JOURNAL OF PHYSICAL ACTIVITY NUTRITION AND REHABILITATION

Journal of Physical Activity, Nutrition and Rehabilitation, 2015
www.panr.com.cy
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Preparing Physical Education Pre-Service Teachers for Student Evaluation Through a Constructivist Pedagogical Course

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Abstract

Pre-service teacher preparation programs aim to enhance teachers' knowledge, skills, and attitudes so that to provide effective teaching. The purpose of the present study was to explore the impact of the theoretical undergraduate course "Assessment in Physical Education-Student Evaluation" on pre-service physical education teachers' knowledge level on student evaluation. The participants were 89 pre-service teachers; 51 were enrolled in the experimental and 38 in the control group. Knowledge level was evaluated with the knowledge questionnaire of Emmanouilidou, Derri, Aggelousis, and Vassiliadou (2012). Repeated Measures Anova revealed that the theoretical course influenced significantly teachers' knowledge level. In contrast, the control group showed no significant improvement. In conclusion, although this course does not require mandatory participation, it can contribute to enhancing pre-service teachers' knowledge level.
Key words: teacher knowledge, student evaluation, higher education.

1 Introduction

In the frame of the educational reform internationally, teacher learning and learning how to teach effectively is a major focus of most teacher education programs. Research evidence indicated not only the positive relationship between professional development programs and teachers' knowledge, beliefs, and behavior (Darling-Hammond & Ball, 2004) but also their effect on student learning both in physical education (e.g., Derri, Vassiliadou & Kioumourtzoglou, 2014) and in other subject matters such as science and literacy (e.g., Hart & Lee, 2003).

A plethora of research has also examined the process by which inexperienced (and novice) teachers learn to teach, as well as the type of content considered essential for teaching. Content knowledge (Herold & Waring, 2009), pedagogical content knowledge, and pedagogical knowledge (Shulman, 2004), and more recently the appreciation of content flexibility during teaching (Darling-Hammong & Snowdon, 2005) are included in the aforementioned processes.

Therefore, the preparation of pre- and in-service teachers with strong knowledge and skills that are connected to effective teaching and to the process they learn is considered a critical aspect in teacher education programs (Darling-Hammond & Ball, 2004; Kyrgiridis, Derri, Emmanouilidou, Chlapoutaki, & Kioumourtzoglou, 2014). In turn, studies revealed that teachers' pedagogical preparation is an important contributor to effective teaching practices both in physical education (e.g., Ward, Kim, Ko, & Li, 2004; Walkwitz & Lee, 1992) and in other subject matters such as math and science (e.g., Monk, 1994). Specifically, teachers' pedagogical knowledge (teacher skills necessary for classroom guidance, communication and student assessment) and teaching skills

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greatly impact the way they teach the subject matter to students for meaning and understanding (Darling-Hammond, 2000), and ensure that students attain high achievement. In this frame, special emphasis is placed on teachers' knowledge of the subject which has been found to directly relate to their teaching performance and student learning (Hastie & Vlaisavljevic, 1999).

Based on the above, one standard which pre-service physical education teachers are forced to attain is the development of their knowledge (and skills and attitudes) on student assessment (National Association for Sport and Physical Education; NASPE, 2009; Kyrgiridis et al., 2014). Teachers spend up to 50% of their time (Plake, 1993) in this vitally important teaching element (Kyrgiridis et al., 2014). It concerns a continuous observation and intervention process, that can be used for diagnostic, grouping, motivation and grading purposes of students, for instruction (Stiggins, 1999), improvement of decision making of all those involved in the educational process (NASPE, 2004), and verification of the educational quality (Good & Brophy, 1986) through high level learning of students (Ball & Forzani, 2009; Rink, 2006).

Not surprisingly, the last decade, there has been an increase in expectations regarding teachers' assessment expertise. Assessment-literate educators (teachers, administrators, directors) are required to possess knowledge about sound assessment practices, i.e., definition, terminology, development and use of methodologies and techniques, familiarity with teacher standards in regards to quality and alternative assessment, etc. (Paterno, 2001). They are also required to develop assessments that align with curriculum and students' learning standards as a means of improving the latter's performance (Campbell, Murphy, & Holt, 2002).

Regardless of the method used to investigate teachers' assessment practices, as well as their levels of preparation on the topic (surveys of attitudes, beliefs, and practices; knowledge tests; actual performance), research has documented that teachers' assessment knowledge and skills are generally at a low level (Brookhart, 2001; Campbell, et al., 2002). Similar results have been found in Greece (e.g., Derri, Kouli, & Emmanouilidou, 2013; Emmanouilidou, Derri, Anoniou, & Kyrgiridis, 2012; Vasiliadou, Derri & Kioumourtzoglou, 2014). Also, student assessment was found to align to student participation and effort in the lesson (Ikonomopoulos, Tzetzis, Kioumourtzoglou, & Tsorbatzoudis, 2004). Nevertheless, such assessment criteria do not align either with the educational goals of physical education or the newly developed student learning outcomes (Derri, 2007; Ministry of Education, Lifelong Learning and Religious Affairs, 2011a, b).

The aforementioned results might be attributed to higher education policies; many colleges of education and state education agencies do not require pre-service teachers to complete specific coursework in classroom assessment (Campbell, et al., 2002; O' Sullivan & Johnson, 1993). In line, many in-service teachers report that they are not well prepared to assess student learning mostly because of inadequate pre-service (and graduate) training in the area of educational measurement (Mertler, 2009; Plake, 1993) but they seem to improve slightly while on the job (Mertler, 2003; Stiggins, 1999).

Another reason might be that traditional teacher preparation courses in classroom assessment are not well matched with what teachers need to know for classroom practice as they are based on standardized/large scale testing (Schafer, 1993). Teachers have indicated that they are more concerned with every day issues related to the application of assessment processes and less with fundamental measurement principles (Rogers, 1991). Thus, teachers themselves clearly show the teaching-learning path to be followed in their development process; the incorporation of constructivist approaches. Taking into account teachers' voice, higher education instructors are challenged to re-think the teaching-learning process and to take meaningful actions.

Specifically, through a variety of learner-centered activities, pre-service teachers should be involved in active learning to construct what they are learning. The premises of the constructivist learning model in higher education emphasize a) on student choice making; what and/or how to learn the material at hand, b) on student-centered courses that meet individual needs, providing a variety of experiences for different learning styles, c) on the development of critical thinking skills, through problem solving and reflection, to enable students construct their own belief system based on their experiences, studying, and the instructor's information, d) on the incorporation of active learning, through cooperative activities/projects, simulations and reflections, and e) alternative evaluation forms (Meyers & Jones, 1993; O'Sullivan & Deglau, 2006).

The limited studies on teachers' knowledge and the effect of teacher preparation programs on assessment reported somewhat contradictory findings. Studies comparing assessment literacy of pre- and in-service teachers indicated that pre-service physical education teachers demonstrated a lower level of assessment literacy than in-service teachers without training (e.g., Derri et al., 2013). In contrast, Alkharusi, Kazem, and Al-Musawai (2013) reported that pre-service teachers had a higher level of knowledge, although a lower level of perceived skillfulness, and a less favorable attitude toward educational measurement than in-service teachers.

After measurement training, pre-service teachers demonstrated a higher level of knowledge, although lower level of perceived skillfulness, and a less favorable attitude toward educational measurement than in-service teachers (Zhang & Burry-Stock, 2003). Contradictory results were presented by Mertler (2003); pre-service teachers' knowledge level was lower than that of in-service teachers', shortly after completing an educational measurement coursework. In-service teachers with measurement training, irrespective of teaching experience, reported a higher level of knowledge (e.g., Emmanouilidou et al., 2012) and higher perceived skillfulness (Zhang & Burry-Stock, 2003) in educational assessment than those without measurement training.

In other studies, although teachers followed pre- and in-service training in educational measurement, they presented only a moderate understanding of educational measurement principles (Alsarimi, 2000). In line, Daniel and King (1998) who examined assessment literacy of school teachers in the United States found their knowledge somewhat inadequate. Similarly, low levels of in-service teachers' knowledge level on student assessment were found in a pool of studies conducted in Greece (e.g., Derri, Emmanouilidou, Antoniou & Chatzaraki, 2013; Derri et al., 2013; Derri, Vassiliadou, & Kioumourtzoglou, 2014; Emmanouilidou et al., 2012).

The inadequate level of assessment competency seems to apply equally to in-service and pre-service, regardless of their experience, across a range of contexts and subject domains. Therefore, the professional preparation of teachers in educational measurement should receive considerable scrutiny. Brookhart since 2001 had cited literature that called for emphasis in teacher preparation programs of student assessment. Such programs should equip pre-service teachers with a deep pedagogical knowledge in order to provide quality learning and accurate assessment so that to assist students reach their full potential and achieve the content standards.

In Greece, the topic of student evaluation in relation to the physical education goals began to appear in 2006 with the release of physical education curricula (Ministry of Education and Religion, Pedagogical Institute, 2006) and continued more explicitly in the New Pilot Program Studies (Ministry of Education and Religion, Culture and Sports, 2011a & 2011b), as well as in the newly developed rubric for teacher effectiveness evaluation. Also, since 2004 relevant lectures and courses on assessment in physical

education were introduced in the undergraduate programs, although these were not and still are not applied in a catholic basis.

However, the effects of these courses or lectures and especially of constructivist ones have been rarely examined at pre-service level. For instance, in the study of Derri, Papamitrou, Vernadakis, Koufou and Zetou (2014), pre-service physical education teachers improved significantly their ability to plan their daily lesson in which student assessment was included, after participating in physical education practicum, and previously in related theoretical courses. Also, the positive effects of different type professional development programs purely on knowledge on student assessment appear only with Greek in-service physical education teachers (e.g., Derri, et al., 2012; Emmanouilidou, et al., 2012).

Therefore, in an attempt to gain insights into improving educational measurement preparation, the purpose of the present study was to explore the effect of the theoretical undergraduate course "Assessment in Physical Education-Student Evaluation" on pre-service physical education teachers' knowledge level on student evaluation. It was hypothesized that pre-service teachers who followed that constructivist course would acquire a better knowledge level on student evaluation than those in the control group.

2 Methodology

2.1 Participants

Eighty nine (N=89) Greek pre-service physical education teachers from the School of Physical Education and Sport Science of the Democritus University of Thrace participated voluntarily. Fifty one (n=51; 25 males and 26 females) were enrolled in the experimental group while thirty eight (n=38; 20 males and 18 females) formed the control group. Their age ranged from 21 to 22 years (M=21.3, SD=0.5). In-between the initial and final measurement, pre-service teachers in the experimental group attended six two-hour lectures on student assessment that is half of the undergraduate course "Assessment in Physical Education" which concerns student and teacher evaluation in physical education. Participants in both groups had attended relevant theoretical courses such as Pedagogy, Preschool Physical Education, Elementary Physical Education, Secondary Physical Education and Lab of Preschool, Elementary and Secondary Physical Education. Also, during this study both groups attended six lessons of the mandatory course "Physical education practicum in elementary school".

2.2 Evaluation Instruments

Pre-service teachers' knowledge on student assessment was evaluated with the questionnaire by Emmanouilidou, Derri, Aggelousis, and Vasiliadou (2012). This instrument consists of 17 multiple choice items that refer to techniques, tools, concepts, elements and types of student assessment in elementary physical education. Each item consists of an incomplete sentence with five alternative responses, one correct, three incorrect and an "I do not know". Indicative examples of items are: 1) Cognitive elements in which students should be evaluated are… a) basic skill cues, practice principles, cooperation, b) game strategies, sports rules, cooperation, c) game strategies, principles of proper nutrition, skill performance, d) game rules, cooperation principles, fitness concepts, e) I do not know, 2) Formative assessment monitors students' performance ... a) during a module b) at the end of the term, c) at the end of a module, d) at the beginning of a module, e) I do not know. The mean of item difficulty and discrimination indexes were found acceptable; 0.47 and 0.37 respectively. The internal consistency of

the test was also adequate (Cronbach's a=0.67) and its stability, according to test-retest reliability was high (ICC=0.91).

2.3 Procedure

The researchers informed the pre-service teachers that the study was conducted for scientific purposes only and that their responses would remain anonymous. They were instructed to respond to all items to the best of their knowledge within half an hour in the presence of a researcher. Each correct response was graded with one point, and the total of correct responses was calculated. Thus, the possible score of the participants ranged between zero and 17 points. After the initial measurement the experimental group, in contrast to the control, attended the course "Assessment in Physical Education-Student Evaluation", following the aforementioned procedure.

2.4 The undergraduate course "Assessment in Physical Education-Student Evaluation"

The course consisted of a six two-hour face-to-face lecture. Based on the literature review regarding student assessment in physical education (e.g., Kyrgiridis, Derri, & Kioumourtzoglou, 2006) and its relation to teacher effectiveness (e.g., Kyrgiridis et al., 2014) and student achievement (e.g., Derri et al., 2014) the content of the lecture concerned the following aspects: 1) Introduction on assessment in physical education, 2) Definition, meaning, principles, methods, tools, and types of student assessment, 3) Motor and Physical Fitness development and assessment, 4) Cognitive development and assessment, 5) Emotional/social development and assessment, and 6) Student grading. After the completion of each lecture, its contents were posted on the course's documents, on the on-line platform "E-class" of our Department.

The educational content was related to pedagogical principles (e.g., presentation of the lecture's goals, connection with pre-service teachers' previous knowledge, real-life examples, critical thinking, self-assessment tasks, lecture synopsis, etc.). In line, the framework of the learning program was connected to the perspective that professional learning is valuable when it is active, reflective, innovative, situated, practical, collaborative, etc. (e.g., O'Sullivan & Deglau, 2006). For instance, the lecturer promoted pre-service teachers' active participation in class by encouraging them to ask and to respond to questions, express their ideas and reasoning, explore the lesson's concepts, and collaborate with each other. The lecturer also assisted pre-service teachers to connect what they expected to learn before attending the course with what they learned after the completion of each lecture and of the course, and how they could apply what they learned in practical settings, i.e. in their physical education practicum as well as in other relevant courses.

2.5 Data Analysis

Descriptive statistics were used for the calculation of the percentage of correct responses of both groups at the beginning and at the end of the research. In the absence of between group differences in the initial measurement, $F1,86=0.31$, $p>.05$, data were analyzed with ANOVA with repeated measurements on the last factor (2 groups [experimental-control] X 2 measurements [pre-, post-tests]). Univariate tests and Bonferroni multiple comparisons tests followed to test for differences within and between groups. The effect sizes of partial η^2 were also calculated (Cohen, 1988). Test significance was based on a standard alpha level of $p < .05$. Levene's and Mauchly's tests, used to test Homogeneity of variance and Sphericity of factors' scores, were not

significant. The Statistical Package for Social Sciences SPSS (version 15.0) was used for the conduction of the above analysis.

3 Results

Means and standard deviations of the initial and final cognitive performance of the experimental and the control group are depicted in Table 1. The percentage of pre-service teachers from both groups who responded correctly to each of the questionnaire's question, in the initial and final measurement, are depicted in Table 2.

Table 1. Means (M) and standard deviations (SD) of both groups' initial and final performance on the knowledge test.

	Pre-test measure		Post-test measure	
Group	M	SD	M	SD
Experimental	5.56	2.4	7.23	2.86
Control	5.29	1.98	5.51	2

Table 2. Percentage (%) of teachers of both groups who responded correctly to each question in the initial and final measurement.

		Correct Responses			
		Experimental group		Control group	
Items		Initial measurement	Final measurement	Initial measurement	Final measurement
1	The meaning of assessment	9.8	11.8	0	5.4
2	Norm-referenced assessment	15.7	56.9	18.9	32.4
3	Cognitive elements assessment	39.2	45.1	32.4	40.5
4	Quantitative assessment	37.3	60.8	27	32.4
5	Alternative assessment techniques	35.3	52.9	32.4	48.6
6	Domains of PE student assessment	72.5	76.5	64.9	64.9
7	Criterion-referenced assessment	19.6	25.5	35.1	32.4
8	Authentic assessment	23.5	31.4	24.3	29.7
9	Motor elements assessment	31.4	52.9	16.2	24.3
10	Formative assessment purposes	19.6	43.1	16.2	18.9
11	Informal assessment	23.5	45.1	29.7	29.7
12	The purpose of student assessment	45.1	52.9	40.5	27
13	Tools of social assessment	51	56.9	54.1	51.4
14	Tools for cognitive assessment	27.5	29.4	43.2	35.1
15	Assessment of cooperation	9.8	11.8	21.6	5.4
16	Types of cognitive assessment	37.3	33.3	24.3	29.7
17	Student peer-evaluation	47.1	49	48.6	37.8

ANOVA with repeated measurements on the last factor revealed a statistically significant group X measure interaction, $F1,86=5.76$, $p<.05$, $\eta^2=.063$. Following pairwise comparisons indicated that pre-service teachers in the experimental group improved significantly their knowledge level on student assessment in physical education, as this was measured in the present study ($MD=1.66$, $p<.001$). In contrast, the control showed no statistically significant change ($MD=0.21$, $p>.05$). Also, pairwise comparisons showed that although the two groups had non-significant differences in the initial measurement ($MD=.27$, $p>.05$), students in the experimental group outperformed those in the control in the last measurement ($MD=1.72$, $p<.01$). The effects of measure, $F1,86=9.7$, $p<.01$, $\eta^2=0.1$, and group, $F1,86=5.64$ $p<.01$, $\eta^2=0.06$, were also statistically significant.

4 Discussion

The daily work of classroom teachers is multifaceted. However, student performance assessment is considered the most important one (Mertler, 2003). The purpose of the present study was to explore the impact of the theoretical undergraduate course "Assessment in Physical Education-Student Evaluation" on pre-service physical education teachers' knowledge level on student evaluation. Results of the present study indicated that the undergraduate course "Assessment in Physical Education-Student Evaluation" resulted in enhancing significantly pre-service teachers' knowledge, unlike those in the control group who showed no significant knowledge improvement. In accordance, Zhang and Burry-Stock (2003) reported an improvement in teachers' knowledge level after training. It seems that the nontraditional assessment topics such as using and improving informal assessment methods, teaching for holistic student development and evaluating it with different methods and tools assisted pre-service teachers in the present study to enhance their knowledge. This verified what Airasian (1991) supported that such topics should be addressed in teacher preparation courses since they may help teachers attain a desirable level of assessment literacy to address the challenge of daily student assessment (Stiggins, 1999).

Nevertheless, one course in assessment or more precisely half course, like this in the present study, may be insufficient to cover everything teachers need to know. Indeed, all pre-service teachers had attended courses such as teaching sports, preschool and elementary school physical education, pedagogy while during the conduction of the present study they were all involved in teaching practicum of elementary physical education. Therefore, the improvement of the experimental group's knowledge level may also suggest that sequential subject matter courses which combine content and content specific pedagogy (Laczko–Kerr & Berliner, 2002) may have better results with regard to teachers' knowledge on student assessment. However, the non-significant improvement in the knowledge level of the control group could be directly attributed to the fact that, in comparison to the experimental group, they had not attended the course on student evaluation.

Previous research, although with classroom teachers, reported similar results; pre-service teachers demonstrated a higher level of knowledge than in-service teachers (e.g., Alkharusi et al., 2013), implying the effectiveness of teacher preparation programs. However, it has to be mentioned that besides the significant improvement of pre-service teachers in the experimental group of the present study, all participants in general presented a low knowledge level on student assessment. This result aligns with previous research (Alsarimi, 2000) which indicated that classroom teachers' level remained low even after receiving training. Similarly, Mertler (2003) reported that despite a recent

completion of educational measurement coursework, pre-service teachers demonstrated a lower level of assessment literacy compared to in-service teachers.

Teachers' low level in the present study cannot be attributed to the absence of relevant undergraduate courses or to that the training program did not relate student assessment with the lesson practice. It is likely that the attendance of the whole course on assessment in physical education, a better connection of previously taught courses with the present course as well as an experiential base in student assessment might result in higher levels of assessment knowledge (and literacy) of pre-service physical education teachers.

Therefore, those who teach courses in physical education, and sports, pedagogy and assessment should educate pre-service physical education teachers a) to understand the vital connection between assessment, instruction and learning goals, b) to select, design, and deliver quality assessment procedures, including alternative types and techniques, that correspond to process evaluation, product evaluation and authentic evaluation (Melograno, 2006), and c) to use constructivist (Vygotsky, 1978), critical thinking (Bruner, 1997) and holistic approaches of knowledge (Wineburg& Grossman, 2000). This way student assessment can prove the achievement of the learning goals of the physical education curriculum, and teachers' assessment competence. To this end, the findings of the present research can serve as a guide for teacher educators to discern and reflect on how to effectively prepare their pre-service teachers for achieving the standards in order to ensure high quality learning for students.

It might be argued, however, that although knowledge and skills are crucial, certain personal factors such as beliefs, attitudes, and self-perceptions of skills toward student assessment may override the effects of pre-service preparation on this topic. Thus, the effectiveness of assessment also relies on teachers' attitudes and efforts to deepen their expertise on this subject and in teaching in general, to understand their students and to help them achieve the content standards.

At this point, it is important to mention that teachers who feel better prepared for teaching content to students in context tend to seek continual professional development, compared to those who feel under-qualified (Darling-Hammond & Ball, 2004). Thus, enhancing pre-service teachers' competence in student assessment is critical to teacher education programs, although competence is not just based on their knowledge.

In this study there are some limitations that might have influenced pre-service teachers' performance, despite their significant improvement. One limitation might be the short duration of the course. A larger course duration along with a better connection with previously taught courses might have yielded better results. Another limitation might be that only teachers' knowledge was examined and for this goal only a single inventory was used.

Therefore, to examine pre-service teachers' achievement on the student assessment standard, future studies need to combine knowledge results with performance in real settings. Also, the effect of physical education practicum as well as the effect of the whole course "Assessment in Physical Education-Student and Teacher assessment" on pre-service teachers' knowledge and skills on student assessment could be investigated. In that way, the studies will provide comprehensive and holistic information about pre-service teachers' competence in achieving the standard of student assessment.

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