

Article

Exploring Skills in Observing Teaching Competency through Video Evaluation of Class Demonstrations by Pre-Service Physical Education Teachers

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Abstract: This study aimed to evaluate the level of skill in observing teaching competency in pre-service physical education (PE) teachers and provide basic data to cultivate teaching competency. A total of 21 third-year pre-service PE teachers were selected as participants. The study derived descriptive statistics to analyze the participants' observation skills regarding teaching competency in different class stages using evaluation results of class demonstrations by pre-service teachers. The Mann–Whitney U test was conducted to verify the statistical significance of the evaluation between in-service and pre-service teachers. Compared with in-service teachers, pre-service teachers reported high agreement with intuitive teaching behaviors. However, pre-service teachers indicated low agreement with skills that required complex teaching behaviors depending on various situations. Based on theories by Schon (1983), pre-service teachers showed high “knowledge for practice” and low “knowledge in practice”. The present study confirmed that pre-service PE teachers tended to have high propositional knowledge and low methodological knowledge regarding teaching. Pre-service teacher education requires an approach that harmonizes theory- and practice-centered education. This study provided directions for pre-service teacher education to enhance the competency of pre-service teachers for leading and analyzing classes.

Keywords: pre-service teacher education; teacher evaluation; pre-service physical education teacher; class demonstration; teaching behavior analysis



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1. Introduction

The purpose of pre-service teacher education is to nurture teachers with practical teaching expertise who can guide students in school. In the area of physical education (PE), which mainly consists of physical activities, teaching is commonly conducted in various environments, such as school fields and gymnasiums, depending on the class contents. Therefore, teacher education must be conducted to accurately realize the purpose of education based on various factors, such as physical activity, learning environment, and learners [1]. In pre-service teacher education, training for the cultivation of practical teaching ability is limited to conducting class demonstrations in courses consisting of PE teaching methods, textbook research, and teaching methods. In the absence of mandatory practice and regulations, such training has not always been provided. Class demonstration is an effective way to enhance the practical teaching capacity of pre-service teachers, and research on class demonstrations in pre-service PE teacher education has shown various educational meanings.

Zach, Harari, and Harari [2] reported that class demonstrations based on pre-service teacher education help develop sufficient knowledge and teaching capabilities necessary to run classes in schools. Similarly, Kim [3] showed that self-reflection of class demonstrations in pre-service PE teachers enables understanding of problems and teaching philosophy of PE. Jeon et al. [4] observed that pre-service PE teachers develop competencies to understand the use of documents, such as lesson plans and curricula, through reflection activities of class demonstrations. Saban and Çoklar [5] reported that through micro-teaching, pre-service teachers can identify the strengths and weaknesses of their teaching behavior by reflecting on the use of various teaching tools, lesson planning, and timing.

Ryu [6] showed that self-evaluation of classes using video demonstrations and reflective activities helps pre-service teachers find and improve problems in teaching activities and gain confidence. Indeed, teacher evaluation of class demonstrations by pre-service PE teachers involves reflecting on evaluation results, which identifies problems with various teaching behaviors, such as inefficient presentation of assignments, lack of communication skills with students, and lack of student evaluation [7]. In a study on planning and implementation of class demonstrations by pre-service teachers, Park and Choi [8] suggested the need for an evaluation system that can accurately analyze and interpret the causes of positive and negative behaviors as well as identify practical knowledge levels.

Based on these findings, class demonstrations help pre-service teachers reflect on the process of planning and operating classes and improve their teaching competency. In particular, simultaneous evaluation of teaching and reflective activities effectively improve the quality of classes by further improving teaching competency. Reflective activities have positive effects on class demonstration; opportunities to understand and improve problems through objective evaluation allow professional evaluation of teaching competency according to systematic standards [9,10]. Therefore, evaluation of pre-service teachers' class demonstrations is an effective educational method to cultivate teaching competency for the successful management of classes in school [11].

For instance, NASPE [12] has presented conceptual definitions of each evaluation item and developed a tool to effectively evaluate the teaching expertise of PE teachers. SHAPE America [13] and NBPTS [14] suggested that qualification standards for PE teachers must specifically present the detailed contents of teachers' responsibilities. A team of researchers developed a scale, called Self-Evaluation of Teacher Effectiveness Questionnaire in Physical Education, consisting of 25 questions in six domains that state values in improving teachers' knowledge, understanding, motivation, and belief in education [15]. As such, experts are actively developing tools for teacher evaluation.

Kim [1] developed a teaching competency evaluation tool for PE teachers and evaluated classes led by PE teachers. Kim analyzed the teaching competency by sex and experience to evaluate the applicability of the developed tool. However, most studies on teacher evaluation are focused on evaluating the teaching competency of PE teachers. Meanwhile, research on developing teaching competency evaluation tools or evaluating the performance of pre-service PE teachers—who need practical teaching experience—is lacking. Teacher evaluation requires the analysis of data on teaching as a process, teaching methods, and teacher knowledge, as well as the use of adequate evaluation tools. Such evaluation of teaching competency cannot be achieved in a short period of time; rather, it must be systematically learned to acquire professional abilities [16]. Therefore, studies must be conducted to evaluate the teaching competency of pre-service teachers, identify exact problems, and seek improvements.

Our study aimed to evaluate class demonstrations conducted by pre-service PE teachers and to identify their level of practical teaching knowledge. We selected videos of class demonstrations by pre-service PE teachers conducted in PE teaching methods and evaluated these using the teaching competency evaluation tool developed by Kim and Kwak [17]. Specifically, we aimed to compare the evaluation results of pre-service PE teachers and field teachers to identify their class observation skills. Education that observes and evaluates the

process of class demonstration or practice in pre-service teacher education is expected to affect the improvement of teaching competency [18–24].

Specifically, the research questions of this study were as follows. First, what tendencies do the differences in the mean scores of detailed items show according to the class level between pre-service and field PE teachers? Second, in what order do the detailed items of the class level between the two groups show concordance? Third, what significant differences do the detailed items of the class level between the two groups show? With our findings, we expected to help pre-service PE teachers develop the ability to evaluate correct and incorrect PE teaching behaviors. Furthermore, by presenting the future directions of PE teacher evaluation education, we intended to help enhance professionalism in teachers.

2. Methods

2.1. Participants

Our study participants were 21 third-grade pre-service teachers enrolled in the Department of Physical Education at Happy University, three PE teachers with more than 10 years of experience as PE teachers, and three PE teachers who are PhDs in sports education. To derive meaningful research results that meet the purpose of our study, we used objective sampling among the non-probability sampling methods. The participants had no previous experience of participating in teaching practice and guiding students in schools. However, they had completed major courses, such as Introduction to School Physical Education, Theory of Physical Education, Theory of Gymnastics, Theory of Soccer Guidance, Theory of Cross-Country Guidance, and Theory of Volleyball Guidance, as well as the different major courses and teaching courses required of students by the second semester of the third year, such as Introduction to Education, Psychological Aspects of Education, and Educational Technology.

We explained the purpose and necessity of the study to all pre-service teachers and guided the progress of the study. In particular, we emphasized that the feedback regarding teaching behavior and education on class video analysis, both provided according to the results of this study, was expected to help them improve their teaching abilities. Subsequently, the study was conducted with 21 pre-service teachers who voluntarily agreed to participate. Regarding the number of participants (pre- and in-service teachers), we calculated the number required for the Mann–Whitney U test using G-power 3.1.6 [25]. The standard for calculating the number of samples was set at a significance level of 0.05 and an effect size of 0.80. The analysis revealed that the minimum sample size for our study was 22 people.

2.2. Data Collection

This study was conducted from March 2022 to July 2022, the first semester of 2022. To evaluate the video demonstrations of pre-service PE teachers, we conducted lectures on efficient class operation and practice in the fifth session. This allowed us to enhance the participants' understanding of the plan and operation of class demonstrations. In sessions six to eight, lesson plans completed by the participants were reviewed for feedback. In session nine, middle school PE class videos were shown to the participants, and class evaluation methods were taught using evaluation tools. After all class demonstrations, we evaluated the videos of class demonstrations by pre-service teachers in the classroom in the 14th session. The class with the best systematic plan and operation was selected and then evaluated by three experienced PE teachers, using the pre-service PE teacher teaching competency evaluation tool [17]. The specific evaluation tool item standards are shown in Table 1. Pre-service teachers completed the evaluation tool as they watched videos of class demonstrations. After completion, the evaluation papers were submitted to the instructor for data collection.

Table 1. Items for each teaching evaluation domain.

Stage	Domain	Evaluation Contents	
Class preparation	Establishing a learning environment	Securing teaching aids and space Safety inspection of learning environment	Preparing learning materials
	Routine activity	Attendance and dress check Health check	Warm-up activities Smooth progress
Introduction	Learning objectives and task presentation	Attention Recall of previous lesson contents Use of demonstrations, media, and cues Use of adequate language	Motivation Use of various questions Establishment and introduction of learning organization Safety education
		Use of appropriate teaching and learning methods Teaching method based on the characteristics of learners	Presenting various tasks
Development	Observation and interaction	Providing feedback Establishing a communicative atmosphere	Fair and equal treatment
	Maintaining the learning environment	Adequacy of learning environment Efficient control and operation of class hours	Adequate use of teaching materials and media Inappropriate teaching behavior
		Appropriateness of task execution time	
Conclusion	Routine activity	Cool-down activities Injury check	Efficient organization of learning materials
	Summary and evaluation	Confirming understanding of learning contents Encouraging active participation of learners	Learning transfer to daily life Preview of next lesson
Total		33 items	

2.3. Data Analysis

First, we derived the descriptive statistics for the analysis of class demonstration evaluation results and assessed the level of skill in observing teaching competency by stage. Second, we analyzed the intra-correlation coefficient (ICC) to evaluate agreement between the evaluators [26]. Single measures of ICC are used to evaluate differences in outcomes between groups, and mean measures, differences from the mean [27]. ICC analysis can provide high validity and reliability in measuring the evaluation results of a small number of people [26], as shown in this study. Third, to identify differences between evaluation of in-service and pre-service teachers, we conducted a matrix analysis to visualize the results on coordinates based on the X-axis (in-service teachers) and Y-axis (pre-service teachers). The Mann–Whitney U test is a non-parametric test and can identify differences without requiring assumptions of normality and homogeneity of variance when parameter assumptions are not satisfied [28].

2.4. Inter-Rater Reliability

To confirm the reliability of the evaluators, we selected one of the pre-service teachers' class demonstration videos and evaluated it three times. First, the evaluators received training on how to create evaluation tools. Second, the evaluation was conducted while watching the video. The evaluation was carried out three times, conducted at intervals of 30 min. Table 2 shows the ICC that we analyzed to investigate inter-rater reliability. We confirmed the reliability between raters.

Table 2. Inter-rater reliability analysis.

Classification	ICC Value	95% Confidence Interval		F Test	
		Lower Bound	Upper Bound		Significance (<i>p</i> -Value)
Single measures	0.508	0.301	0.694	4.025	0.000
Mean measures	0.756	0.564	0.872	4.025	0.000

2.5. Ethics

After explaining the purpose and necessity of the study to the participants, we provided each with a written IRB consent form for participation. The entire process of class demonstration was observed and operated to execute the study in accordance with the proposed plan. The data collected during the study were reviewed by with pre-service teachers. Additionally, peer debrief and triangulation were conducted with two PhDs in Sports Education who had interests in and conducted research on pre-service teacher education. This study was conducted after obtaining IRB approval (GINUEIRB-2021-005) from Gyeongin National University of Education in Korea.

3. Results

3.1. Class Preparation Stage

Figure 1 and Table 3 show the evaluation score on class preparation by in-service and pre-service teachers. The mean score difference between the two groups was 0.53 points. In detail, inter-rater agreement was observed in the order of “safety inspection of learning environment” (−0.04), “preparing learning materials” (0.76), and “securing teaching aids and space” (0.80). The Mann–Whitney U test showed a significant difference in “preparing learning materials” ($U = 6.00, p = 0.05$).

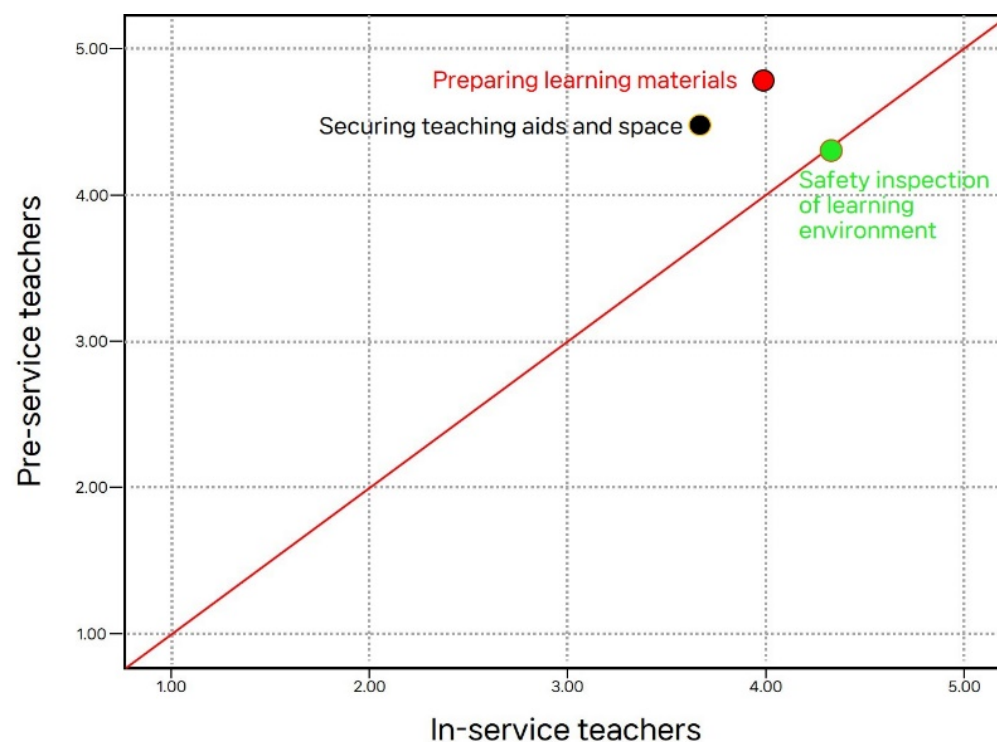
**Figure 1.** Comparison of detailed evaluation items in class preparation stage.

Table 3. Analysis of class preparation stage.

Class Stage	Domain	Detailed Item	In-Service Teachers (n = 3)		Pre-Service Teachers (n = 21)		GAP	U	Z	p
			M	SD	M	SD				
Class preparation	Establishing a learning environment	Securing teaching aids and space	3.67	0.58	4.47	0.72	0.80	10.00	−1.800	0.072
		Safety inspection of learning environment	4.33	0.58	4.29	0.59	−0.04	25.00	−0.061	0.951
		Preparing learning materials	4.00	0.00	4.76	0.44	0.76	6.00	−2.495	0.013 *
Total (M)			4.00		4.51		0.53			

* $p < 0.05$. GAP: Gap between X and Y, U: Mann–Whitney test, Z: Z-value.

3.2. Introduction Stage

Figure 2 and Table 4 show the evaluation score on the introduction stage of class demonstration by in-service and pre-service teachers. The mean score difference between the two groups was 1.11 points. In detail, inter-rater agreement was observed in the order of “use of various questions” (0.41), “health check” (0.62), “establishment and introduction of learning organization” (0.73), “recall of previous lesson contents” (0.79), “motivation” (0.98), “smooth progress” (1.06), “warm-up activities” (1.09), “attention” (1.15), “use of demonstrations, media, and cues” (1.29), “attendance and dress check” (1.45), “use of adequate language” (1.47), and “safety education” (2.33). The Mann–Whitney U test showed a significant difference in “attendance and dress check” ($U = 2.00$, $p = 0.01$) and “warm-up activities” ($U = 4.00$, $p = 0.01$) of the routine activity domain and “attention” ($U = 6.50$, $p = 0.05$), “recall of previous lesson contents” ($U = 9.00$, $p = 0.05$), “use of demonstrations, media, and cues” ($U = 4.50$, $p = 0.05$), “use of adequate language” ($U = 1.50$, $p = 0.01$), and “safety education” ($U = 0.00$, $p = 0.01$) of the learning objectives and task presentation domain.

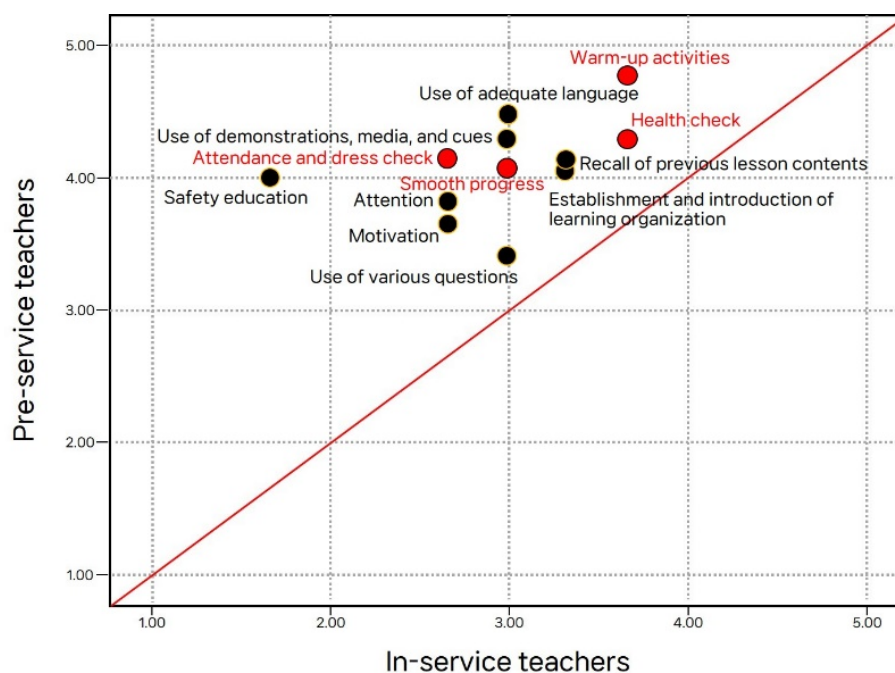
**Figure 2.** Comparison of detailed evaluation items in introduction stage.

Table 4. Introduction stage analysis.

Class Stage	Domain	Detailed Item	In-Service Teachers (n = 3)		Pre-Service Teachers (n = 21)		GAP	U	Z	p
			M	SD	M	SD				
Introduction stage	Routine activity	Attendance and dress check	2.67	0.58	4.12	0.60	1.45	2.00	−2.748	0.006 **
		Health check	3.67	0.58	4.29	0.47	0.62	12.00	−1.782	0.075
		Warm-up activities	3.67	0.58	4.76	0.44	1.09	4.00	−2.720	0.007 **
		Smooth progress	3.00	0.00	4.06	0.83	1.06	6.00	−2.201	0.028 *
	Learning objectives and task presentation	Attention	2.67	0.58	3.82	0.81	1.15	6.50	−2.144	0.032 *
		Recall of previous lesson contents	3.33	0.58	4.12	0.70	0.79	9.00	−2.061	0.039 *
		Use of demonstrations, media, and cues	3.00	0.00	4.29	0.77	1.29	4.50	−2.364	0.018 *
		Use of adequate language	3.00	0.00	4.47	0.62	1.47	1.50	−2.739	0.006 **
		Motivation	2.67	0.58	3.65	1.00	0.98	11.00	−1.608	0.108
		Use of various questions	3.00	1.00	3.41	0.87	0.41	19.00	−0.735	0.462
		Establishment and introduction of learning organization	3.33	0.58	4.06	0.75	0.73	10.50	−1.804	0.071
		Safety education	1.67	0.58	4.00	0.79	2.33	0.00	−2.803	0.005 **
	Total (M)		2.97		4.09		1.11			

* $p < 0.05$, ** $p < 0.01$. GAP: Gap between X and Y, U: Mann–Whitney test, Z: Z-value.

3.3. Development Stage

Figure 3 and Table 5 show the evaluation scores on the development stage of class demonstration by in-service and pre-service teachers. The mean score difference between the two groups was 0.64 points. In detail, inter-rater agreement was observed in the order of “adequacy of learning environment” (0.08), “use of appropriate teaching and learning methods” (0.09), “adequate use of teaching materials and media” (0.12), “presentation of various tasks” (−0.33), “inappropriate teaching behavior” (0.38), “providing feedback” (0.51), “appropriateness of task execution time” (0.51), “fair and equal treatment” (1.08), “efficient control and operation of class hours” (1.15), “teaching method based on the characteristics of learners” (1.39), and “establishing a communicative atmosphere” (1.41). The Mann–Whitney U test showed a significant difference in “teaching method based on the characteristics of learners” ($U = 2.00$, $p = 0.01$) of the class strategy domain. In the observation and interaction domain, we found significant differences in “establishing a communicative atmosphere” ($U = 5.00$, $p = 0.05$) and “fair and equal treatment” ($U = 6.00$, $p = 0.05$). The maintaining the learning environment domain showed a significant difference in “efficient control and operation of class hours” ($U = 3.00$, $p = 0.01$).

3.4. Conclusion Stage

Figure 4 and Table 6 show the evaluation score on the conclusion stage of class demonstration by in-service and pre-service teachers. The mean score difference between the two groups was 0.79 points. In detail, inter-rater agreement was observed in the order of “en-

couraging active participation of learners" (0.14), "cool-down activities" (−0.21), "preview of next lesson" (0.26), "learning transfer to daily life" (0.51), "confirming the understanding of learning contents" (−1.04), "efficient organization of learning materials" (1.14), and "injury check" (2.24). The Mann–Whitney U test showed a significant difference in "injury check" ($U = 0.50, p = 0.01$) of the routine activity domain and "confirming the understanding of learning contents" ($U = 8.00, p = 0.05$) of the summary and evaluation domain.

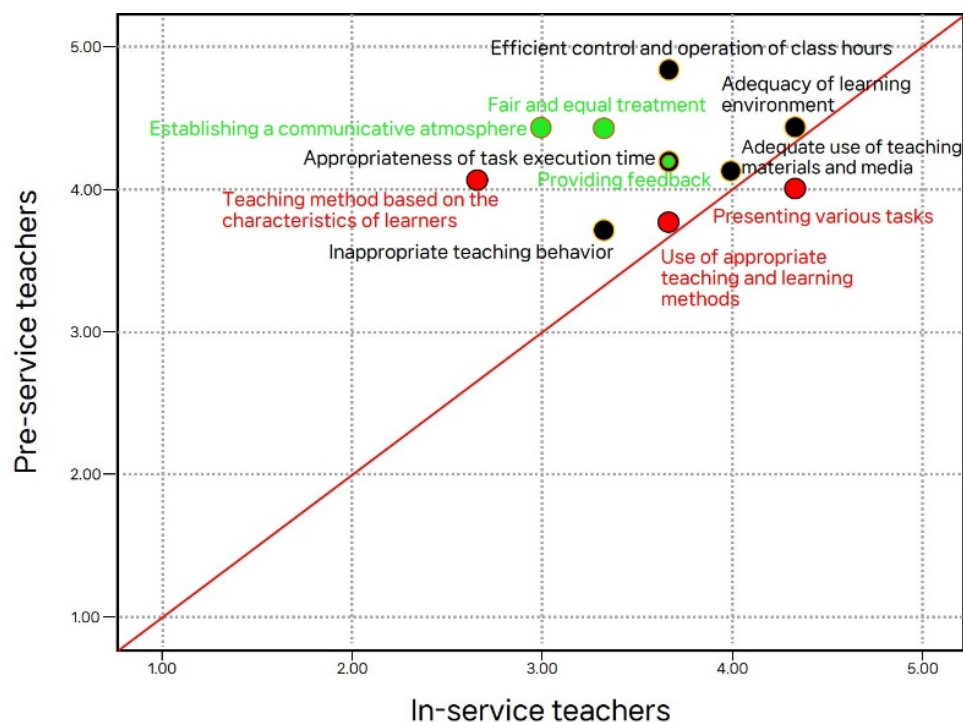


Figure 3. Comparison of detailed evaluation items in development stage.

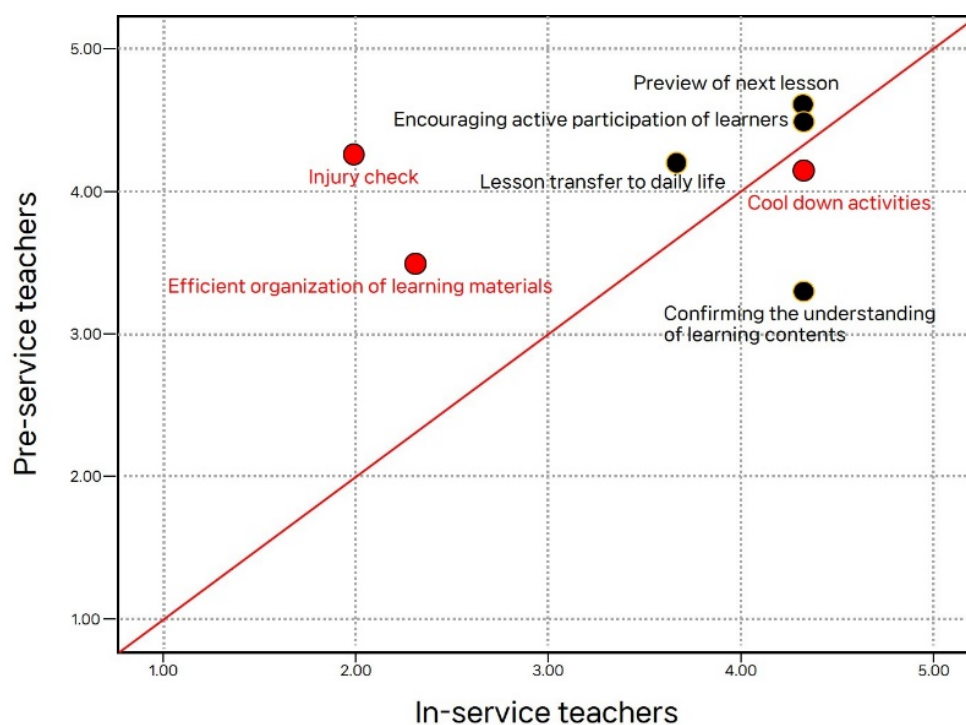


Figure 4. Comparison of detailed evaluation items in conclusion stage.

Table 5. Development stage analysis.

Class Stage	Domain	Detailed Item	In-Service Teachers (n = 3)		Pre-Service Teachers (n = 21)		GAP	U	Z	p
			M	SD	M	SD				
Development stage	Class strategy	Use of appropriate teaching and learning methods	3.67	0.58	3.76	0.66	0.09	24.00	−0.178	0.858
		Teaching method based on the characteristics of learners	2.67	0.58	4.06	0.56	1.39	2.00	−2.827	0.005 **
		Presenting various tasks	4.33	0.58	4.00	0.87	−0.33	20.50	−0.575	0.565
	Observation and interaction	Providing feedback	3.67	0.58	4.18	0.53	0.51	14.50	−1.445	0.149
		Establishing a communicative atmosphere	3.00	1.00	4.41	0.51	1.41	5.00	−2.438	0.015 *
		Fair and equal treatment	3.33	0.58	4.41	0.62	1.08	6.00	−2.247	0.025 *
	Maintaining the learning environment	Adequacy of learning environment	4.33	0.58	4.41	0.80	0.08	21.50	−0.478	0.633
		Efficient control and operation of class hours	3.67	0.58	4.82	0.39	1.15	3.00	−2.970	0.003 **
		Appropriateness of task execution time	3.67	0.58	4.18	0.81	0.51	14.50	−1.296	0.195
		Adequate use of teaching materials and media	4.00	0.00	4.12	0.60	0.12	22.50	−0.394	0.694
		Inappropriate teaching behavior	3.33	0.58	3.71	0.85	0.38	18.50	−0.794	0.427
Total (M)			3.61		4.19		0.64			

* $p < 0.05$, ** $p < 0.01$. GAP: Gap between X and Y, U: Mann–Whitney test, Z: Z-value.**Table 6.** Conclusion stage analysis.

Class Stage	Domain	Detailed Item	In-Service Teachers (n = 3)		Pre-Service Teachers (n = 21)		GAP	U	Z	p
			M	SD	M	SD				
Conclusion stage	Routine activity	Cool-down activities	4.33	0.58	4.12	0.70	−0.21	22.00	−0.462	0.644
		Injury check	2.00	1.00	4.24	0.56	2.24	0.50	−2.924	0.003 **
		Efficient organization of learning materials	2.33	1.15	3.47	0.94	1.14	10.00	−1.768	0.077
	Summary and evaluation	Confirming the understanding of learning contents	4.33	0.58	3.29	0.77	−1.04	8.00	−2.013	0.044 *
		Encouraging active participation of learners	4.33	0.58	4.47	0.62	0.14	21.50	−0.478	0.633
		Lesson transfer to daily life	3.67	0.58	4.18	0.88	0.51	16.50	−1.013	0.311
		Preview of next lesson	4.33	0.58	4.59	0.51	0.26	19.00	−0.797	0.425
Total (M)			3.62		4.05		0.79			

* $p < 0.05$, ** $p < 0.01$. GAP: Gap between X and Y, U: Mann–Whitney test, Z: Z-value.

4. Discussion

We analyzed the differences in the characteristics of evaluation results for each stage of class demonstration between pre-service and in-service teachers. Both groups had the same evaluation scores for “securing teaching aids and space” and “safety inspection of learning environment” of the establishing a learning environment domain in the class preparation stage. This stage has the purpose of selecting an appropriate place for learning contents before class and creating a safe and enjoyable learning environment by using adequate teaching aids and facilities [29]. In pre-service teacher education, the importance of establishing a learning environment is emphasized for smooth class progression. Pre-service teachers are thought to have understood the knowledge needed to create a learning environment and experience the process of preparing a class, thereby accumulating the knowledge to distinguish teaching behaviors to create the necessary learning environment. As such, they showed similar results for the evaluation of class demonstration videos as in-service PE teachers.

However, inter-rater agreement was not observed for “preparing learning materials”. This suggests differences in the standards for using materials suitable for learning topics between pre-service and in-service teachers. Preparing learning materials involves organizing an appropriate space and preparing sufficient teaching aids, such as scoreboards and team vests, to facilitate task activities according to individual or group activities [30]. As such, the differences between the evaluation scores of pre-service and in-service teachers can be expected; the latter have abundant experience in preparing learning materials for teaching. Pre-service PE teachers can grasp the appropriate behavior of securing space for classes; however, they have not reached the same level of distinguishing teaching behaviors for preparing learning materials appropriate for various conditions.

In the routine activity domain, pre- and in-service PE teachers showed the same evaluation scores for “health check” and “smooth progression”, and discrepancies in the scores for “attendance and dress check” and “warm-up activities”. Routine activity refers to events that occur repeatedly in class, such as attendance check, dress check, and warm-up activities [31]. In-service PE teachers use various and interesting ways for attendance check and warm-up activities. In contrast, pre-service teachers conduct formal routine activities, which they consider as excellent teaching activities.

In the learning objectives and task presentation domain, pre-service and in-service teachers showed similar evaluation scores for “motivation”, “use of various questions”, and “organization”, and discrepancies in the scores for “attention”, “presenting learning tasks”, “use of demonstrations, media, and cues”, and “use of adequate language”. Task presentation plays a role in promoting active participation by effectively presenting learning topics and tasks to the learners [32]. This requires effective communication using language, demonstrations, and media. Effective teachers explain task presentations concisely and clearly, demonstrate with complete movements, use appropriate cues, and emphasize key contents [33]. In-service teachers may have given a moderate score for the use of different task presentation behaviors, whereas the pre-service teachers tended to overrate.

The pre-service and in-service PE teachers gave similar scores for “use of appropriate teaching and learning methods” and “presenting various tasks” in the teaching strategy domain of the development stage. In contrast, the two groups did not show an agreement for “teaching method based on the characteristics of learners”. The national PE curriculum suggests teaching and learning methods that consider the characteristics of learners [34]. Such teaching strategy tailored for the learners is an important factor in PE. However, since most pre-service PE teachers performed class demonstrations as secondary assistant teachers, they faced difficulties in understanding the characteristics of learners. Consequently, the pre-service teachers may have given high scores, in contrast to in-service teachers.

In the observation and interaction domain, intuitive teaching functions, such as “providing feedback” and “fair and equal treatment”, can be easily judged from videos of class demonstrations. However, pre-service teachers tended to overrate items that are learned through field experience, such as “establishing a communicative atmosphere”. In

the maintaining the learning environment domain, pre-service teachers showed discrepancies in scores for “efficient control and operation of control hours” and similar scores for “appropriateness of task execution time”, “adequacy of learning environment”, “adequate use of teaching materials and media”, and “inappropriate teaching behavior” compared with the in-service teachers. Based on these findings, pre-service PE teachers showed a tendency to overrate instructional functions that involve direct interaction with learners, compared with in-service teachers. However, pre-service PE teachers had similar opinions as in-service teachers on skills that could be acquired from assisting fellow teachers.

Pre- and in-service PE teachers showed agreement in scores for “cool-down activities” and “efficient organization of teaching materials” in the routine activity domain of the conclusion stage while showing a discrepancy in the score for “injury check”. Injury check is directly related to the safety and health of students [35]. However, pre-service teachers may not have acquired knowledge on basic routine activities as in the introduction stage, thereby limiting their analysis of “injury check”.

Pre-service and in-service PE teachers showed similar scores for “encouraging active participation of learners”, “lesson transfer to daily life”, and “preview of next lesson” in the summary and evaluation domain while showing a discrepancy in the score for “confirming the understanding of learning contents”. This suggests that pre-service teachers tended to overrate the important educational activity of confirming the achievement of learning goals through reflective activities with students.

Thus, pre-service PE teachers had a high level of “knowledge for practice” in which universal concepts or propositional knowledge were represented in specific language and methods through class demonstrations. However, their level of “knowledge in practice”, which refers to knowledge that is internalized or newly acquired in practice through teaching, was judged to be low. Based on these problems of pre-service PE teachers’ class analysis ability, theory-oriented teacher education may not be helpful in cultivating pre-service teachers’ practical competence [36]. In pre-service teacher education, the dominance of “theory-centered teacher education” based on the technical rationalism model [37] is a major obstacle [21].

Therefore, rather than concentrating on education that highlights theory (knowing-that), education that harmoniously composes practical knowledge (knowing-how) is needed. As a way to increase the practical knowledge of pre-service PE teachers, Schon’s [38] cyclical view of teacher knowledge is limited. A plan to practice a balanced education of “knowledge for practice” and “knowledge in practice” is required. Based on our results, we urge the development of various models for class demonstration and evaluation in pre-service PE teacher education. Through the development and application of a model that integrates theory and practice, pre-service teacher education can move in the direction of cultivating the ability of preservice PE teachers to manage and analyze classes.

5. Conclusions and Suggestions

In our study, the pre-service teachers showed discrepancies in their evaluation scores for class demonstration videos and tended to overrate many items compared with in-service teachers. Such tendency was attributed to the low level of knowledge in pre-service teachers observing teaching behaviors required for different classes and may be related to a lack of practical teaching knowledge. Class demonstrations in pre-service PE teacher education in universities often depend on assistant teachers rather than actual students, similar to micro-teaching. Intuitive teaching function is the capacity to demonstrate and appropriately apply the learned contents as assistant teachers. However, teaching skills that require interaction with actual students or teaching behaviors acquired through field experience and presented as practical knowledge are difficult to demonstrate or evaluate. Therefore, in light of our findings, the following suggestions are presented to improve the teaching behavior analysis ability of pre-service PE teachers.

First, pre-service teachers should obtain higher levels of practical teaching knowledge. The lack of reliability in the evaluation results by pre-service teachers may be attributed

to their limited knowledge to judge the level of teaching behavior. To analyze classes, the teacher must apply curriculum knowledge and teaching methods, as well as observe class environment and learner characteristics. Therefore, pre-service teacher education must provide effective training to cultivate practice-oriented pedagogical content knowledge required for PE teachers.

Second, institutions must establish a well-organized curriculum that can help pre-service teachers accumulate adequate knowledge and analysis skills for PE classes. Pre-service teachers often do not have opportunities to observe in-person or lead PE classes at schools. Therefore, they must be sustainably provided with opportunities to spectate PE classes led by excellent in-service teachers and learn professional PE class management skills and standards.

Based on our findings, suggestions for follow-up studies are as follows. Future studies must explore the value of self-reflective activities according to class evaluations to confirm the value of evaluation tools from the perspective of pre-service teachers. Additionally, studies must combine and apply systematic observation methods for analysis of teaching behavior. Using teaching behavior analysis tools, such as duration recording, QMTPS, and Cheffers' Adaptation to Flanders' Interaction Analysis System, will increase the reliability and validity of data in follow-up studies.

Finally, this study has the following limitations. First, it was conducted with pre-service teachers, and second, it included a small number of in-service teachers at a specific university. Future research should target a large number of pre-service and in-service teachers across various teacher education institutions. This can reduce the error of the sample. Further, more interesting results can be derived by using the statistical method of parameters.

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