace the effort of improving pre-service teachers' subject matter expertise and competency into the entire process of developing their pedagogical skills and knowledge through a balanced teacher education approach.

2. METHODS

2.1 Participants and Research Setting

Participants were thirteen pre-service physical education teachers (8 females and 5 males) who had enrolled in a secondary methods course. The participants were informed of the purpose of the study and data collection methods stated on the informed consent form. The university institutional review board granted the permission for conducting this study. Also, the participants signed the informed consent form to indicate their voluntary participation in this study.

The methods course was divided into two sessions: the instructor's teaching and followed by the pre-service teachers' microteaching. During the instructor's teaching session, the pre-service teachers participated in five sequential two-hour lessons to learn essential basketball skills, tactics, and game rules. Meanwhile, they learned how to teach sequential basketball lessons at the secondary level. At the end of the fifth basketball lesson taught by the course instructor, the PETE students formed four teams of three players. They played two 10-minute 3 vs. 3 games, which were videotaped by one research assistant. During the videotaping of the games, the research assistant constantly adjusted the camcorder's angles and zoomed in and out to ensure that all six players' on-the-ball skills and off-the-ball movements were in view at all times.

Next, the pre-service teachers began their microteaching which was organized into seven lessons in the basketball unit. Each pre-service teacher worked in pairs to team-teach one 50-minute basketball intact lesson to their peers, with the exception of one pre-service teacher independently teaching one 25-minute lesson to their peers. The pre-service teachers' teaching seven basketball lessons were videotaped by the research assistant. The research assistant began videotaping as the pre-service teacher(s) started his/her teaching and continued until the pre-service teacher(s) dismissed the class.

2.2 Data Collection

2.2.1 Coding the taped game plays

Basketball Offensive Game Performance Instrument (BOGPI) [8] was a validated instrument used to assess the pre-service teachers' offensive game ability in basketball based on the framework of essential game components proposed by Griffin, Mitchell, and Oslin [9]. The BOGPI consists of three essential game dimensions: Skill Execution, Decision Making, and Supports. It used a two-point, "yes" or "no" rating scale to help evaluators objectively assess whether or not a player demonstrated the performance indicator of a given game component [8].

Prior to officially coding the two videotaped game play sessions, two investigators spent approximately 20 hours practicing observation and coding six players' offensive game actions with the BOGPI until they were satisfied with the

performance indicators of each game component, rating scales, and coding protocols. Next, the two investigators began independently coding each player's offensive game behaviors with the BOGPI by strictly following the coding protocols. The coding results indicated that the average inter-rater reliability coefficient of the BOGPI was 99%, indicating a very high consistency of two raters' judgment [10].

2.2.2 Coding the taped lessons

Assessing Quality Teaching Practices (AQTR) [11] was a validated observational rubric designed particularly to assess pre-service teachers' teaching practices that are associated with quality teaching in physical education contexts. The four key dimensions of quality teaching practices grounded in research on teaching were used as the essential dimensions of the AQTR including Task Design, Task Presentation, Management, and Responses. The Task Design includes three sub-critical components: Appropriateness, Maximum Participation, and Progression. The Task Presentation contains five critical components: Clarity and Accuracy, linking Prior Knowledge, Demonstration, Learning Cues, and Checking for Understanding. The Management is comprised of four critical components: Gaining Attention, Equipment Distribution, Grouping Students, and Transition. The Response consists of five critical components: Monitoring, Adjusting/Re-emphasizing the Task, Reflections, General Feedback, and Specific Feedback [11].

The AQTR used a 3-point rating scale to identify a graduation of quality teaching levels in each teaching component. For example, a rating of "3" indicated that the teacher fully demonstrated the criteria of quality teaching practices in each teaching component. A rating of "2" indicated the teacher to some degree demonstrated the criteria of quality teaching practices. A rating of "1" indicated that the teacher did not demonstrate the criteria of quality teaching practices. Also, a "/" indicated that the specific teaching component was not applicable to a given teaching episode [11].

Prior to officially coding the videotaped lessons taught by the pre-service teachers, two investigators spent approximately 20 hours practicing coding one videotaped lesson, which was randomly selected with the AQTR Assessment Sheet until they were satisfied with the performance indicators of each teaching

component, the rating scales, and the coding protocols. Next, the two investigators began to independently code the taped lessons using the coding protocols. The coding results revealed that the average inter-rater reliability coefficient of the AQTR was 99%, demonstrating a very high consistency of the two raters' judgment [10].

2.2.3 Writing descriptive lesson vignettes

While watching each teaching episode, starting from the teacher's presenting the task, organizing the class, and responding to students' learning, the second investigator wrote the descriptive lesson vignettes using the protocols. She described what types of tasks the pre-service teachers presented and how the pre-service teachers (a) delivered the tasks to the class, (b) organized the class, and (c) responded to the students' on-going learning process. If necessary, she rewound the tape to re-watch and re-wrote the description of the teaching episode. She used the protocols to describe all teaching episodes of each taped lesson.

2.2.4 Interviewing the pre-service teachers

We conducted one 30-45 minute formal interview with each pre-service teacher at the end of the unit using a semi-structured interview approach. The interview questions focused on the pre-service teachers' athletic and coaching background in basketball, self-assessment of their skill and game competency levels as well as their knowledge about basketball, their reflections on the strengths and weaknesses in their teaching practices, and what they have learned most from the class. During the interview, the investigator probed to elicit the teacher's elaboration and clarification if needed. The interview was tape-recorded and transcribed.

2.3 Data Analysis

Regarding the quantitative data analysis, the mean score of the pre-service teachers' overall game performance index was calculated to classify the participants into above-average group and below-average group. Next, the mean scores of the four essential dimensions and overall teaching practices between the two groups were computed. Lastly, the MANOVA and ANOVA methods were used to examine if there was a significant difference on each of the dependent variables between the two groups.

With respect to qualitative data analysis, the constant comparison technique [12], which is a qualitative data-analytic process, was used to analyze the teaching summary, descriptive lesson vignettes, and interview transcripts. The investigators independently read and re-read them. Then, they identified similar information and labeled them with tentative assertions in the margin of the documents. Next, they grouped similar ideas into categories by using separate sheets to list ideas under each category. Lastly, they summarized the categories and themes. They discussed the categories and themes until they reached an agreement.

3. RESULTS

3.1 Quantitative Differences in Teaching Practices

The mean score (.55) of the overall game performance index was used to classify eight pre-service teachers into the above-average game performance group and five the below-average game performance group. Table 1 presents the descriptive statistics of the overall game performance index between the two groups.

The results of independent sample t-test yielded a significant difference of the mean game performance index between the two game performance groups ($t = 3.93, df = 10, sig. = .003$).

Subsequently, the descriptive statistics of the four essential dimensions of quality teaching between the two game performance groups were conducted. Table 2 presents descriptive statistics of the four dependent variables including Task Design, Task Presentation, Management, and

Instructional Responses between group 1 (above-average game performance group) and group 2 (below-average game performance group).

The results of the MANOVA yielded a significant difference on the overall teaching practices between the two groups ($\lambda = .858, F = 2.534, df = 65, p = .049$). Subsequently, the ANOVA (see Fig. 1) indicated that the above-average game performance participants' mean scores on Task Presentation and Instructional Responses were significantly higher than their counterparts ($F = 8.49, Sig. = .005, p < .00; F = 6.281, Sig. = .015, p < .01$). However, the ANOVA revealed no significant difference of the mean score on Task Design ($F = 2.024, Sig. = .136, p >.05$) and Management ($F = .141, Sig. = .662, p >.05$) between the two groups.

3.2 Qualitative Differences in Task Presentation

The qualitative differences of the teaching practices between the two groups were described using two case studies. The two cases provided descriptive and contextual information about how the pre-service teachers displayed different characteristics of Task Presentation and Instructional Responses in their lessons.

3.2.1 Background

Nicole (fictitious name) demonstrated high game performance competency and had subject matter expertise in basketball. In high school, she played on the varsity basketball team all four years. Nicole had coached 6th-8th graders for three years with her dad and coached 3rd-5th graders for three years on her own.

Table 1. Descriptive statistics of the overall game performance index between the two groups

Groups	Mean	Std. deviation	Std. error
Above-average group	.57	.010	.004
Below-average group	.53	.023	.010

Table 2. Descriptive statistics of quality teaching between the two game performance groups

Dimensions of quality teaching	Group 1		Group 2	
	M	SD	M	SD
Task design	2.96	.14	2.88	.25
Task presentation	2.66	.49	2.16	.81
Management	2.96	.15	2.94	.12
Instructional responses	2.59	.43	2.24	.61

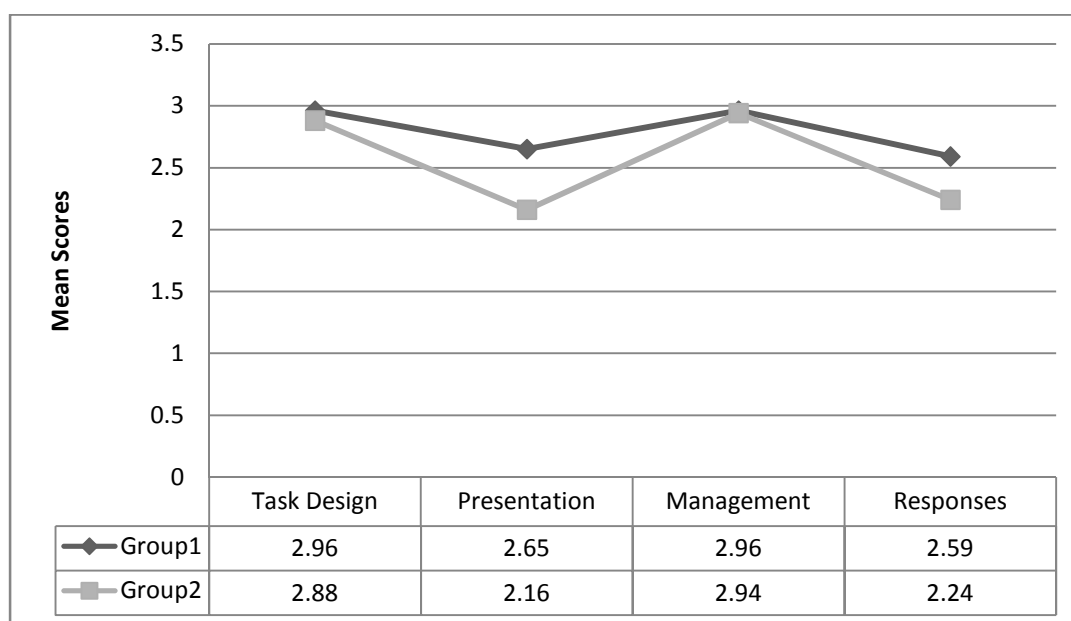


Fig. 1. Mean scores of the four essential teaching dimensions between the two groups

In her interview, when asked how she would rate her knowledge of game rules and tactical concepts in the game of basketball, she rated herself a 5 out of 5 in basketball game knowledge before and after taking the course. When asked to give examples of her knowledge about basketball she stated, “Yeah, well I know how to pick and roll, I know how to read a court, and you know, see the open player cut through or, on the man to man where the weaknesses are.” She also stated that she has been playing basketball for a long time so she knew how to do the required tasks and how to react to specific situations.

In contrast, Rachel (fictitious name) had the lowest game performance score in the class and lacked subject matter expertise in basketball. In high school, the only sport she participated in was swimming. She had been teaching swim lessons for six years, teaching infants to adults. In her interview, when asked to rate her knowledge of game rules and tactical concepts in the game of basketball on a scale of 1-5, she rated herself as a “1”, meaning low knowledge. She stated that, “I have no experience with it, it was, yeah, as a kid I didn’t like aggressive stuff and I never tried that.” When asked what she would rate herself in knowledge of basketball after the unit on basketball, she rated herself as a “3” out of “5”. She was asked why she chose 3 out of 5, she responded, “It’s still confusing to me, um, like in actual game situations, like setting screens and doing different cuts and stuff

like that.” She said that she didn’t feel like she mastered basketball very well.

3.2.2 Nicole’s presentation of relevant learning cues in game scenarios

In her lesson, as she taught various dribbling skills to her peers, Nicole presented precise and accurate learning cues that were directly related to the focus of each task. For example, when she demonstrated the stationary dribbling skill, she presented the students with the learning cues: “fingertips, ball on the side of the body, and waist high.” When she taught crossover dribbling, she emphasized: “stay low, cross right to left, following the ball with your shoulder, protect the ball.” As she taught the hesitation dribbling skill, she gave the learning cues: “fast, slow, and fast” to help the students grasp the key forms of the hesitation dribbling. When she taught dribbling to lay-ups, she stressed the learning cues of “dribble towards block for lay-up, big step, little step, leg up, shoot.” When she taught 1-on-1 with defense, she used the relevant learning cues, “arms length away, stay low, push them somewhere.” she presented learning cues that are critical and relevant to a specific learning task.

Nicole also set up the game scenarios for helping the students think critically about the rationale for the use of a specific learning cue. For instance, as she demonstrated proper forms of the dribbling skill and presented the second learning

cue: “keep the ball on the side of the body”, she placed the students into game situations to engage them in thinking critically about why they need to do so. Similarly, when presenting the third learning cue: “waist high,” Nicole asked the students to identify what level they need to use while dribbling the ball. After she engaged the students in using their thinking and prior knowledge to learn the proper form for dribbling, she summarized the learning cues. When teaching 1-on-1, she asked questions about why they need to stay one arm length away from the defender:

- Nicole: Can anyone tell me why you’d want to stay an arm length away?
Student: So they don’t pass you.
Nicole: Correct! Because if you stand up here (defending Adam closely), he is going to drive by you. And if you are too far back, he’s just going to shoot it (she steps way back and Adam fakes a shot).

During her demonstration and explanation, she clearly related the learning cues to authentic game situation and demonstrated the rationale behind defending a player’s one arm length away.

3.2.3 Rachel’s getting through explaining the learning task and missing key points

When she explained the learning task, Rachel did not pause at all and did not use any fluctuated tone to emphasize the key information to her students. She seemed to rush through her explanations. After going over the drill, she didn’t ask any facilitating questions to check for understanding. She was more worried about teaching the information she could remember. During her teaching team defense, Rachel merely explained the procedures of what the students were going to do. She did not engage the students in cognitively thinking about why they should do what they were told to do and what other options they had during the defense.

Rachel’s explanation of defensive positions during the 3-on-3 game play was inaccurate and incomplete. The learning cues she used missed key features of team defense. For example, when teaching the class 3-on-3 team defense, Rachel said, “So we are going to talk about the weak side of the court and the strong side of the court.” She said, “Now this is the strong side of the court. That means that the ball is on this side.

When the ball is on the strong side, the defense wants to mark up right on the offense.” However, Rachel failed to tell the students how far exactly they wanted to be from their opponents. She should have told them that they should keep one arm’s length away from their opponents and put one arm out to deny the pass. Also she should have told the students where they should be forcing their player, either to the baseline or to the middle.

Next, she said, “the people over here are preparing for a pass” (she walked and pointed to the opposite side of the court) “So you want to sag off, so you see how Adam is not close to Amanda.” She failed to mention that realistically, they were not just preparing for a pass, they were preparing to help out their teammate if an opponent beats their teammate’s defense line. She didn’t go over where the defense should shift if the opponent passed the defensive player to the basket, nor did she explain that if a player were one pass away, they should deny the pass to their opponents. The terminology and information she used to describe team defense related more to playing defense in the game of soccer rather than basketball. Even though some of the concepts were the same, she did not have a clear understanding of all the key components of team defense in the game of basketball. In her interview, when asked to reflect on her teaching, she said,

I guess with basketball, for example, I had to do defensive tactics and that was one of the things that I really struggled with when Dr. Smith was teaching it. So I had to sit down for a long time and read through the book and really understand what was going on so that I could explain it.....I definitely, I had to do probably more prep work than a lot of other people.

Even though she did her homework and researched the information on her own outside of the class, she did not capture the key features of defense and did not know how to teach the key points of defense.

3.3 Qualitative Differences in Instructional Responses

3.3.1 Nicole’s skillful detection of students’ errors

Nicole had the ability to quickly and easily spot and fix a student’s mistake. For example, while the students were practicing their dribbling,

Nicole walked around to check on everyone's stationary dribbling. She checked to make sure they were using the proper techniques. Nicole challenged one of the better basketball players in the class to practice dribbling with her head up. She said, "Can you try dribbling with your head up maybe? Look up at me, you've got it, good job Megan."

When the students were practicing crossover dribbling task, Nicole paid close attention to the students' skill performance. She noticed that a student wasn't keeping the ball low, so she quickly corrected her. She said "Try to keep the ball a little lower, Christina." As she noticed a majority of the students did not use their body to purposely protect the ball while crossing over from left to right or from right to left, Nicole stopped the entire class and re-emphasized the learning cue: "To make sure you are following with your shoulder." When the students re-practiced this task, she still noticed that Christina was not following with her shoulder, so she stopped her, re-emphasized the key learning cue, and demonstrated it next to her so she could visually see how it was supposed to be done again. She finally performed the task correctly and Nicole said, "There you go!"

For another instance, when the students were practicing lay-ups off the dribble, she noticed Christina and Britney had problems performing the skill correctly; she stopped them and asked them to watch her demonstration of the lay-ups. As she slowly demonstrated the skill step-by-step, she addressed the learning cues to them individually, "big step, little step, leg up and jump." She then asked the students to practice the lay-ups approach without the ball and had them focus on the learning cues she just re-emphasized. After the students seemed to use correct steps, she asked the students to practice the lay-ups with the ball and join the group. There are many instances where she pulled students aside to help fix their techniques. During her one-on-one interaction with students who were struggling to exhibit correct techniques, she demonstrated the skill again, and had them practice the skill without a ball—making it as simple as possible. She clearly had an understanding of how to teach students and can instantly point out a mistake and fix it.

Nicole knew the game of basketball very well, so it was easy for her to think on her feet and made adjustments based on the students' skill and ability level. In her interview, she re-emphasized

the importance of her understanding of the game in her teaching of the lesson,

...I can pull kids aside and just be like hey this, maybe explain it in different words and use different things that might click with them and whereas if I didn't know the game, I would only know that one way because I've only read that one way or learned that one way.

3.3.2 Rachel's lack of specific feedback during student practice

While the students were practicing the drill, Rachel didn't provide any specific feedback, nor did she try to correct the students' mistakes. It was observed that when many of the students were fooling around and they were not in a low stance to shuffle into positions, she did not stop the whole class to re-emphasize the key points of the task. Instead, she said in a nice voice, "Right now we are just working on defensive footwork and either marking on your person or sagging off." She could have been much sterner and really told them to focus on this drill and stay low in the defensive stance. She also could have demonstrated how to be as active as a good defensive player. The students did not achieve the lesson objectives from the drill and developed bad habits during the drill.

After observing the students' working on 3-on-3 for about 5 minutes, Rachel was talking to her co-teacher, Mike, about what they were going to do next and wasn't paying attention to the students during the drill. Rachel told the students that "we are going to basically do the same exact drill, but defense can steal it." The offense team must have five passes before attempting to shoot." One student was standing straight up on defense, but Rachel didn't tell her to stay low. That student got beaten defensively, but Rachel didn't say anything. Offense scored and Rachel said "OK, good." That was the only feedback she gave throughout this drill and she praised the offense even though it was a defensive drill. Again, Rachel was talking to Matt about what they were going to do next and wasn't paying attention to the students during the drill. Then after another five minutes, she said they were going to play a live 3-on-3 game. She seemed caught up in just explaining the information instead of actually observing and assessing the students' performance and making corrections as they went along.

Even the students who were highly skilled weren't in a low defensive stance and they

weren't shuffling into position. This fell back on Rachel's shoulders because she didn't emphasize these key points. Due to her lack of experience and background in basketball, she was unable to fix students' errors during the drill and to make any adjustments. She didn't provide any specific feedback and rarely provided any general feedback as well. At the end of the lesson, she had the students gather around her and reviewed what they had learned that day. She asked one of the students to demonstrate what they learned that day (the slide, attack, retreat movements that Mike taught). She did review the "strong side and weak side" on defense, but failed to discuss many critical points about team defense.

3.4 Qualitative Similarities in Task Design and Class Management

3.4.1 Nicole's and Rachel's offering sequential tasks

In Nicole's and Rachel's lessons, both Nicole and Rachel taught sequentially progressive learning tasks to their peers. Nicole worked with her partner to team-teach the first lesson in the basketball unit. They presented sequentially progressive learning tasks in which each learning task was built on one another and coherently interrelated. They started the lesson with a series of stationary ball handling warm-up activities. Then, they asked the students to practice dribbling in stationary, dribbling while moving, dribbling while changing directions, pathways, and hands, and dribbling while changing speeds with faking. Next, she introduced game rules related to dribbling: double dribble and traveling. Lastly, they challenged the students to practice and apply the dribbling skills in game-like and conditioned game situations. These tasks included dribbling to lay-ups, use of the dribbling skill to drive, crossover drive, and 1-on-1 defense. In this lesson, Nicole and her partner designed a rich progression of learning tasks and a coherent combination of learning the skill in isolation and applying the skill in authentic situations. Not only did the students have opportunities to learn the skill in various ways, but they also learned the skill in the context of game situations.

Rachel worked with her partner to team-teach the fourth lesson in the basketball unit. The lesson focus was on defensive positions and strategies. They started the lesson with learning and practicing various footwork including proper techniques of shuffling, shuffling to the right and

left, and shuffling to retreat and upward. Then, they used one-on-one to help the students work on individual defensive stances and positions on half court. Next, they used 3-on-3 on the half court, and 3-on-3 with active defense allowed on the half court to help the students learn about strong-side and weak-side defensive strategies. Lastly, they used a 5-on-5 shadow drill to reinforce strong-side and weak-side defensive strategies and then played a 5-on-5 game. In this lesson, Rachel presented sequentially progressive learning tasks to help the students learn defensive positions in various game situations.

3.4.2 Nicole's and Rachel's use of instructional routines

Both Nicole and Rachel smoothly organized the class for doing the learning tasks throughout the lesson. When presenting the learning tasks to the students, both of them asked the students to stand on a line and put the ball between their feet to listen to their explanations and demonstrations. They always used their own instructional routines like counting off numbers to partner students up and dividing the class into groups. They always used "go" as a starting signal, and "stop" as a stopping signal to start and stop the class activities. They also had the students quickly collect and return the equipment in order.

4. DISCUSSION

4.1 The Role of Subject Matter Competency in Task Presentation

In this study, the results of ANOVA revealed that the pre-service teachers in the high-game performance group scored significantly higher on the Task Presentation than the pre-service teachers in the low-game performance group. Subsequently, the qualitative findings supported the quantitative difference on the Task Presentation between the two groups. It was noticeable that Nicole, with strong subject matter competency, presented accurate and relevant learning cues while demonstrating and explaining the critical elements of the skill. To help the students have a better understanding of the meaning of learning cues, Nicole used game scenarios while presenting the learning cues to engage the students to critically think about why they need to dribble to the side at waist high and why they need to position themselves one arm's length away from their defenders. Consistent

with the findings of this study, Chen, Rovegno, Todorovich, and Babiarez [13] found that the teachers who had subject matter expertise used metaphors to present learning cues to help students understand key concepts of a task; they used examples and game scenarios to help students understand why they should focus on those learning cues while performing a task. Likewise, Hill et al. [6] reported that the in-service teachers with high mathematical knowledge for teaching used accurate and concise terms to present mathematical information. They used examples and scenarios that were directly linked to students' life experiences and prior knowledge to explain the mathematical concepts and procedures. They skillfully steered the students to cognitively think about the reasoning of mathematics. They encouraged the students to contribute to their ideas without scarifying the integrity of the mathematics content.

In contrast, Rachel, with weak subject matter competency, rarely used examples, metaphors, and scenarios to present the learning task. While presenting the learning task, she merely focused on explaining the procedures of how to practice the task instead of directing the students' attention to the critical meaning of the task. Her explanation of defensive positions in the 3-on-3 game play was inaccurate and incomplete. The learning cues she used missed key features of the skill and game tactics. She seldom engaged the students in using their ideas throughout the course of instruction. Her instruction was academically weak and lacked academic richness. Hill et al. [6] reported that the in-service teachers with weak mathematical knowledge for teaching frequently used error terms and mathematical language to explain mathematical concepts. Their rigid instructional presentation focused on explaining the procedures of mathematical calculation. They failed to explain the rich concepts underlying the mathematical procedures. Likewise, Chen and Rovegno [5] reported that the novice teachers focused on explaining what the students were going to do. Although the novice teachers presented learning cues to the students, they only used pre-determined learning cues throughout the lesson no matter what learning tasks the students were going to learn.

The findings of this study indicated that the pre-service teachers' subject matter competency plays a paramount role in their task presentation. Careful use of proper and accurate language to explain the learning task, using flexible and

multiple ways to engage the students in the process of instruction, and using precise and relevant key words were related to the pre-service teachers' strong subject matter competency. This study suggested that equipping pre-service teachers with sound subject matter knowledge and building their subject matter competency is a critical task for teacher education program.

4.2 Role of Subject Matter Competency in Instructional Responses

The results of ANOVA indicated that the pre-service teachers in the high-game performance group scored significantly higher than those in the low-game performance group on Instructional Responses. The case study provided qualitative evidence for supporting the quantitative findings. During the students' drill practice and game play, Nicole, the one who had strong subject matter competency, focused her effort on observing the students' skill performance. With her keen observation and evaluation ability, she easily and quickly discerned who had problems performing the skill correctly and what caused the problems. She modified tasks and simplified steps of the task to help the students learn the correct forms of the skill. When she found out a majority of students did not perform the skill and game tactics correctly, she stopped the class to re-address and re-demonstrate the key points of the task and asked questions to help the students reflect on what they did wrong and how they could fix the problems. She provided the students with adequate positive feedback specific to the students' skill levels and skill performance. These findings were congruent with the previous studies [5,6,7] Chen et al. [7] reported that the teacher who had very strong subject matter knowledge flexibly and timely provided tailored instructional support and guidance for students' engagement in their tasks. The teacher knew when to provide specific feedback, when to ask thought provoking questions, and when to adjust difficult level of a task to meet students' specific needs. Similarly, Hill et al. [6] noted that the in-service teachers who had high mathematical knowledge for teaching were alert at observing the students' on-going learning responses. When they found that the students were confused with a given concept, the teachers were able to simplify their explanations and use different examples to re-explain the information to the students. Based on the nature of the task and what specific problems the students had, the teachers were able to use

contingent instructional strategies to guide the students arriving at a solution from different ways.

On the contrary, Rachel who had weak subject matter competency seemed to focus her effort on going over the learning task. Once she finished the task presentation and organizing the students for doing the task, she seemed to feel her teaching job was done. When the students were practicing the task, she did not focus on observing the students' on-going learning responses. Instead, she looked at the students' practice for a while and then talked to her teaching partner to discuss what they were going to teach the students next. Even though some students did not perform the task correctly and some students were intentionally off track of the learning task, she rarely stopped the whole class to re-emphasize the key elements of the task in order to bring the whole class back to the purpose of the task. Again, she rarely provided students with any specific feedback related to task performance. She merely let the students go through the motions. Similar findings were also reported in the previous studies. Chen and Rovegno [5] noted that the pre-service teachers tended to provide students with pre-determined learning cues to respond to students' performance no matter whether the learning cues (specific feedback) were related to the student's specific response or not. When the pre-service teachers found a majority of students had problems performing the task successfully, they failed to adjust some parameters of the task and to re-state the key feature of the task. Likewise, In Hill et al.'s [6] study, they reported that the teachers with poor mathematical content knowledge mainly focused on engaging students in class activities. These activities were not related to mathematics at all. Their observation focus was on whether or not the students were busy engaging in the activities. The teachers did not provide any guidance or feedback specific to how these activities were related to the focus of the lesson. When responding to students' confusion, these teachers had difficulty choosing appropriate examples to re-explain the key concepts in order to help students gain a conceptual understanding of a key mathematical concept. Instead, they simply demonstrated the mathematical procedure once again.

The findings of this study confirmed that the pre-service teachers' subject matter competency plays a critical role in their instructional responses. Keen responses to students' misunderstanding and questions, flexible

simplification and justification of explanation, and congruent feedback specific to the students' on-going learning processes were associated with the pre-service teachers' strong subject matter competency.

4.3 The Role of Subject Matter Competency in Task Design and Class Management

Contradictory to the previous studies [5,6], the results of ANOVA indicated that there was no significant difference in terms of the mean scores on Task Design and Class Management between the high-game performance group and the low-game performance group. The case studies described that both Nicole and Rachel designed sequentially progressive and developmentally appropriate learning tasks for their lessons, respectively. They also smoothly organized the class into groups, used signals to start and stop the class activities, and had the students quickly collect and return the equipment.

What factors caused the pre-service teachers with weak subject matter competency to demonstrate some characteristics of quality teaching practices similar to the pre-service teachers with strong subject matter competency? First, this study was limited to studying how the pre-service teachers' subject matter competency affected their Task Design, Task Presentation, Class Management, and Instructional Responses in one unit. Prior to the pre-service teachers' beginning their micro-teaching, the course instructor modeled not only sequential learning tasks in a lesson and across the lessons in the unit, but also modeled how to design a lesson plan and a unit plan. The instructor also repeatedly demonstrated how to use class routines to smoothly organize the class for doing the learning activities. Additionally, the pre-service teachers team-taught one lesson to their peers, the college PETE majors. The pre-service teachers' motor skill levels, intellectual abilities, and emotional and social maturity were different from K-12 public school students. The class size in this study was small. These factors provided the pre-service teachers with a more ideal class context. In this particular class context, the pre-service teachers, no matter what their subject matter competency levels are, can "imitate" the classroom management techniques and instructional routines to organize the class for doing the learning activities. Because of this ideal classroom context for the pre-service teachers to experiment with practicing what they had just

learned from the instructor, the pre-service teachers demonstrated quality class management characteristics in the micro-teaching settings, but not in the “real” classroom settings of public schools.

The findings of this study indicated that if the class instructor created a focused and complexity-reduced classroom setting, the pre-service teachers could learn and demonstrate some quality teaching characteristics of the Task Design and Class Management even though they did not have high subject matter competency. Grossman and McDonald [14] suggested that providing less complicated classroom settings helped the pre-service teachers focus on learning and practicing discrete essential teaching components and some important instructional routines. This study suggests that when the teacher educator teaches and models a well-sequenced and well-structured lesson, the pre-service teachers can learn and demonstrate quality characteristics of task design and class management in the microteaching setting.

Lending support for Grossman and McDonald's [14] argument, this study suggests that teacher educators need to provide more opportunities for pre-service teachers to practice (a) how to present the learning tasks accurately while relating the information to students' prior knowledge and authentic application, and (b) how to observe and respond to students' on-going learning responses flexibly and effectively in micro-teaching settings. Teacher educators need to focus more on guiding the pre-service teachers in reflecting back how they taught the lesson and how to interact with students' learning processes. Teacher educators need to provide the pre-service teachers with immediate feedback on their enactment of pedagogy. The study suggests that teacher educators need to equip pre-service teachers with strong subject matter competency, which is a critical task for a teacher education program.

5. CONCLUSION

This study showed quantitative and qualitative evidence that pre-service teachers' subject matter competency plays a significant role in Task Presentation and Instructional Responses. The pre-service teachers in the high-game performance group significantly outperformed on Task Presentation and Instructional Responses compared with their counterparts in the low-

game performance group. Further, the case studies revealed that Nicole, with strong subject matter competency, used game scenarios to present accurate and relevant learning cues accompanied with quality demonstration of a skill; easily diagnosed what caused a student's incorrect skill performance and provided specific feedback and tailored instructional guidance for a student. In contrast, Rachel, with weak subject matter competency, presented incomplete and irrelevant learning cues when students were learning tactical concepts of a game; had difficulty discerning the causes of students' off-task performance and behaviors and adjusting the focus of a task to meet the students' emerging needs. However, the promising results of this study indicated that the pre-service teachers, no matter what their subject matter competency levels were, presented sequentially and developmentally appropriate learning tasks for their lessons and used instructional routines to smoothly organize the class for learning in their micro-teaching settings. Given the major limitation of this study that the pre-service teachers team-taught lessons to their peers on-campus, future studies may investigate how pre-service teachers' subject matter competency influences their four essential dimensions of quality teaching in school settings. The results of this study along with future studies should provide more insightful and meaningful information about effective ways to equip pre-service teachers with both subject matter and pedagogical competency.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. McCullick BA. Practitioners' perspectives on values, knowledge, and skills needed by PETE participants. *J Teach Phys Educ.* 2001;21:35-56.
2. National Association for Sport and Physical Education. National standards for beginning physical education teachers. 3rd ed. Reston: NASPE /AAHPERD; 2009.
3. Siedentop D. Content knowledge for physical education. *J Teach Phys Educ.* 2002;21:368-377.
4. Charalambous CY. Mathematical knowledge for teaching and task

- unfolding: An exploratory study. *Ele Sch J*. 2010;110:247-277.
5. Chen W, Rovegno I. Examination of expert and novice teachers' constructivist oriented teaching practices using a movement approach to elementary physical education. *Res Quart Exerc Sport*. 2000;71:357-372.
 6. Hill HC, Blunk ML, Charalambous CY, Lewis JM, Phelps GC, Sleep L, Ball DL. Mathematical knowledge for teaching and the mathematical quality of instruction: An exploratory study. *Cog Instruct*. 2008;26:430-511.
 7. Chen W, Rovegno I, Cone TP, Cone SL. An accomplished teacher's use of scaffolding during a second grade unit on designing games. *Res Quart Exerc Sport*. 2012;83:221-234.
 8. Chen W, Hendricks K, Zhu W. Development and validation of the basketball offensive game performance instrument. *J Teach Phys Educ*. 2013;32:100-109.
 9. Griffin LL, Mitchell SA, Oslin JL. Teaching sport concepts and skills: A tactical games approach. Champaign: Human Kinetics; 1997.
 10. van der Mars H. Observer reliability: Issues and procedures. In: Darst P, Zakrajsek D, Mancini V, editors. *Analyzing physical education and sport instruction*. 2nd ed. Champaign: Human Kinetics; 1989.
 11. Chen W, Hendricks K, Archibald K. Assessing Pre-service Teachers' Quality Teaching practices. *Educ Res Eva*. 2011;17:13-32.
 12. Patton MQ. *Qualitative evaluation and research methods*. 3rd ed. Thousand Oaks: Sage Publications; 2002.
 13. Rovegno I, Chen W, Todovich J, & Babiarz M. Accomplished teachers' pedagogical content knowledge of teaching third graders. *J Teach Phys Educ*. 2003;22:426-449.
 14. Grossman P, McDonald M. Back to the future: Directions for research in teaching and teacher education. *Am Educ Res J*. 2008;45:184-205.

© 2015 Chen and Hendricks; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://www.sciencedomain.org/review-history.php?iid=693&id=21&aid=6749>