Journal of Teaching Physical Education in Elementary School

Journal homepage: https://ejournal.upi.edu/index.php/tegar/index

Enhancing Self-Efficacy of Pre-service Physical Education Teachers through Course Design: A Systematic Review

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ABSTRACT

Teacher self-efficacy has been shown to be related to teaching competence, perseverance, and student learning outcomes, making it an important focus in pre-professional teacher education. As one important psychological factor, self-efficacy predicts how well the pre-service teacher can perform teaching skills in real situations and ultimately enhances their job satisfactions. There are numbers of study on physical education which attempted to enhance physical education teacher competencies, but there is no literature review which specifically shows how course design may develop pre-service physical education teachers' self-efficacy. This systematic review analyzed nine articles published from 2014 to 2024 to reveal the impact of PETE courses designed to improve pre-service physical education teachers' self-efficacy. The findings showed that the courses designed to optimize the fulfilment of sources of self-efficacy can improve pre-service teachers' self-efficacy. This study confirms the importance of course design in physical education teacher education. Recommendations for practice and further research are discussed in this paper.

ARTICLE INFO

Article History:

Submitted/Received September 2025

First Revised September 2025

Accepted October 2025

Publication Date October 2025

Keyword:

Course design, pre-service teacher, self-efficacy, teacher education

INTRODUCTION

Physical Education Teacher Education (PETE) programs play a crucial role in preparing pre-service physical education teachers to deliver high-quality physical education in schools (Bryan & Sims, 2020; Mason, 2023). One key aspect of teacher preparation is the development of teacher self-efficacy, a teacher's belief in their ability to plan, teach, manage the classroom, and assess student learning (Klassen & Tze, 2014). This is important because the teacher's self-efficacy has been shown to play a crucial role in shaping the quality of teaching, instructional decision-making, perseverance in the face of challenges (Kuhn, 2022), and teachers' readiness to accommodate the diverse needs of students, including those with disabilities (Sharma et al., 2012; Tschannen-Moran & Hoy, 2001). Thus, self-efficacy is an important psychological output for pre-service physical education teachers enrolled in the PETE program.

According to Bandura's (1997) self-efficacy theory, four sources are critical to the development of pre-service teachers' self-efficacy. The urgency of four main sources of self-efficacy—mastery experiences, vicarious experiences, verbal persuasion, and physiological and emotional conditions—lies in their function as predictive foundations for individual resilience and performance (Sheu et al., 2018). Mastery experience refers to an individual's success in completing a task, and it is the most powerful source of self-confidence. For example, a student who has successfully acquired sports skills, such as shooting a basketball, will be more confident in performing such skills. Thus, this source is considered the most influential source; without real past successes, the belief of capability is often fragile. Vicarious experience is gained by observing the success of others who are considered equal or capable, such as a student who feels more confident to play basketball after seeing a friend making a successful shot. Thus, this social modeling allows individuals to gauge their abilities by comparing themselves to peers. Verbal persuasion takes the form of support or positive feedback from others that can strengthen self-confidence. For example, a teacher who provides motivation so that students are more confident in attempting a difficult movement task. This persuasion serves as an external boost, strengthening cognitive commitment to a task. Finally, physiological or emotional arousal under certain physical and emotional conditions influences an individual's assessment of their abilities. For instance, feeling calm, compared to feeling anxious, during an attempt to shoot increases self-confidence. This is crucial because negative perceptions of stress can paralyze action, even if technical skills are adequate. Eventually, a holistic understanding of these four elements is essential because self-efficacy affects how much effort is expended, how long individuals persevere in the face of obstacles, and how they recover from failure, which collectively determine success in academic, professional, and mental health domains (Bandura, 1997).

Self-efficacy beliefs tend to be formed and strengthened through early experiences, particularly mastery experiences and vicarious experiences. These experiences frequently occur during pre-service training and allow pre-service teachers to carry on into their future teaching practice (Hoy & Spero, 2005). Therefore, the four main sources of self-efficacy should be integrated into the PETE courses to help pre-service physical education develop knowledge and skill acquisition processes aligned with program outcomes. Previous empirical studies have shown that pre-service physical education teachers' self-efficacy can be enhanced through purposeful course design by integrating activities based on the four

DOI: https://doi.org/10.17509/tegar.v9i1.78337
p- 2797-2038 e- ISSN 2614-5626

sources of self-efficacy, such as brief interventions, field practicum experiences, or course-based training (Fletcher et al., 2013; Reina et al., 2019). For example, Nowland & Haegale (2023) found that practical teaching experience, inclusive practice-based learning, and the quality of supervision during a PETE program can positively influence pre-service teachers' self-efficacy in teaching students with disabilities. Despite this, there are few studies particularly focused on pre-service PE teachers' self-efficacy (Richards et al., 2017; Standal & Moe, 2013).

The development of teacher self-efficacy is crucial, as it enables pre-service physical education teachers to help their students overcome learning anxiety and improve self-concept in physical education. However, no systematic review has explored the relationship between course design and teacher self-efficacy. Therefore, the purpose of this review is to identify the characteristics of studies published in the past ten years, with a special focus on how the four sources of self-efficacy were integrated in PETE programs. Through this review, we hope to inform how the self-efficacy theory can be applied to and provide a stronger conceptual and empirical foundation for evidence-based course design that explicitly strengthens pre-service teachers' self-efficacy.

METHODS

Systematic Literature Review (SLR) is suitable for identifying empirical research that meets predetermined inclusion criteria to answer a specific research question or hypothesis and to avoid literature review search bias. Because the method of reviewing articles and research results is carried out systematically, the literature search results tend to have good credibility (Moher et al., 2009). Built on previous literature reviews (Richards et al., 2017; Standal & Moe, 2013), the current literature review search from 2014 to 2024, intended to provide an overview of the latest research results.

The current systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines (Page et al., 2021). The electronic databases include SportDiscuss, CINAHL, ERIC, and PsycINFO. The search strategy was focused on three main search categories: (a) Pre-service Physical Education Teacher, (b) Teacher Training, and (c) Self-efficacy. The keyword terms for these concepts are provided in Table 1, using Boolean operators such as AND, OR, and NOT, and combined keywords, which effectively refined the search results.

Table 1 *Categories and Full List of Search Terms*

Category	List of full search terms
Pre-service Physical Education Teacher	"Pre-service teacher" OR "Pre-service physical education teacher" OR "preservice PE teacher" OR "Future Physical Education Teacher OR PETE"
Teacher Training	"Courses" OR "Training" OR "Online training" OR "Teacher skills development" OR "Teacher preparation programs" OR "Pre-service teacher training" OR "Teacher training programs"
Self-efficacy	"Self-efficacy"

DOI: https://doi.org/10.17509/tegar.v9i1.78337
p- 2797-2038 e- ISSN 2614-5626

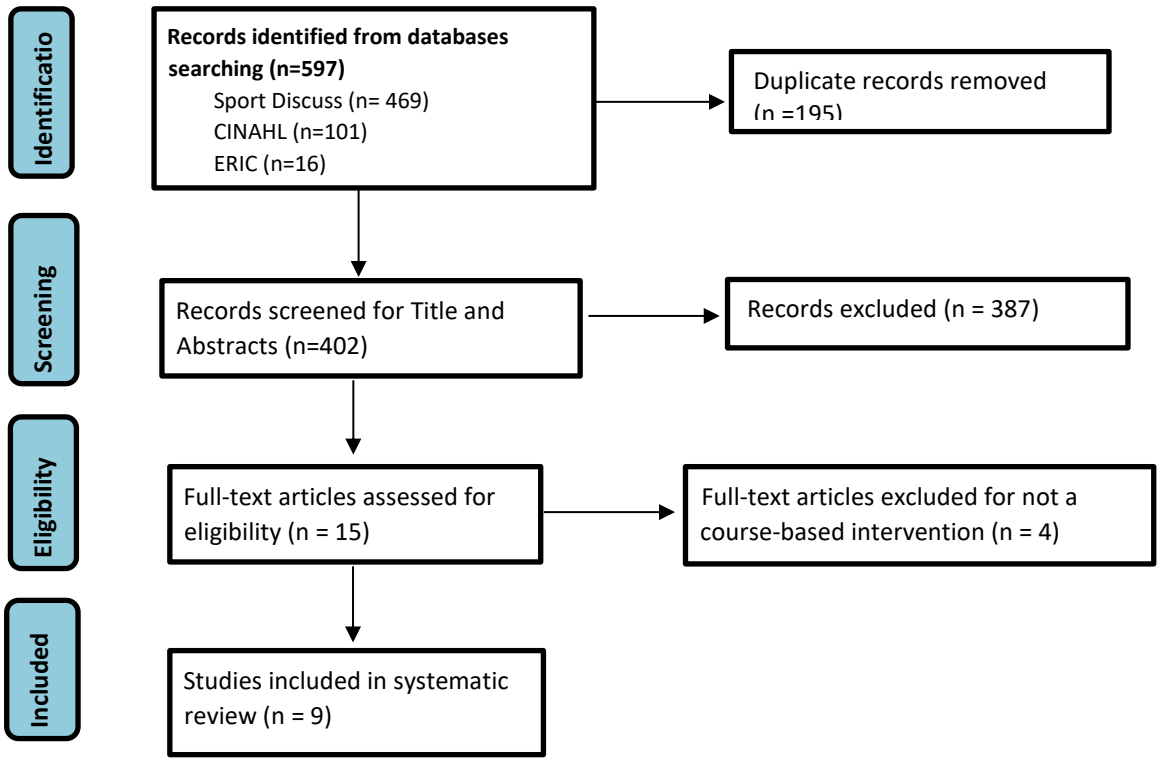
Inclusion and Exclusion Criteria

Studies included in this review met the following criteria: (a) they are empirical studies; (b) they were published in English; (c) they were published in peer-reviewed journals; (d) they were published between 2014 and 2024; (e) available in full text; (f) they include a measure of self-efficacy; and (g) participants are pre-service physical education teachers. Conversely, studies were excluded if they are not empirical research, not published in English, did not undergo peer review, were published outside the 2014–2024 period, were not available in full text, did not explicitly measure self-efficacy, or involved participants other than pre-service physical education teachers, such as practicing PE teachers or in-service trainees.

Article Search Process

The article selection process included four phases based on the PRISMA guidelines: (a) identification, (b) screening, (c) eligibility, and (d) inclusion. A total of 597 articles were identified through a database search: Sport Discuss (469 articles), CIHAHL (101 articles), ERIC (16 articles), and PsycINFO (11 articles). Covidence automatically removed 195 duplicates, and then the author screened 402 titles and abstracts. After screening the titles and abstracts, 383 were excluded for not meeting the inclusion criteria. In the full-text review, six studies were excluded for not meeting the inclusion criteria. Finally, nine studies met the inclusion criteria for further full-text review. Therefore, a thematic analysis was conducted to answer the research questions. The PRISMA flow diagram for the article selection process is shown in Figure 1.

Figure 1. *PRISMA flow diagram for the article selection process*



DOI: https://doi.org/10.17509/tegar.v9i1.78337
p- 2797-2038 e- ISSN 2614-5626

Methodological Quality Assessments

The methodological quality of the studies was assessed using the Mixed Methods Appraisal Tool (MMAT; Hong et al., 2018; Pace et al., 2012). For each research design type, the MMAT provides five assessment criteria for evaluating methodological quality, as presented in Table 1. Each criterion is rated as "yes," "no," or "can't tell" when the information presented in the article is insufficient to provide a clear assessment. The risk-of-bias assessment was conducted independently by the researchers (Table 1). Discrepancies in the assessments were resolved through discussion until an agreement was reached, with an additional researcher serving as a mediator.

Table 1. *Risk of bias assessment for included studies using MMAT*

Authors	Method	Q1	Q2	Q3	Q4	Q5
Taliaferro et al. (2015)	Quantitative non-randomized	Yes	Yes	Yes	Yes	Yes
Tindall et al. (2016)	Mixed methods	Yes	No	No	No	No
Krause et al. (2017)	Quantitative non-randomized	Yes	Yes	Yes	Yes	Yes
Kwon et al. (2017)	Quantitative non-randomized	Yes	Yes	Yes	Yes	Yes
Weissblueth et al. (2019)	Qualitative	No	Can't Tell	Yes	No	Can't Tell
Legrain et al. (2019)	Quantitative non-randomized	Yes	Yes	Yes	Yes	Yes
Foley at al. (2020)	Quantitative non-randomized	Yes	Yes	Yes	Yes	Yes
Hovey et al. (2020)	Quantitative non-randomized	Yes	Yes	Yes	Yes	Yes
Moosbrugger et al. (2023)	Qualitative	Yes	Yes	Yes	Yes	Yes

Note: Three criteria of assessment are Yes, No, and Can't Tell. MMAT comprises five questions based on the methodology; however, in this paper, the authors present the general wording of the questions to make them more accessible to readers.

Coding and Data Extraction

In the coding process, data were identified and classified into four sources of self-efficacy based on Bandura's theoretical framework: mastery experience, vicarious experience, social persuasion, and physiological and affective states. Each activity, learning strategy, or intervention component reported in the reviewed studies was conceptually analyzed to determine the most dominant source of self-efficacy. Since there were no standard criteria, the extraction indicators were established deductively by directly referring to Bandura's theoretical definitions.

Specifically, the data were coded as mastery experience if they included information about direct success experiences, independent task completion, or improved competence through gradual practice. Vicarious experience was identified through the observation of models, demonstrations, or practice examples by relevant others. Social persuasion included verbal feedback, positive reinforcement, and encouragement from lecturers, trainers, or peers, aimed at increasing participants' self-confidence in their performance. Meanwhile, physiological and emotional states were coded when the activity involved managing

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p- 2797-2038 e- ISSN 2614-5626

emotions, anxiety, or stress, or when participants' emotional responses were observed during the learning process. Each data unit was classified into only one main category based on its dominant function in building self-efficacy, to maintain consistency and clarity in the thematic analysis.

FINDINGS

Aligned with the research purposes, the findings of the current literature review consist of two themes: (1) study characteristics and (2) four sources of self-efficacy in course design.

Study Characteristics

The study characteristics are summarized in Table 2, including theoretical framework and research design, participants and setting, variables and measures, and overall effectiveness. In general, all nine selected articles used the self-efficacy theory, while one paper also used the Theory of Planned Behavior (TPB) (Taliaferro et al., 2015) and the Whole Community Child Framework (Moosbrugger et al., 2023) as additional theories. Based on the research methods used, five studies employed a quantitative approach, two by qualitative design, and one adopted a mixed-methods combining quantitative and qualitative data. Furthermore, four studies were conducted in the United States (Taliaferro et al., 2015; Krause et al., 2017; Hovey et al., 2020; Moosbrugger et al., 2023), and one in each of the following countries: Ireland (Tindall et al., 2015), Israel (Weissblueth et al., 2019), Korea (Kwon et al., 2017), and France (Legrain et al., 2019). There is also one study conducted across European countries, i.e., Spain, the Czech Republic, and Lithuania (Foley et al., 2020).

Seven studies involved pre-service teachers exclusively in the PETE Program (Taliaferro et al., 2015; Tindall et al., 2016; Kwon et al., 2017; Weissblueth et al., 2019; Foley et al., 2020; Hovey et al., 2020; Moosbrugger et al., 2023), one study combined pre-service teachers, master programs, and certified teachers (Krause et al., 2017), and another study involved volunteer coaches from various countries (Legrain et al., 2019). Meanwhile, the number of participants in the reviewed studies varied, ranging from 12 (Moosbrugger et al., 2023) to 111 (Hovey et al., 2020). Regarding sex distribution, three studies reported a relatively balanced number of male and female participants, four reported an imbalance in gender proportions, and one did not report gender information. The average age of participants was 21 years, with the youngest participant being 19 years old and the oldest 36 years old. Generally, participants were undergraduate students in their first to third years, while a few studies included master's students and teacher certification programs.

Regarding course contents, there were studies focused on Adaptive Physical Education (APE) (Taliaferro et al., 2015; Foley et al., 2020), Adaptive Physical Activity (APA) (Tindall et al., 2016), general Physical Education (PE) consist of delivered technology integration in physical education (Krause et al., 2017), motor learning and posture course (Weissblueth et al., 2019), martial arts course (Legrain et al., 2019), outdoor education course (Hovey et al., 2020), and health education course (Moosbrugger et al., 2023). In these studies, seven courses were conducted face-to-face (offline), while the other two were delivered online via e-learning (Kwon et al., 2017; Legrain et al., 2019). The duration of the interventions embedded in corresponding courses varied. Specifically, four studies lasted fewer than five-

DOI: https://doi.org/10.17509/tegar.v9i1.78337
p- 2797-2038 e- ISSN 2614-5626

Table 2

Data descriptives on the course design procedure and main results of pre-service teacher self-efficacy

Author & Country	Participants	Research Design	Procedure	Theoretical Framework	Measure	Results
Taliaferro et al. (2015)	n=98 (M=75; F=23); 51 enrolled in Course 1 (2nd or 3rd semester); 47 enrolled in Course 2 (one-credit-senior APE Course during last semester)	Quantitative	Participants enrolled in 1 of 2 separate 15-wk APE courses with an associated 9-wk practicum experience were surveyed at the beginning, middle, and conclusion of each course. Course 1: APE Survey course; Course 2: one-credit senior-level APE course; APE Practicum (9-week, 60-minutes per week) on campus practicum working with individuals with various disabilities students.	Theory of Planned Behavior; Self-Efficacy Theory	Self-Efficacy (PESEISD-A)	The only statistically significant difference in self-efficacy beliefs between the two groups was found in Time 1 for Autism, with self-efficacy beliefs for Course 2 participants significantly lower than Course 1 participants (MCourse1 = 7.36, SD = 1.84; MCourse2 = 6.52, SD = 1.35).
Tindall et al. (2016)	n=64 (M: 34; F=30; age between 19-25) 3rd year PETE Program	Mixed-method	APA Program Participation: PSTs engaged in a 10-week Adapted Physical Activity (APA) program designed to enhance self-efficacy in teaching children with disabilities.	Self-efficacy Theory	Self-Efficacy (SE-PETE-D)	self-efficacy scores significantly increased after participation in the program than those prior to participation in the program. Results of the focus group discussion also confirmed the findings from

DOI: https://doi.org/10.17509/tegar.v9i1.78337
p- 2797-2038 e- ISSN 2614-5626

Author & Country	Participants	Research Design	Procedure	Theoretical Framework	Measure	Results
						the questionnaire to be true and accurate.
Krause et al. (2017)	n=104. Response rate 71% (60 participants (M=28, F=32; Meas Age = 22.77, SD=1.8; 95% Caucasian). 22% Bachelor Program, 22% Master program, 1% Teacher Certification	Quantitative Experiment	Technology integration in PE course. Duration: 6- to 8- week student-teaching placement.	Self-efficacy Theory	Self-efficacy (CTIS-PE)	Strong Positive Correlations: All sources of self-efficacy showed strong positive correlations with self-efficacy for technology integration, significant at p <.01. Correlation Coefficients: Mastery Experience: r = .465 (n = 52); Vicarious Experience: r = .433 (n = 52); Social Persuasion: r = .412 (n = 46). Technology Training Correlation: Strong positive relationship found between self-efficacy and level of technology training: r = .499 (p < .01).

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p- 2797-2038 e- ISSN 2614-5626

Author & Country	Participants	Research Design	Procedure	Theoretical Framework	Measure	Results
Kwon et al. (2017)	1st (82.9%)and 2nd (15.8%) year in the college M = 19.44, SD =0.757, range = 18 to 21. N=74 (Male=53; Female=21)	Quantitative Experiment	E-learning supplement program. No specific study duration stated. The conducted four Phases, including: Phase I (Developing Supplements), Phase II (Pilot Study), Phase III (Data Collection), and Phase IV (research design and data analysis)	Self-efficacy Theory	Self-Efficacy (SE-PETE-D)	Increased Self-Efficacy: The e-learning supplement significantly improved pre-service teachers' self-efficacy in including students with intellectual disabilities (ID) in team sports, with notable differences between the e-learning and control groups (p = 0.024). Enhanced Content Knowledge: Both the e-learning and traditional groups showed significant improvements in content knowledge regarding inclusion strategies for students with ID, while the control group showed no change, indicating the effectiveness of the APE supplement.
Weissblueth et al. (2019)	2nd year; n=30 (M=18, F=12) Mean (M=26.5,	Qualitative. Experiment	Courses Involved: Motor Learning and Control (4 semester-hours)	Self-efficacy Theory	Self-Efficacy	Importance of Practical Experience: Practical experience significantly

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Author & Country	Participants	Research Design	Procedure	Theoretical Framework	Measure	Results
	SD=4.7; F=26, SD=5.48)		"Proper Posture" (4 semester-hours). Goal: Enhance professional growth and improve postural behavior in learners through practical application of course concepts.			enhanced motivation and engagement in learning.
Legrain et al. (2019)	69 PSTs (M=46, F=23; mean age=21, SD1.5). 3rd year of training in the "Education and Motor Skills" specialization	Quantitative Experiment	Cooperative Learning (CL) Environment: Participants in mixed-sex teams practiced boxing techniques and taught them to teammates using the Jigsaw method. Emphasis on collaboration and peer feedback during practice sessions. Cooperative Learning with Scaffolding (CLS): Additional instructional support was provided to enhance teaching and feedback skills. Participants learned to demonstrate tasks and observe	Social Cognitive Theory.	Self-efficacy (PETE Self-Efficacy Judgement); Videotaped Performance; Pedagogical Content Knowledge (PCK)	The results of correlation analysis computed on the three conditions revealed that the post-test performance was positively related to pedagogical knowledge and teaching self-efficacy scores (r = .24, p = .05, and r = .26, p = .03)

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Author & Country	Participants	Research Design	Procedure	Theoretical Framework	Measure	Results
			peers while offering constructive advice.			
Foley at al. (2020)	n=18 (M=5, F=13) age range 19-33 (mean=23, SD 3years)	Quantitative Experiment	Course Structure: Orientation: 1.5 days. Practicum: 90 hours of hands-on teaching. Camp Setting: Summer camp for children aged 9-19 with visual impairments. Diverse racial and ethnic backgrounds; varying levels of visual acuity. Training Program: 8.5 hours training covering.	Self-efficacy	Sports Camp	Increased Self-Efficacy: Significant rise in self-efficacy among PE pre-service teachers for teaching students with intellectual, physical, and visual impairments. Practical, disability-oriented experiences (e.g., one-week intensive sports camp) are effective in enhancing confidence.
Hovey et al. (2020)	n=111 (M=59,F=36) aged 19-36, mean age 21.5	Quantitative Experiment	Outdoor Education (OE) Program. The intervention had a duration of two weeks, divided into two main components: Component 1: Classroom and practical sessions on outdoor education skills, group dynamics, and educational models and theories. Component 2: A backcountry	Self-efficacy	Self-efficacy for Teaching Outdoor Education	Self-Efficacy Boost: The OE program gave PETE students more self-assurance in their ability to instruct OE models, group dynamics, and abilities. Strength vs. Level improvements: Self-efficacy strength increased significantly in all domains, although group dynamics showed little level

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p- 2797-2038 e- ISSN 2614-5626

Author & Country	Participants	Research Design	Procedure	Theoretical Framework	Measure	Results
			camping experience, lasting five nights/six days, where students applied the skills learned in Component 1.			improvements. Gender Effects: Compared to men, women demonstrated greater increases in self-efficacy for models and theories. Influence of Prior Experience: Although the OE program increased self-efficacy, prior exposure to group dynamics inhibited its growth.
Moosbrugger et al. (2023)	12 pre-service teachers (8 dual major students in PETE and HETE, 4 PETE program) (no report about male or female participants)	Qualitative.	Participants followed the CATCH My Breath online free sources for educators.	Self-efficacy, Whole School, Whole community, and Whole Child framework	Semi-structured FGD	Improved Teaching Efficacy: Boost in pre-service teachers' confidence and teaching skills.

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weeks, including two on adaptive physical education courses (Foley et al., 2020; Hovey et al., 2020) and two on general physical education (Kwon et al., 2017; Wiessblueth et al., 2019). There were two studies, each lasting six to ten weeks: one on adaptive physical activity (Tindall et al., 2016) and one on general PE (Krause et al., 2017). Furthermore, two studies ranged from 11 to 15 weeks, including one on adaptive physical activity (Taliaferro et al., 2015) and one on general PE (Legrain et al., 2019). However, one study did not explain the program's duration (Moosbrugger et al., 2023).

The main outcome variable in the current review is pre-service physical education teachers' self-efficacy. One study also reported pedagogical content knowledge as a secondary outcome (Legrain et al., 2019). The current review was not limited to a specific physical education teacher education course; the self-efficacy measurement tools used in the included studies are adjusted to the content provided in programs that include physical education, adaptive physical education, and technology integration in physical education. The self-efficacy variable was measured using SE-PETE-D instrument (Tindall et al., 2016; Kwon et al., 2017; Foley et al., 2020), Physical Educators' Self-Efficacy Toward Including Students With Disabilities–Autism (PESEISD-A) (Taliaferro et al., 2015), one study that measured self-efficacy specific to technology integration used the Computer Technology Integration Survey for Physical Education (CTIS-PE) (Krause et al., 2017), one study with self-reflection (Weissblueth et al., 2019), one study with the PETE Self-Efficacy Judgement (Legrain et al., 2019), one study Self-Efficacy for Teaching Outdoor Education (Hovey et al., 2020), and one study Norwegian Teacher's Self-Efficacy Scale (NTSES) (Moosbrugger et al., 2023).

Overall, all studies yielded positive results. Specifically, the results of the adaptive physical education research showed that a course design that optimizes the four sources of self-efficacy can increase pre-service physical education teachers' self-efficacy (Taliafero et al., 2015; Tindall et al., 2016; Kwon et al., 2017; Foley et al., 2020). Four studies on general physical education courses found a positive increase in pre-service teachers' self-efficacy (Krause et al., 2017; Weissblueth et al., 2019; Legrain et al., 2019; Hovey et al., 2020), and the health education course also showed a similar increase (Moosbrugger et al., 2023).

Four Sources of Self-Efficacy in Course Design

The overall fulfillment of the sources of self-efficacy across the nine studies varied by course design. One study reported fulfilling all four sources of self-efficacy, namely mastery experience, vicarious experience, social persuasion, and physiological/psychological response in Taliafero et al.'s (2015) study. Seven studies fulfilled three sources of self-efficacy, without involving vicarious experience (Hovey et al., 2020; Weissblueth et al., 2019), while five did not report physiological responses (Foley et al., 2020; Kwon et al., 2017; Krause et al., 2017; Legrain et al., 2019; Moosbruger et al., 2023). Meanwhile, the Tindall et al (2016) study explicitly reports only two sources of self-efficacy: mastery experience and social persuasion. Of the nine included articles, only one study addresses four of the self-efficacy factors (Taliafero et al., 2015).

The first source of efficacy, mastery experience, in the courses was manifested through various forms of practical activities, such as teaching physical education through school practice or fieldwork (Krause et al., 2017; Moosbruger et al., 2023), working directly with students with disabilities (Foley et al., 2020; Taliafero et al., 2017; Tindall et al., 2016), practicing motor skills or techniques (Legrain et al., 2019), implementing activities with volunteer clients (Weissblueth et al., 2019), leading outdoor activities (Hovey et al., 2020),

DOI: https://doi.org/10.17509/tegar.v9i1.78337
p- 2797-2038 e- ISSN 2614-5626

and developing lesson plans for individuals with disabilities (Kwon et al., 2017). The second source, vicarious experience, was obtained through observation activities during the courses, including observing lectures or course instructors (Hovey et al., 2020; Krause et al., 2017; Legrain, Moosbruger et al., 2023), observing instructors and peers (Taliafero et al., 2015), observing sports specialists (Foley et al., 2020), and through online comments about peer experiences (Kwon et al., 2017). Two studies did not report any specific form of vicarious experience. Next, social persuasion was generally provided by instructors through encouragement and direct feedback (Taliafero et al., 2017; Krause et al., 2017; Kwon et al., 2017; Legrain et al., 2019; Hovey et al., 2020; Moosbruger et al., 2023), whereas in the Weissblueth et al (2016) study, it was obtained from client feedback or testimonials. One study (Tindall et al., 2016) did not report any specific form of support or encouragement. Lastly, physiological or psychological responses were only reported in a few studies, for example, through self-reflection (Taliafero et al., 2015; Weissblueth et al., 2016), examining internal feelings or gut feelings in pre-service teachers (Hovey et al., 2020), and activities involving closing eyes to foster empathy towards individuals with disabilities (Foley et al., 2020). The remaining studies did not explicitly report the fulfillment of psychological response resources.

DISCUSSION

The main purpose of this study was to review the most recent studies on pre-service PE teachers' self-efficacy and identify how the four sources of self-efficacy were integrated in the PETE course design. This study is significant because the fulfillment of these four sources of self-efficacy is a key aspect for the course instructor to facilitate enrolled students in developing their self-efficacy (Bandura, 1997). In this section, the study characteristics and the details of how the four sources of self-efficacy will be discussed.

Learning about study characteristics is fundamental to systematic reviews because it helps navigate study outcomes across context, settings, participants, and course content. Self-efficacy has been widely used across disciplines, including in teacher education (Malnauskas, 2017), the health sector (Erschens et al., 2024), and sport performance (Horcajo et al., 2022). In line with those findings, self-efficacy is consistently used as a theoretical lens to explain changes in behavior and performance. Based on our findings, self-efficacy theory is applicable in the PETE context, both as a main theory and also supported by other theories such as TPB and the Whole Community Child Framework. Richards et al. (2022) emphasize that using a theoretical framework helps understand how experiences in PETE shape pre-service teachers' beliefs and teaching practices. Zhou (2024) also points out that a theoretical lens is necessary to link learning processes with outcomes such as motivation and self-efficacy in a more systematic manner, rather than merely descriptively. The current study has shown the effective implementation of self-efficacy in the PETE program, prompting further researchers to explore and examine the theory specifically in that context, which can be a powerful tool for enhancing pre-service physical education teachers' capabilities through meaningful learning activities.

The included studies show that pre-service physical education teachers' self-efficacy has mostly been studied in developed countries over the past decade. Studying across the world can help demonstrate the relevance of self-efficacy theory in socioculturally diverse environments that may vary in their cultural values. For example, Teaching and Learning

DOI: https://doi.org/10.17509/tegar.v9i1.78337
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International Survey (TALIS) data from 73,100 teachers across 23 countries indicate that differences in teacher self-efficacy reflect cultural values while being consistent and correlated with teaching practices and job satisfaction (Vieluf et al., 2013). However, the current literature review of pre-service physical education teachers' self-efficacy was captured from eight countries, with four studies in the US and five in non-English-speaking countries. This indicates that research on pre-service physical education teachers' self-efficacy is scarce and remains underdeveloped worldwide.

Participants in the included studies were not only undergraduate students in PETE programs but also students in master's or other teacher certification programs. They may not have equal levels of psychological development and work experience, which can lead to bias. For example, Lam et al. (2023) observed across various dimensions of self-efficacy, specifically student engagement, instructional strategies, classroom management, and literacy instruction. They found pre-service and novice in-service teachers had lower self-efficacy than experienced teachers. Also, Kervinen et al. (2022) explain that differences in professional backgrounds between pre-service and in-service teachers create "asymmetric backgrounds" that can influence how they work and learn together. Thus, future research should control for differences in age and professional status (pre-service, novice, in-service, or certified teachers), as these potentially have both positive and negative effects on pre-service teachers' learning process. Consequently, researchers may provide a clear explanation of how the course design is highly effective in improving pre-service physical education teachers' self-efficacy.

The courses in the included studies are mostly on APE, while other courses cover APE, GPE, motor learning and posture, martial arts, outdoor education, and health education. The findings strengthen the self-efficacy theory by focusing on the development of pre-service physical education teachers' capabilities in relation to specific course learning outcomes. This is consistent with self-efficacy theory centered on goal-oriented behaviors (Schunk, 1995). In addition, the exposure to a variety of content and learning experiences can enrich teaching readiness, aligning with SHAPE America standards (2024) that emphasize the mastery of both content and pedagogy. Thus, we encouraged more studies to examine pre-service physical education teachers within coursework in PETE programs.

Bandura (1997) established the foundation for studies on self-efficacy by outlining four sources of self-efficacy. All included studies indicate that mastery experiences provide a strong foundation for building self-efficacy among pre-service teachers. Several studies reported that mastery experiences were provided through presentations by the class instructors (teaching faculty), and practical experiences, such as school practice or fieldwork (Taliaferro et al., 2015; Kwon et al., 2017). For example, in Hovey et al (2020) study, pre-service teachers were allowed to accompany and teach students with disabilities. This hands-on experience is critical, because it helps pre-service teachers become more familiar with the situations they will face in real school situations (Martins et al., 2015). Next, the vicarious experiences aspect is also very important in providing pre-service teachers with a clear picture through examples related to specific learning objectives (Yim, 2023). In face-to-face interventions, pre-service teachers observe how to teach physical education through direct demonstrations by instructors, peer-teaching, and teaching videos (Tindall et al., 2016). In the online supplementary program, pre-service teachers are given materials and online teaching simulations. Meanwhile, social persuasion is a crucial source of teacher self-efficacy,

DOI: https://doi.org/10.17509/tegar.v9i1.78337
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providing external reinforcement through feedback, support, and expressions of confidence from the social environment (Bandura, 1997). In the current review, the instructors provide encouragement, and the client in the motor learning class also provides feedback on the students' work. Korte & Simonsen's (2018) study shows that social support from students, parents, and the school community is a significant predictor of teacher self-efficacy. Finally, physiological or emotional arousal is significant to pre-service teachers' learning process. Several included studies asked pre-service teachers to reflect on their experiences on purpose (Tindall et al., 2016; Krause et al., 2017; Weissblueth et al., 2019). These neuroscience-based research suggests that improving memory and retention of information might result in better learning outcomes (Gellosch et al., 2024). From this perspective, pre-service physical education teachers should experience and recognize their emotional and physiological responses when practicing teaching physical education or implementing specific course skills.

CONCLUSION

Overall, the current systematic review indicates that implementing the source of self-efficacy in teacher training through a course-based approach can enhance pre-service physical education teachers' self-efficacy. The development of self-efficacy is specific and goal-oriented, focusing on the acquisition of competencies. The reviewed literature suggests that courses designed to maximize the fulfillment of all four sources of self-efficacy can effectively improve skills and competency attainment

IMPLICATION

Implications for Practice in the PETE Program

Self-efficacy is not only an important learning outcome but also a fundamental psychological factor that can predict the resilience and endurance of pre-service physical education teachers (Lu et al., 2024). The current systematic review identified several implications for PETE programs, suggesting the integration of four sources of self-efficacy into course design. First, to facilitate mastery experiences, systematic learning activities can be supported by sufficient hands-on experiences aligned with the course objectives. Secondly, vicarious experience can be gained through optimizing demonstrations by an instructor or model, video observation, and/or peer teaching. Thirdly, social persuasion can be achieved through positive feedback and peer-to-peer interaction. Last, physiological and affective states can be strengthened through self-reflection and stress management. Strategically combining these sources, in such as a reflection session, not only reflects their teaching performance but also how they feel emotionally or psychologically during the teaching activities. It helps pre-service teachers prepare to face the challenges of inclusive and effective physical education teaching. Ultimately, understanding self-efficacy theory is applicable not only to course designers but also to program coordinators as a prerequisite for implementing or designing self-efficacy-based courses in their PETE program.

Direction for Future Research

First, the participants' educational backgrounds and experiences in the studies reviewed were not limited to undergraduate students but also master's and teacher certification students. Future studies should control for participants' backgrounds and experiences to obtain more generalizable results and reduce participant bias. Second, all the studies reviewed in this paper were pseudo-experimental. Without a control group, it is

DOI: https://doi.org/10.17509/tegar.v9i1.78337
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difficult to establish the causal effects of interventions on self-efficacy. Therefore, we encourage researchers to include a control group with random assignment to truly reveal the experimental effects. Meanwhile, to explore the development of self-efficacy and related factors, researchers can use a longitudinal design to examine changes in self-efficacy over time. Third, the limited number of studies on pre-service physical education teachers' self-efficacy within a decade, with only nine studies, and the predominance of research conducted in the United States also constrain the generalizability of the literature's findings. Thus, we encourage researchers worldwide to focus on pre-service teachers' self-efficacy, particularly in PETE programs, to advance understanding of the factors influencing their beliefs across diverse cultural, social, and educational contexts. Last but not the least, future research should explore the fulfillment of various sources of self-efficacy as an integral part of course design to understand how each of these sources shapes and strengthens pre-service physical education teachers' efficacy beliefs.

AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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