

The development of reflective skills in physical education teacher education: a systematic review

El desarrollo de habilidades reflexivas en la formación del profesorado de educación física: una revisión sistemática

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Abstract. Research has shown an increased attention towards Reflective Practice as a successful aspect in the professional development of Physical Education Teacher Education. Notwithstanding, there is a lack of empirical research about how teachers' reflective skills should be developed in this context. The aim of this systematic review was to understand what and how has been studied about physical education teachers' reflective skills, and how such strategies can be further developed and refined in Physical Education Teacher Education. Following Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) (Page et al., 2021) six databases were included to ensure that all relevant data was considered, and criteria scales were adapted in order to access studies' quality. The results show the importance of incorporating meticulously planned and organized practicum in teachers' training of reflective skills. Despite the importance of collaborative work in reflective skills development, there is a need to perform a deeper examination of those which contribute to improve reflective skills and how teachers develop reflection in collaborative settings, such as through the examination of communities of practice. Besides, writing reflections and video-taped classroom situations can enhance teachers' reflective skills, although supervision is required. This review highlights the important yet challenging role of teachers' reflective skills investigation, in order to achieve a deeper understanding of the contexts and strategies through which this issue is developed.

Key words: collaborative work, professional development, reflective practice, reflection levels, critical reflection.

Resumen. La investigación ha mostrado un incremento de la atención hacia la Práctica Reflexiva, como un aspecto exitoso en el desarrollo profesional de la Formación de Profesores de Educación Física. No obstante, falta investigación empírica sobre cómo se deben desarrollar las habilidades reflexivas de los docentes en este contexto. El objetivo de esta revisión sistemática fue comprender qué y cómo se han estudiado las habilidades reflexivas de los profesores de educación física, y cómo dichas estrategias pueden desarrollarse y refinarse aún más en la Formación del Profesorado de Educación Física. Siguiendo Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) (Moher et al., 2009), se incluyeron seis bases de datos para garantizar que se consideraron todos los datos relevantes, y se adaptaron las escalas de criterios para acceder a la calidad de los estudios. Los resultados muestran la importancia de incorporar prácticas minuciosamente planificadas y organizadas en la formación de habilidades reflexivas de los docentes. Pese a la importancia del trabajo colaborativo en el desarrollo de habilidades reflexivas, es necesario examinar en profundidad aquellas prácticas que contribuyen a mejorar las habilidades reflexivas y cómo los docentes desarrollan la reflexión en entornos colaborativos, mediante el examen de comunidades de práctica. Además, las reflexiones escritas y la grabación en vídeo de las situaciones de clase pueden mejorar las habilidades reflexivas de los profesores, aunque se requiere supervisión. Esta revisión destaca el papel importante, pero desafiante, de la investigación sobre las habilidades reflexivas de los docentes, para lograr una comprensión más profunda de los contextos y estrategias a través de los cuales se desarrollan las mismas.

Palabras clave: trabajo colaborativo, desarrollo profesional, práctica reflexiva, niveles de reflexión, reflexión crítica.

Introduction

Research has shown that promoting reflection can be a successful aspect of professional development efforts (Beauchamp, 2015; Brantley-Dias, Puvirajah, & Dias, 2021; Lasheras, Arruabarrena, García, & Standal, 2019). Many researchers agree that reflection is the key aspect of building a «self» and developing an ongoing need for professional development (Isik-Ercan & Perkins, 2017; Korthagen & Vasalos, 2005; Marzano, 2012). Such ideas have particu-

lar implications in teacher education (Osmanović-Zajić & Maksimović, 2020), as teachers (student-teachers, pre-service teachers, novice teachers and expert teachers) should be «thoughtful and alert» in order to grow as practitioners. In change processes, reflection seems to serve two purposes (Dewey, 1965). First, reflection can create the internal dissonance necessary to close gaps between teachers' actions and their beliefs about learning (Wedman, Espinosa, & Laffey, 1999). Second, reflection forces teachers to critically examine their work and make improvements as needed. Reflection directs teachers' natural inclination to act on tacit knowledge into practice based on well-reasoned knowledge (Fernández, Zwierewicz, & Castillo, 2022; Richardson, 1990). Through the use of reflection

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questions, an understanding is developed of how the implementation of the goals went that day, how the teacher feels about the goals they're implementing, and what to focus on next. In this sense, reflection has been considered a skill of utmost importance for teachers (Bengtsson, 1995; Playsted, 2019).

However, reflection cannot be developed within abstraction and detached from the real practice context, as only learning by doing involves appropriate paths to develop such skills (Gibbs, 1998; Mesquita, Borges, Rosado, & Batista, 2012). Reflective practice (RP) was coined by Schön (1983) to describe the use of reflection in professional or educational contexts and has consequently been identified as central to educational settings (O'Brien, 2016). Indeed, the role of RP in teacher education has been increasingly highlighted over the last decade (Hains-Wesson & Young, 2017). Therefore, implementing RP in teacher education has the potential to help future teachers¹ become thoughtful and open-minded practitioners, who take responsibility for their own learning process and genuinely care about their students (Attard & Armour, 2005; Pike, 2015). Over the years, various definitions of RP have been presented in the literature. Namely, it has been defined as «an active, dynamic, action-based, and ethical set of skills used in real time and in dealing with real, complex, and difficult situations» (Bright, 1996, p. 162) as well as a «thoughtful consideration of one's experience in applying knowledge to practice» (Schön, 1983, p. 18). Moon (2004) added that RP is a critical stance to solve professional problems in the light of theory to find out the inconsistencies and similarities between theorize practice and actual practice. Indeed, RP is crucial for teachers to actively participate in an ongoing growth process that results from continuous critical reflection on their teaching practice (Larrivee, 2010).

Therefore, a broad consensus exists that RP has become important for academic and professional development (Khazaenezhad, Tavakoli, & Amirian, 2018; Watts, 2019). By reflecting on what happens in the classroom, teachers can promote effective change. They can perceive their experiences in a different perspective and change their actions or reactions to future experiences based on their reflections (Ussher & Chalmers, 2011). By reflecting on their practice, teachers can figure out teaching problems, evaluate their teaching behaviours, and improve their teaching skills (Ling, 2018). However, in order to develop teachers as reflective practitioners, it is necessary to develop their reflective skills, such as the identification of an area to reflect, selection of key aspects to reflect, making sense, integration with existing knowledge and planning to make changes in the future. Reflective skills are therefore necessary to engage teachers in reflective practice, since they involve the ability to remember, analyse, synthesize, plan,

implement, and understand their practices and themselves (Henderson & Johnson, 2002). Through reflective skills, teachers can focus on the key aspects of their practice and, based on the knowledge they have, choose the most appropriate planning to change future actions and consequently improve their practice (Vivekananda-Schmidt et al., 2011).

Notwithstanding, teachers' reflective skills can only be developed from practice in real contexts, rather than being taught through direct teaching strategies and approaches that focus more on technical aspects (Nagle, 2008). This implies the development of teachers' reflective skills are triggered from the ambiguity and complexity of real practice and real problems that arise from the daily «chaotic practice». Therefore, reflective skills are configured as a tool of reflective work that needs to be implemented in teachers' real-life practice. Nevertheless, teacher education programs have been enhancing «specific skills» sometimes designated as tips and hints (Moody, 2009). Furthermore, even in those education programs that aim to promote the development of teacher' reflective skills, solutions have been failing during their training, mainly given the use of direct teaching strategies and approaches more focused on the technical level of reflection (Nagle, 2008). To date, there is limited evidence on how to map theory to the complexity of practice and how to improve the development of teachers' reflective skills to enable deeper RP (Harford & MacRuairc, 2008; Winkel, Yingling, Jones, & Nicholson, 2017)

Teachers' use of reflective skills becomes particularly relevant within Physical Education (PE) because this is an ambiguous, complex, unpredictable and dynamic context (Ward, Kim, Ko, & Li, 2014). Specifically, PE teachers are required to manage and solve complex problems that arise in their daily practice due to the nature of the subject (D. Kirk, MacDonald, & O'Sullivan, 2006). Consequently, an essential task of Physical Education Teacher Education (PETE) should be the development of reflective skills, so that teachers learn to think critically and transform the information conveyed into personally meaningful understanding (Mesquita et al., 2015). Therefore, this could encourage teachers to reflect and transform knowledge into personally grounded understanding (Entwistle & Entwistle, 1991). However, little empirical research on this topic was found by Tsangaridou and Siedentop (1995) within the PE and PETE literature. A few years later, Standal and Moe (2013) reviewed the empirical knowledge base for reflection and reflective practice in PE and PETE from 1995 to 2011 in order to assess whether there was a robust evidence base for RP in these contexts. These authors found that students made little progress in critical reflection and, in the context of PE, teachers expressed a need for reflective communities (Standal & Moe, 2013). However, the topic of reflective skills development in educational contexts,

particularly in PE, is still absent. It is therefore critical to examine what is known about PE teachers' reflective skills, how they have been studied, and how such strategies can be further developed and refined in PETE to guide future research and practice. The present study was undertaken to map the existing literature and ultimately construct a theoretical framework that can serve other studies on reflective practice and reflective skills in PETE.

Methods

Eligibility criteria

The present systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) (Page et al., 2021) (Table 1). In particular, empirical articles were considered eligible for inclusion if published in peer-reviewed international journals with an impact factor indexed in Journal Citation Reports (JCR) or Scimago Journal & Country Rank (SJR). In addition, only articles published between January 2000 and March 2021 were included. Following Alexander's (2020) recommendations, significant dates should be identified for each topic, so a time interval for the research was limited to this date range, as interest in this topic has increased significantly since 2000. Participants, interventions, comparators, outcomes, and study design (PICOS) were defined as followed: (i) physical education teachers with no restrictions regarding sex, age, experience or context of intervention (university, primary, elementary, etc.); (ii) interventions focused on the development of teachers' reflective skills; (iii) comparators not required; (iv) demonstrated how reflection was analysed, developed, and/or identified; (v) no limitations imposed on study design. Using these criteria, this review considers studies that focus on qualitative and quantitative data, including but not limited to designs such as phenomenology, grounded theory, ethnography, action research, and feminist research (Institute, 2014). In addition, papers using mixed methods were also considered.

Studies were excluded if: (i) not published in peer-reviewed international journals with impact factor; (ii) published before 2000; (iii) not focused on the development of physical education teachers' reflective skills; (v) not empirical studies, such as opinion articles, review articles, editorials, conference proceedings, chapters in books, and narrative articles - 'grey literature' (Alexander, 2020); (vi) not published in English, Portuguese or Spanish.

Information sources

A comprehensive computerized search of the following seven electronic databases was performed: *Scopus*, *Web of Science*, *Academic Search Ultimate*, *APA PsycInfo*, *ERIC*, *Edu-*

cation Source and *Teacher Reference Center*. Boolean operators were applied into searching the article title, keywords and abstract: («reflection skills») or («reflective skills») or («reflective practice»), AND («teacher») AND («physical education»). In addition, the authors performed a manual search of the studies' references included in the automated search to find other articles not identified in the computerized search.

To increase the trustworthiness of the review's findings by removing personal bias and to minimize the potential for error, this review was conducted by two researchers (Aromataris & Pearson, 2014; Porritt, Gomersall, & Lockwood, 2014; Riesenbergh & Justice, 2014) and any disagreements about inclusion were resolved through discussion until consensus was reached. Additionally, a library expert was consulted for support and guidance in developing keywords, identifying appropriate databases, and designing the search strategy (Butler, Hall, & Copnell, 2016). Reasons for exclusion were noted for all full papers accessed (contact first author) (Butler et al., 2016).

Data items

In order to analyse all the information from the studies selected to this review, conventional content analysis was used (Hsieh & Shannon, 2005; O'Brien, Harris, Beckman, Reed, & Cook, 2014). To provide an analytical approach and to put into evidence the information that could give an answer to our aim (Institute, 2014), a framework was created a priori (Harris et al., 2014), which included: (i) author, (ii) study focus, (iii) research design, (iv) participants and context, (v) data sources, (vi) data analysis, (vii) main results, and (viii) how reflection was developed (strategies, frameworks, and levels of reflection). The first author reviewed all included papers and the first and second authors reviewed the data synthesis. Disagreements were discussed and resolved by the three authors until consensus was reached (Alexander, 2020).

Assessment of studies quality

Given the methodological focus, it was critical to assess the quality of the studies reviewed (Gascoine, Higgins, & Wall, 2017). Specifically, the analysis of the quality of the studies which provided «data relevant to the authors' critical questions in a manner that indicates the reliability and validity of those data» (Alexander, 2020, p. 15). The framework for this assessment was created by two reviewers (first and second author) to ensure the quality of data extraction. Differences between the two authors were discussed and agreed upon. The third author was consulted when differences could not be resolved.

The criteria used to access the quality of the studies were adapted from the Standards for Reporting Qualitative Re-

Table 1
PRISMA Checklist

Section and topic	Item #	Checklist item	Location where item is reported
Title			
Title	1	Identify the report as a systematic review.	√
Abstract			
Abstract	2	See the prisma 2020 for abstracts checklist.	√
Introduction			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	√
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	√
Methods			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	√
Information sources	6	Specify all databases, registers, websites, organizations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	√
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	√
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	√
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	√
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g., For all measures, time points, analyses), and if not, the methods used to decide which results to collect.	√
	10b	List and define all other variables for which data were sought (e.g., Participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	√
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	√
Effect measures	12	Specify for each outcome the effect measure(s) (e.g., Risk ratio, mean difference) used in the synthesis or presentation of results.	Na
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g., Tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	√
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	-
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	√
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	√
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g., Subgroup analysis, meta-regression).	Na
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	√
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	√
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Na
Results			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	√
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	-
Study characteristics	17	Cite each included study and present its characteristics.	√
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Na
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g., Confidence/credible interval), ideally using structured tables or plots.	Na
Results of syntheses	20a	For each synthesis, briefly summarize the characteristics and risk of bias among contributing studies.	Na
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g., Confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Na
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	-
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	√
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Na
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	√
Discussion			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	√
	23b	Discuss any limitations of the evidence included in the review.	√
	23c	Discuss any limitations of the review processes used.	√
	23d	Discuss implications of the results for practice, policy, and future research.	√
Other information			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	√
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	√
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	√
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	√
Competing interests	26	Declare any competing interests of review authors.	√
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	√

Legend: √ - Yes; NA - non applicable; - No

search scale (O’Brien et al., 2014) and the Mixed Methods Appraisal Tool (MMAT) (Hong et al., 2018). This scale has a total of 15 items (the items differ according to the methods of the studies, i.e., quantitative, qualitative, or mixed) and is flexible enough to accommodate different paradigms, approaches, and methods presented in this review. Each study was given a score from 0 to 15 and coded as being of low (score of 0-5), medium (score of 6-10) or high quality (score of 11-15). Articles were not excluded based on low scores. Instead, scores were used to weight confidence in each outcome during synthesis (Herbert et al., 2017).

Methodologic quality of studies

Combining the Standards for Reporting Qualitative Research scale (O’Brien et al., 2014) and the Mixed Methods Appraisal Tool (MMAT) (Hong et al., 2018) resulted in a mean of these checklists (Range 87,3%). All included studies were rated as having moderate methodological quality (Table 3).

Results

Studies selection

From the identified articles, our searches initially yielded a total of 190 publications without inclusion criteria. This initial searching of data bases was then exported to a

reference manager software (EndNote™ X9, Clarivate Analytics, Philadelphia, PA, USA). Duplicates (n=36), articles not published in in peer-reviewed international journals with impact factor (n= 24) and articles published before year 2000 (n=18) were then removed. The remaining articles were then screened (title, abstract, keywords and full article if necessary) and removed if: did not integrate the keywords (n=70) not focused on physical education teachers’ reflective skills (n=14), not in English, Portuguese or Spanish (n=13) and without access (n=3). The current review identified 23 studies on the topic of reflective skills (figure 1). These articles were then deeply analysed data items can be found in table 2.

Type of participants and contexts selected for the re-search studies of teachers’ reflective skills

Pre-service teachers were the participants most examined in the studies gathered for this review (n=10) (Derwent, 2015a; Lamb, 2015; Lamb, Ko, & Aldous, 2016; Lamb, Lane, & Aldous, 2013; MacPhail & Sohun, 2019; Østergaard, 2019; Senne & Rikard, 2002, 2004; Tsangaridou & Polemitou, 2015; Zhu, 2011), followed by in-service teachers (n= 8) (Casey, 2012; Fletcher, Chróinín, & O’Sullivan, 2019; Font, 2009; Gillespie, 2011; Jung, 2012; Mooney & Hickey, 2017; Peralta, Bennie, Gore, & Lonsdale, 2020; Whittle, Telford, & Benson, 2018),

Table 3
Methodologic quality of studies

		Casey (2012)		Crawford,O'Reilly and Luttrell (2012)		Derwent (2015)		Fletcher, Chróinín and O'Sullivan(2018)		Font (2009)		Garrett and Wrench (2008)		Gillespie (2011)		Gonzalez-Calvoa and Fernández-Balboa (2018)		Jung (2012)		Keay (2006)		Lamb (2015)	
		R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2
Title		1	1	1	0	1	0	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	0
Abstract		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Introduction																							
Problem formulation		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Purpose or research question		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Methods																							
Qualitative studies	Q1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
	Q2	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
	Q3	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1	1	1	1	1	1	1
	Q4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Q5	1	1	1	1	1	1	1	1	1	0	0	1	1	0	0	1	1	1	1	1	1	1
Quantitative studies	Q6																					1	1
	Q7																					1	1
	Q8																					1	1
	Q9																					1	1
	Q10																					0	0
Mixed-Methods studies	Q11																					1	1
	Q12																					1	1
	Q13																					0	1
	Q14																					0	1
	Q15																					0	1
Results																							
Q16		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Q17		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Discussion																							
Q18		1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1
Q19		0	1	0	0	1	1	1	1	0	0	0	0	0	0	1	0	1	0	1	0	1	0
Other																							
Q20		0	1	0	1	0	1	1	1	0	1	0	1	0	1	1	1	0	1	0	1	0	1
Q21		0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Table 3
Methodologic quality of studies

	Lamb (2015)		Lamb and Aldous (2016)		Lamb, Lane and Aldous (2012)		Macphail and Sohun (2019)		Melnychuk (2001)		Mooney and Hickey (2017)		Østergaard (2019)		Peralta, Bennie, Gore and Lonsdale, 2020		Senne and Rikard (2002)		Senne and Rikard (2004)		Tsangaridou and Polemitou (2015)		Whittle, Telford and Benson (2018)		Zhu (2011)	
	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2
Title	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
Abstract	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Introduction																										
Problem formulation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Purpose or research question	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Methods																										
Qualitative studies	Q1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Q2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Q3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Q4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Q5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Quantitative studies	Q6																1	1	1	1						
	Q7																1	1	1	0						
	Q8																1	1	1	1						
	Q9																1	0	0	0						
	Q10																1	1	1	1						
Mixed-Methods	Q11																1	1	1	1						
	Q12																1	1	1	1						
	Q13																1	1	1	1						
	Q14																1	1	1	1						
	Q15																1	1	1	1						
Results																										
Q16	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Q17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Discussion																										
Q18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Q19	1	0	1	1	0	0	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Other																										
Q20	0	1	0	1	0	1	1	1	0	1	1	1	1	1	0	1	0	1	0	1	1	1	0	1	0	1
Q21	1	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0

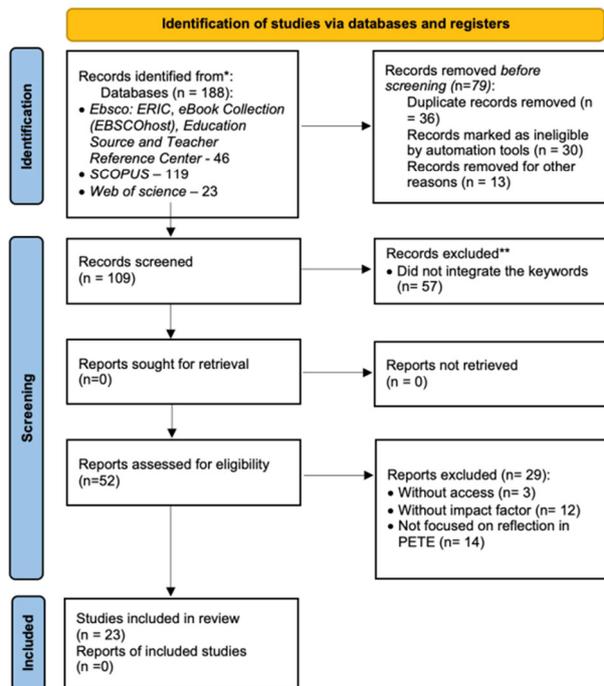


Figure 1
PRISMA Flow diagram

student teachers (n= 3) (Crawford, O’Reilly, & Luttrell, 2012; Garrett & Wrench, 2008; Melnychuk, 2001b), and novice teachers (n= 2) (González-Calvo & Fernández-Balboa, 2018; Keay, 2006). In terms of contexts chosen, universities predominated (n= 13) (Crawford et al., 2012; Dervent, 2015a; Fletcher et al., 2019; Garrett & Wrench, 2008; Lamb, 2015; Lamb et al., 2016; Lamb et al., 2013; MacPhail & Sohun, 2019; Østergaard, 2019; Senne & Rikard, 2002, 2004; Tsangaridou & Polemitou, 2015; Zhu, 2011) followed by schools (n=10) (Casey, 2012; Font, 2009; Garrett & Wrench, 2008; Gillespie, 2011; González-Calvo & Fernández-Balboa, 2018; Jung, 2012; Keay, 2006; Melnychuk, 2001b; Mooney & Hickey, 2017; Whittle et al., 2018) PETE programs (degree and post-graduate) were the most studied (n=16) (Casey, 2012; Crawford et al., 2012; Dervent, 2015a; Font, 2009; Jung, 2012; Lamb, 2015; Lamb et al., 2016; Lamb et al., 2013; MacPhail & Sohun, 2019; Mooney & Hickey, 2017; Østergaard, 2019; Peralta et al., 2020; Senne & Rikard, 2002, 2004; Tsangaridou & Polemitou, 2015; Zhu, 2011), followed by secondary (n=4) (Gillespie, 2011; Keay, 2006; Melnychuk, 2001b; Whittle et al., 2018), primary (n=2) (Fletcher et al., 2019; Garrett & Wrench, 2008) and both primary and secondary (n=1) (González-Calvo & Fernández-Balboa, 2018).

Table 2

Data items used to analyze studies.

Authors	Study focus	Research design	Participants/ Context	Data sources	Data analysis	Results	How the reflection was developed (individual/collaborative work, strategies and framework)
Casey (2012)	To explore a teacher's self-study of pedagogical and curricular change through reflective practice and 'insider' action research.	Qualitative. Action-research and self-study. 1 year and 8 months.	1 expert PE teacher. Grammar school in England, UK.	Critical friends. Reflective diaries. Unit diaries. Post-teaching reflective analysis. Student group interviews.	Inductive analysis.	Insider action-research and reflective practice should be seen as a vital ingredient in sustainable educational innovation, needs to be hand-in-hand with collaboration with significant others, and it needs to engage in a critique of the extra-individual conditions as part of the reflective process.	Individual. Aligned with the study purpose, no strategies and frameworks were considered in this article.
Crawford, O'Reilly and Luttrell (2012)	The effects of using the reflective framework for teaching in physical education on the teaching and learning of undergraduate sport studies and physical education students.	Qualitative. Longitudinal. Exploratory. Semester-long module in sport, physical activity and disability	6 student-teachers. Sport studies and physical education students. University College Cork, Republic of Ireland.	Interviews. Reflective logs. Observations. Video analysis.	Inductive and content analysis. Case analysis and cross case analysis.	The reflective pedagogical strategies such as logs, video commentaries and school observations that included specific and challenging questions influenced pre-service teachers to develop more analytical responses to their teaching as presented in the framework for teaching in physical education.	Collaborative.
(Dervent, 2015b) Dervent (2015)	To determine the effect of reflective thinking on the professional teaching practices of pre-service PE teachers and to explore their reflective levels.	Qualitative. Action-research. 2 Months (10 weeks)	10 pre-service PE teachers in Marmara University in Istanbul, Turkey.	Reflective journals. Interviews. Video recordings. Micro teaching sessions	Content analysis.	At the beginning of PE PSTs reflection, the participants were at the technical level of the reflective framework; then they started to reflect at both contextual and dialectical levels. The reflective thinking framework allowed PSTs to focus on their application of their knowledge and enabled them to generate a conscious awareness of their professional development. PE PSTs displayed professional development in proper planning, time management, and use of school facilities.	Collaborative.
Fletcher, Chr�n�n and O'Sullivan (2018)	To examine the ways, it accessed and responded to students' engagement with a set of pedagogical principles of teacher education focused on meaningful physical education (through reflection on- and in-action).	Qualitative. Longitudinal. Cross-cultural self-study. 1 year.	2 teachers. Undergraduate physical education program and primary teacher education program. 48 students. Brock University, Canada and Mary Immaculate College, Ireland.	Written reflections. Non-participant observations. Critical incident reflections with a critical friend. 3-way recorded Skype conversation. Meta-critical friend.	Inductive coding and analysis.	The concepts of reflection on- and in-action provided a framework for understanding how being more intentional about accessing student perspectives can be enacted in teacher education practice.	Collaborative.
Font (2009)	To construct and reconstruct teachers' knowledge of values education through PE.	Qualitative. Longitudinal. Exploratory. 2 years.	14 Experts PE Teachers. 1 Academic Teacher. 1 Research teacher. Different schools in Cerdanyola, Spain.	Not defined.	Not defined.	Reflection on teaching practice itself, exchange of experiences between peers, and the shared design and implementation of a project for innovation in the classroom, are the keys that benefit the professional development of the participants.	Collaborative.
Garrett and Wrench (2008)	To examine how exposure to a diverse range of personal experiences and then guided self-reflection of lab school episodes could be harnessed to assist student teachers to reflect more critically and make meaningful connections with their diverse and complex learners.	Qualitative. Longitudinal. Exploratory. 5 weeks.	154 student-teachers. Primary school. University in Australia.	Teacher written reflections. Semi-structured interviews (only 50 student-teachers).	Analytic induction.	The data gathered and analyzed in this study provided a deeper understanding of student teacher learners as well as the factors that support and hinder their engagement with critical perspectives.	Individual
Gillespie (2011)	Explore the significance of curriculum value orientations for curriculum implementation and, therefore, for teacher education.	Qualitative. Cross-sectional. Self-study.	6 teachers. Secondary schools. Aotearoa, New Zealand.	Interviews.	Not defined.	The paper draws the attention to the significance of course content, practicum, critically reflective practice, and programme structures in relation to efforts to embed value orientations into teacher education programmes.	Individual.
Gonzalez-Calvo and Fernandez-Balboa (2018)	To analyse the factors determining the quality of relationships between a novice physical education teacher and his students' families and understand the implications of these relationships from a longitudinal (self-) reflective teaching diary.	Qualitative. Longitudinal. Self-study. 5 years.	1 novice PE teacher. Public primary and secondary schools. Madrid, Spain.	(Self-)reflective teaching diary.	Content and categorical analyses. Inductive and deductive analysis.	In the fourth and fifth years, due to the teacher's ongoing commitment and (self-) reflective practice, there emerged eight 'success factors' that transformed his previous discouragement into hope and self-confidence. The concepts of reflection on- and in action provided a framework for understanding how being more intentional about accessing student perspectives can be enacted in teacher education practice.	Individual.

						perspectives can be enacted in teacher education practice.	
Jung (2012)	To investigate the nature of three exceptional PE teachers' reflection in terms of its focus and roles.	Qualitative multiple case study design. Not defined.	3 PE expert teachers. School	Semi-structured interviews. Non-participant observations. Teachers' written reflections. Students' work samples. Relevant archival data. Researcher's field notes.	Constant comparative method. Member Checking.	The teachers' reflection focused on the students, instruction, context, and critical incidents. Reflection impacted the teachers' practice playing key roles such as making sense of unforeseen events, developing knowledge-in-action, making on-the-spot decisions, and reconstructing teachers' belief systems.	Individual.
Keay (2006)	To determine the effectiveness of Lesson Study, owned and managed by PSTs, in facilitating mutual spaces of pedagogical learning between peers.	Mixed methods. 2 years.	41 novice physical education teachers. Teacher training course. Secondary schools. England, UK.	Questionnaires. Case-study methodology using semi-structured interviews and "professional life histories". Card check system discussed with others.	Comparative analysis. Grounded theory approach.	Reflective practice needs to be undertaken at a more detailed level than merely career options and must include regular reflection on every aspect of the role, and if it is to inform professional learning it must be critical reflection.	Collaborative.
Lamb (2015)	To explore a model of lesson study owned entirely by pre-service teachers, conveying its potential to facilitate mutual spaces of learning between peers beyond formal hierarchical relationships with expert teachers.	Qualitative. Action-research. 38 weeks.	17 pre-service teachers. Master's level in education course. University of East Anglia, Norwich, UK.	Surveys. Individual interviews and questionnaires. Online discussion boards.	Grounded theory. Individual case followed by a cross-case analysis. Inductive analysis.	The Lesson Study facilitated a series of reflective stages. Sharing reflective accounts of each lesson as they watched the recording allowed them to learn from each other, whilst considering alternate points of view.	Collaborative.
Lamb and Aldous (2016)	Explore the role lesson study can play in developing pre-service processes of reflexivity whilst enhancing their reflective practice.	Qualitative. Action-research. 38 weeks.	40 pre-service teachers. Master's level certificate in education course. Eastern England, UK.	Surveys. Individual and in-depth semi-structured focus group. Virtual learning environment group discussion.	Grounded theory. Individual case followed by a cross-case analysis. Inductive analysis.	The role of external structures is important in the reflexive process as it enables them to identify the various structures that were shaping their practice. The processes of reflexivity were facilitated by agents sharing experiences and forms of knowledge, drawn from their internal dispositions. The reflective practice is created by student agency rather than the external structures of the programme.	Collaborative.
Lamb, Lane and Aldous (2012)	To determine whether working and learning together autonomously as a pair would extend trainee teachers' ability to reflect.	Qualitative. Longitudinal. Exploratory. 36 weeks.	23 pre-service teachers. Master's level certificate. University of East Anglia, UK.	Surveys. Focus group. Online discussion boards.	Grounded theory. Thematic analysis.	Trainees endorsed the peer review process as a method of engaging in critical reflection. The data illustrated the positive benefits that can be derived from sharing feedback with a peer. The emergent theory presented suggests that the collaborative spaces created by training buddies enhance reflective ability and practice.	Collaborative.
Macphail and Sohun (2019)	To interrogate a course-embedded service-learning project in a PETE programme to provide a broader, potentially more critical view of the experience, knowledge and learning related to the effort to link service and learning.	Qualitative. Action-research. 6 to 8 weeks.	8 pre-service teachers in focus group 14 in short narratives and 59 in surveys. University of Limerick, Ireland.	Interviews. Focus group. Short narrative responses. Course-specific survey.	Thematic content analysis. Inductive analysis.	Three main challenges arose: linking academic coursework with community service structured through reflective practice; dialogue focusing specifically on PSTs' service-learning partnership and weekly reflections; and discussing the appropriate proposed assessment points.	Collaborative.
Melnichuk (2001)	Investigate the lived world of 10 physical education student in secondary schools setting for their final eight-week field experience through a reflective practitioner model of teacher education.	Qualitative. Longitudinal. Case-study. 8 weeks.	10 student-teachers. Two secondary schools in Alberta. Canada.	Participant and non-participant observation. Field notes. Informal conversation. Journal-writing. Individual and group interview.	Thematic analysis. Triangulation.	Having several student teachers in one department was advantageous in many ways, fostering reflective practice, joint thought, and collaborative action. Engagement by all participants in technical and practical levels of reflective thought was evident, whereas engaging in critical reflectivity was less frequent and less obvious.	Collaborative.
Mooney and Hickey (2017)	To explore experiences of 'video-stimulated reflection' as a methodological tool for promoting reflective practice with teachers.	Qualitative. Longitudinal. Multiple case-study. 6 months.	2 teachers. Schools in Victoria and Melbourne, Australia.	Video-stimulated reflection interviews.	Data were analyzed by Foucauldian lens.	Specific examples of the ways in which the boys responded to aspects of their practice acted to create moments of professional dissonance, which could be read as stimulating examples of productive reflection.	Individual.
Ostergaard (2019)	To explore how second-order reflection as a tradition-challenging and developing form of reflection can be stimulated by an inquiry-based learning approach in PETE.	Qualitative. Longitudinal. Case study. 6 weeks.	32 pre-service teachers. Danish university college, Denmark.	Video recorded of group discussions and pre-service teachers' performance. Filed notes and written material.	Analytic induction.	During the inquiry-based learning approach the pre-service teachers used both reflection at first and second-order level. Reflections in the form of technical and practical considerations were common. IBL enhanced the second-order reflective skills of some of the preservice teachers.	Collaborative.

(Peralta et al., 2020)	To explore the influence of video types and facilitation on PE in-service teachers' reflections and their perceptions of their own and their students' learning.	Qualitative. Exploratory. Cross-sectional.	49 PE teachers (five were considered early career teachers (1–5 years teaching experience), Western Sydney, Australia).	Semi-structured interviews. Evaluations of PE teachers' written reflective statements	Content analysis.	Teachers believed video-based reflection on their own teaching, rather than viewing others' practice, was the most useful, even though both forms of analysis produced a similar depth of reflection. The importance of researchers, teachers, and facilitators delivering and participating in TPD collaboratively and focusing on strategies that may increase the depth of teacher reflection on their own practices.	Collaborative.
Senne and Rikard (2002)	Comparison between two implementations of the PETE teaching portfolio model.	Mixed methods (quantitative quasi-experimental). 2 semesters.	67 pre-service teachers. George Mason University and East Carolina University, EUA.	Portfolio. Defining issues test. Weekly reflection logs. Questionnaire.	T-test. Inductive content analysis.	Most of the student-teachers valued the portfolio process as an indicator of professional growth. Both PETE portfolio models employed conceptual frameworks denoting an emphasis on reflective practice as an underlying premise of the teaching portfolio process. Differences in reflective practice and similarities in dual versus single-site placements were noted.	Individual.
Senne and Rikard (2004)	To examine and determine the impact of a three-semester developmental portfolio intervention utilizing the Teaching/Learning Framework.	Mixed-methods. (quantitative quasi-experimental) 3 semesters.	18 pre-service teachers. Pseudonymous used for both universities.	Defining issues test. Written portfolio questionnaires. Focus group.	T-test. Inductive content analysis.	Teacher candidates presented more in-depth, critical and more thoughtful reflections from one semester to the next. It was recommended PETE programs using teaching portfolios initiate the process at least two semesters prior to internship.	Individual.
Tsangaridou and Polemitou (2015)	To provide descriptions of the nature of pre-service primary teachers' reflection during their student teaching experience.	Qualitative. Longitudinal. Exploratory. 1 year.	5 pre-service teachers. University of Cyprus, Cyprus.	Written reflective journals. Documents (e.g. lesson and unit plans).	Inductive content analysis. Individual-case and cross-case analysis.	The participants' reflections went beyond a narrow focus on technical and managerial aspects to include content, PCK, and social issues as well. The analysis also indicated that the participants reflected on pedagogical issues almost twice as much as they reflected on PCK, content and social aspects of teaching.	Individual.
Whittle, Telford and Benson (2018)	Explore teacher perceptions of how they influence academic performance of Victorian certificate of education physical education students.	Qualitative. Longitudinal. Exploratory. 5 months.	37 teachers. 31 secondary schools. Secondary schools in Victoria, Australia.	Focus groups. Written field notes.	Inductive content analysis.	At the individual level teachers perceived content knowledge, expectations, passion and enthusiasm, pedagogical content knowledge and use of reflective practices to inform teaching as key factors influencing student academic performance.	Collaborative.
Zhu (2011)	To examine student teacher reflective practices during practicum, where instructional activities were structured to promote student teachers' reflection and professional development.	Qualitative. Longitudinal. Exploratory. 1 semester.	12 pre-service. 1 instructor. University in the EUA.	Field observations. Instructional material. Non-participant observations. Semi-structured interviews.	Thematic content analysis.	Student teachers tapped into different types of experiences during practicum for reflection, primarily reflection on action. Reflection in action appeared to be vague and difficult for student teachers due to 'too many things going on' in teaching. Plenty of opportunities for reflection on action were reported, yet few for reflection in action were identified.	Individual.

Methodological designs used for the development of teachers' reflective skills

In the studies considered for this review, two methodological designs were observed, namely qualitative and mixed methods. The most common methodology involved qualitative techniques with intervention (n=20) (Casey, 2012; Crawford et al., 2012; Dervent, 2015a; Fletcher et al., 2019; Font, 2009; Garrett & Wrench, 2008; Gillespie, 2011; González-Calvo & Fernández-Balboa, 2018; Jung, 2012; Lamb, 2015; Lamb et al., 2016; Lamb et al., 2013; MacPhail & Sohun, 2019; Melnychuk, 2001b; Mooney & Hickey, 2017; Østergaard, 2019; Peralta et al., 2020; Tsangaridou & Polemitou, 2015; Whittle et al., 2018; Zhu, 2011).

Almost all of them were longitudinal studies (n=18) (Casey, 2012; Crawford et al., 2012; Dervent, 2015a; Fletcher et al., 2019; Font, 2009; Garrett & Wrench, 2008; González-Calvo & Fernández-Balboa, 2018; Jung, 2012; Lamb, 2015; Lamb et al., 2016; Lamb et al., 2013; Ma-

cPhail & Sohun, 2019; Melnychuk, 2001b; Mooney & Hickey, 2017; Østergaard, 2019; Tsangaridou & Polemitou, 2015; Whittle et al., 2018; Zhu, 2011) while two studies were cross-sectional (Gillespie, 2011; Peralta et al., 2020).

Notably, within these 18 longitudinal studies, seven were purely exploratory (Crawford et al., 2012; Font, 2009; Garrett & Wrench, 2008; Lamb et al., 2013; Tsangaridou & Polemitou, 2015; Whittle et al., 2018; Zhu, 2011), four integrated action-research (Dervent, 2015a; Lamb, 2015; Lamb et al., 2016; MacPhail & Sohun, 2019), and one combined action-research with self-study (Casey, 2012). The remaining longitudinal studies were self-studies (n=2) (Fletcher et al., 2019; González-Calvo & Fernández-Balboa, 2018) and four were based on case-study designs, particularly two were case-studies (Melnychuk, 2001b; Østergaard, 2019), and two were a multiple case-study (Jung, 2012; Mooney & Hickey, 2017).

Of the three studies that used mixed methodology (Keay, 2006; Senne & Rikard, 2002, 2004), two used a

longitudinal design, with the quantitative methodology being a quasi-experimental design (Senne & Rikard, 2002, 2004). Although one of these studies included a control group, the authors did not acknowledge an experimental design given the number of participants (Senne & Rikard, 2004). The other was cross-sectional with an exploratory design (Keay, 2006).

The studies included in this systematic review had different time intervals, namely from one month to five years. Only one study did not mention the duration of the intervention (Jung, 2012). In terms of qualitative methods, 12 studies showed a duration between one and eight months (Crawford et al., 2012; Dervent, 2015a; Garrett & Wrench, 2008; Lamb, 2015; Lamb et al., 2016; Lamb et al., 2013; MacPhail & Sohun, 2019; Melnychuk, 2001b; Mooney & Hickey, 2017; Østergaard, 2019; Whittle et al., 2018; Zhu, 2011), three studies between one year and 18 months (Casey, 2012; Fletcher et al., 2019; Tsangaridou & Polemitou, 2015), one of the studies presented a duration of 2 years (Font, 2009) and another five years (González-Calvo & Fernández-Balboa, 2018). However, the duration of the mixed-methods studies did not show any trend as the protocol interventions had different time intervals, namely two years (n=1) (Font, 2009), 18 months (three semesters; n=1) (Senne & Rikard, 2004) and six months (2 semesters; n=1) (Senne & Rikard, 2002).

Interviews were the most common data collection tool (n=20) (Casey, 2012; Crawford et al., 2012; Dervent, 2015a; Garrett & Wrench, 2008; Gillespie, 2011; Jung, 2012; Keay, 2006; Lamb, 2015; Lamb et al., 2016; Lamb et al., 2013; MacPhail & Sohun, 2019; Melnychuk, 2001b; Mooney & Hickey, 2017; Østergaard, 2019; Peralta et al., 2020; Senne & Rikard, 2004; Tsangaridou & Polemitou, 2015; Whittle et al., 2018; Zhu, 2011). These were individual interviews in eleven studies (Crawford et al., 2012; Dervent, 2015a; Garrett & Wrench, 2008; Gillespie, 2011; Jung, 2012; Keay, 2006; Lamb, 2015; Mooney & Hickey, 2017; Peralta et al., 2020; Tsangaridou & Polemitou, 2015; Zhu, 2011) and group interviews in eight (Casey, 2012; Lamb et al., 2016; Lamb et al., 2013; MacPhail & Sohun, 2019; Melnychuk, 2001b; Østergaard, 2019; Senne & Rikard, 2004; Whittle et al., 2018).

Interviews were followed by written reflections (n=15; mostly individual), questionnaires (n=4) (Keay, 2006; Lamb, 2015; Senne & Rikard, 2002, 2004) field observations (n=5) (Crawford et al., 2012; Fletcher et al., 2019; Jung, 2012; Melnychuk, 2001b; Zhu, 2011), surveys (n=4) (Lamb, 2015; Lamb et al., 2016; Lamb et al., 2013; MacPhail & Sohun, 2019) and field notes (n=4) (Jung, 2012; Melnychuk, 2001b; Whittle et al., 2018).

In terms of qualitative data analysis, the majority of studies gathered for this review used inductive analysis

(n=12) (Casey, 2012; Crawford et al., 2012; Fletcher et al., 2019; Garrett & Wrench, 2008; Lamb, 2015; Lamb et al., 2016; MacPhail & Sohun, 2019; Østergaard, 2019; Senne & Rikard, 2002, 2004; Tsangaridou & Polemitou, 2015; Whittle et al., 2018), followed by both inductive and deductive analysis (n=1) (González-Calvo & Fernández-Balboa, 2018). In the same line, ten studies showed the use of content analysis (Crawford et al., 2012; Dervent, 2015a; González-Calvo & Fernández-Balboa, 2018; MacPhail & Sohun, 2019; Peralta et al., 2020; Senne & Rikard, 2002, 2004; Tsangaridou & Polemitou, 2015; Whittle et al., 2018; Zhu, 2011) and four studies showed thematic analysis (Lamb et al., 2013; MacPhail & Sohun, 2019; Melnychuk, 2001b; Zhu, 2011). Four studies used grounded theory for data analysis (Keay, 2006; Lamb, 2015; Lamb et al., 2016; Lamb et al., 2013). In terms of quantitative data analysis, both studies used T-test analysis (Senne & Rikard, 2002, 2004).

Strategies and theoretical frameworks applied for the development of teachers' reflective skills

With respect to how teachers' reflective skills were developed, 13 of the studies included in this systematic review presented collaborative approaches in which the development of reflective skills occurred through working with other teachers and discussing their practices (Crawford et al., 2012; Dervent, 2015a; Fletcher et al., 2019; Font, 2009; Keay, 2006; Lamb, 2015; Lamb et al., 2016; Lamb et al., 2013; MacPhail & Sohun, 2019; Melnychuk, 2001b; Østergaard, 2019; Peralta et al., 2020; Whittle et al., 2018). Within these studies, the most common strategy was observation of other teachers' practice (video or participant; n=8) (Crawford et al., 2012; Fletcher et al., 2019; Lamb et al., 2013; MacPhail & Sohun, 2019; Melnychuk, 2001b; Østergaard, 2019; Peralta et al., 2020; Whittle et al., 2018), followed by lectures, seminars and group discussions (online or not; n=5) (Casey, 2012; Dervent, 2015a; Lamb, 2015; Lamb et al., 2016; MacPhail & Sohun, 2019) and one of the studies used the Inquiry-Based Learning (IBL) approach (Østergaard, 2019). Despite this collaborative development of teachers' reflective skills, four of these studies also used supplementary written reflections (Fletcher et al., 2019; Østergaard, 2019; Peralta et al., 2020; Whittle et al., 2018).

On the other hand, the other ten studies included in this review used an individual approach to the development of teachers' reflective skills (i.e., unrelated to others) (Casey, 2012; Garrett & Wrench, 2008; Gillespie, 2011; González-Calvo & Fernández-Balboa, 2018; Jung, 2012; Mooney & Hickey, 2017; Senne & Rikard, 2002, 2004; Tsangaridou & Polemitou, 2015; Zhu, 2011). Within these studies, the majority used written reflections (n=6) (Garrett

& Wrench, 2008; Jung, 2012; Peralta et al., 2020; Senne & Rikard, 2002, 2004; Tsangaridou & Polemitou, 2015), observation and discussion of teachers' practice (video-based or not), questionnaires to guide teachers' reflection and observation and lectures and workshops (n=1) (Garrett & Wrench, 2008).

In parallel, ten of the studies used theoretical frameworks to develop teachers' reflective skills that focused specifically on the development of reflection (Casey, 2012; Crawford et al., 2012; Dervent, 2015a; Lamb, 2015; Lamb et al., 2016; Melnychuk, 2001b; Mooney & Hickey, 2017; Østergaard, 2019; Senne & Rikard, 2002, 2004)

Levels of reflection

Only eight studies collected for this review approached levels of reflection (Crawford et al., 2012; Dervent, 2015a; Garrett & Wrench, 2008; Østergaard, 2019; Peralta et al., 2020; Senne & Rikard, 2002, 2004; Zhu, 2011). In particular, Crawford, O'Reilly and Luttrell's (2012) study identified three levels of reflection, namely technical, situational and sensitizing, based on Tsangaridou and O'Sullivan's (1994) Reflective Framework for Teaching in Physical Education (RFTPE). Garret and Wrench (2008) showed that student-teachers moved from purely technical and descriptive reflections to a more critical perspective, thereby questioning and reconstructing their practice. Similarly, Dervent (2015b) found that when participants began reflecting on PE PSTs, they were at the technical level of the reflective framework and then began to reflect at both the contextual and dialectical levels. Østergaard (2019) focused on IBL as a promoter of reflection at different levels and showed the evolution of PSTs from technical and practical reflections to second-order reflections (stimulating professional change). Senne and Rikard (2002) attempted to develop PSTs with higher levels of reflection, and Zhu (2011) showed that PSTs primarily used Schön's (1987) reflection-on-action, while reflection-in-action seemed to be vague and difficult.

Discussion

The purpose of this systematic review was to analyse what and how PE teachers' reflective skills have been studied, and how this process could be improved in future research and practice. Mostly through the use of qualitative and longitudinal research designs, results have shown the importance of developing teachers' reflective skills through «real-world practice» (such as PSTs' practicum) and the use of specific strategies to foster them (such as, reflective logs, observation of others, written reflections, portfolios, critical friends, lesson study, lectures, etc.). From these results emerged the need for future research to consider

the implementation of action-research designs, and a deeper exploration of both collaborative work and levels of reflection.

In particular, the studies included in this systematic review showed the prevalence of longitudinal qualitative designs and within those the use of sophisticated research designs (19 out of 23 studies), such as action-research and case-studies. However, despite the holistic interpretation offered by action-research, results showed that only five out of nineteen studies used this design (Casey, 2012; Dervent, 2015; Lamb, 2015; Lamb, Ko, & Aldous, 2016; MacPhail & Sohun, 2019). These five studies showed that through the cyclical process in four steps (planning, acting, observing, and reflecting/evaluating), teachers could analyse situations and use their expertise from previous experiences to find appropriate responses and concomitantly develop their reflective skills (Schön, 1983) (such as, identification of an area to reflect upon, selection or focus on key aspects, writing down, making sense and integration with existing knowledge and planning to make changes in the future) to the detriment of neglect reflection (Vivekananda-Schmidt et al., 2011). This process can be described as learning by changing and changing by learning and consistently adapting to the specific needs of the context (Huber, Bogner, & Mompoin-Gaillard, 2017; Keegan, 2016; Zajic & Maksimovic, 2020).

Therefore, it is important to enhance that three of those studies (Lamb, 2015; Lamb, Ko, & Aldous, 2016; MacPhail & Sohun, 2019) applied action-research designs during PSTs' practicum. Results demonstrated practicum as an excellent opportunity for PSTs understand the connection between theory and practice and its application in real practice contexts, as already stated by previous research in other contexts (Mesquita, 2014; Tülüce, 2016). The link between theory and practice during practicum is dependent on reflection, which proclaims the incorporation of theoretical knowledge to analyse practice (Diez-Fernández & Domínguez-Fernández, 2018; Huu Nghia & Tai, 2019). Thus, practice and reflection enter into a complex and binding relationship, as reflection enables teachers to understand, develop and direct learning itself (Mesquita et al., 2015; Moon, 2007; Rogers, 2001). Once action-research bridges the gap between theory and practice, it seems extremely important to include this design to improve the development of teachers' reflective skills during practicum. Although, in the studies examined for this systematic review the most common participants were teachers in their practicum (n=9), only three (Macphail, 2019; Lamb, 2015; Lamb et al., 2016) have included action-research in their designs.

The lack of inclusion of this design at the initial stage of teachers' professional development could limit the analy-

sis and adaptation of PSTs' actions and compromise the development of their reflective skills. Therefore, there is a need to reinforce and clarify the benefits of this design to increase the success of decision making and appropriate adaptation of PSTs' actions.

In addition to the implementation of action research in the PSTs' practicum, collaboration between all stakeholders (e.g., PST, supervisors, peers, and school) also appeared to be crucial in this process (Messiou, 2019), as it promotes demarcation between them and is replaced by the notion that all educators systematically work together to support each other's learning and achieve common goals. As an example, the three aforementioned action-research studies (Lamb, 2015; Lamb et al., 2016; MacPhail & Sohun, 2019) allow the exploration of collaborative work. In two of those studies, collaboration occurred through peer collaboration (Lamb, 2015; Lamb et al., 2016) and in the other through Service-Learning Partnership (MacPhail & Sohun, 2019). The practicum collaboration in Lamb (2015) and Lamb et al. (2016) research was potentiated by the PSTs' collaboration with a peer, specifically through the creation of a peer-buddy intervention. This collaboration not only allowed a less formal environment outside of the course assessment structure, but also allowed for effective social interaction between peers. Such interactions enabled them to demonstrate expanded forms of active agency and knowledge and to develop practices beyond the traditional support structures of the training program (Dyson, 2006). On the other hand, the collaborative work of Service-Learning Partnership exposed the challenges of creating a generous space for dialog between faculty and PSTs that focused specifically on PSTs reflections. Specifically, in creating space and time for PSTs to explore how their weekly service-learning partnership experience could most effectively contribute to the completion of related assessments (MacPhail & Sohun, 2019).

Collaborative work, however, was found not only in those three action-research studies during PSTs' practicum, but in twelve of twenty-three studies gathered for this review (e.g., Fletcher, Chróinín, & O'Sullivan, 2019; Garrett & Wrench, 2008; Gillespie, 2011; Whittle, Telford, & Benson, 2018). Through collaborative work, individuals share their diverse perspectives, insights, observations, experiences and critically «theorize, interpret, and critically analyse the research of others» (Goodnough, 2010, p. 920). However, results also show that a deeper consideration of collaborative competences, such as interactive skills, inter-professional competences, dialog, the importance of tutors and link workers, and scaffolding strategies, is still lacking in these studies (Keay, 2006; MacPhail & Sohun, 2019). In particular, developing teacher reflection requires more than physical proximity for collaborative learning

to occur. It requires intentional engagement (Leeferink, Koopman, Beijaard, & Ketelaar, 2015) and must integrate cognitive, interactive, and inter-professional skills as well as the specific contexts in which learning occurs (Ruffinelli, de la Hoz, & Álvarez, 2020).

CoPs are understood as experiences in a real context of professional practice of a selected group of individuals who share experiences and deepen their knowledge and expertise by sharing common goals and interacting continuously (Kirk & Macdonald, 1998; Lave & Wenger, 1991; Wenger, McDermott, & Snyder, 2002). Within these CoPs, teachers are only able to take on problems and tasks with complexity above their level when supported by someone more capable (Wink & Putney, 2002), i.e., a learning facilitator (Wenger et al., 2002). Therefore, CoPs promote insider collaboration between facilitator, teachers, and other colleagues, which increases the development of teachers' reflective practice (Saccomano, 2013).

Regardless of individual or collaborative work, the studies in this systematic review showed that reflective processes must be triggered by the completion of various classroom tasks, such as teaching lessons, lesson plans, and teaching evaluations, which in turn provide the necessary evidence base for assessment processes. However, beyond these «surface-level trigger» tasks (Lamb et al., 2012, p. 22), some studies from this review also implemented specific strategies to encourage the development of reflection activities. Nevertheless, although written reflections are increasingly used in the literature (e.g., portfolios, journals, written reports, reflection diaries, and logs) (Casey, 2012; Fletcher, Chróinín & O'Sullivan, 2018), only nine studies gathered for this systematic review use this strategy in PETE programs (Crawford et al., 2012; Dervent, 2015b; Garrett & Wrench, 2008; MacPhail & Sohun, 2019; Melnychuk, 2001a; Senne & Rikard, 2002, 2004; Tsangaridou & Polemitou, 2015; X. Zhu, 2011).

Some of the studies included in this systematic review show that written reflection differentiates the reflective component of teacher practice (e.g., pedagogical content knowledge, content and social issues of teaching), which increases the depth, critical, and thoughtful content of reflection (Senne & Rikard, 2004; Tsangaridou & Polemitou, 2015). These results corroborate several authors (e.g., Kember, McKay, Sinclair, & Wong, 2008; Standal & Moe, 2013; Tsangaridou & Polemitou, 2015), who also argue that written reflections can promote the development of reflection. More specifically, in the first step of reflection writing, the teacher usually becomes aware of a particular aspect of their teaching method that they want to improve (Saavedra Jeldres & Campos Espinoza, 2019). For example, in Tsangaridou's and Polemitou (2015) study present in this review, journal entries were focused

on professional knowledge related to specific skills and/or tactics that PSTs taught their students. Then, the teacher experiments with a new approach, and while the experience is recorded, it is reflected upon and analysed to draw conclusions for the future.

In relation to this topic, research has also highlighted the importance of close supervision during the process of producing teachers' written reflections and the more capable the supervisor or facilitator is, the better the reflection will be (Brown, McNeill, & Shaw, 2013; Thomas, 2005). Nevertheless, there is only one study in which the development of a portfolio was conducted through a purposeful and deliberate intervention with a structured supervision to PSTs in order to develop teachers' reflective skills (Senne & Rikard, 2004). This is even more evident when some authors in this review (e.g., Senne & Rikard, 2002) enhance that the use of written reflections can become solely descriptive rather than beneficial. Without a comprehensive vocabulary of critical pedagogy, PSTs found it difficult to describe these aspects of their teaching in detail. Therefore, it seems crucial to develop an approach that prepares PSTs during their training with a specific vocabulary and supervision that could provide the necessary support for the development of reflective skills (Beauchamp, 2015; Kõrkkö, Kyrö-Ämmälä, & Turunen, 2016).

In addition to written reflection, the studies collected for this review also use classroom observation (in or out of group and using video or participant observation) as another strategy to promote reflection (e.g., Crawford, O'Reilly, & Luttrell, 2012; Garrett & Wrench, 2008). In the work of Lamb and colleagues (2013), it appears that teachers' reflection during their teaching practice may not provide teachers with the «space» to engage in meaningful reflection and challenge their own practice in a way that leads to sustainable change. Therefore, two years later, following Schön's (1987) reflection-on-action, Lamb and colleagues (2015) found that post-teaching observations could fill this gap. Specifically, by allowing multiple periods of reflection that promote awareness, understanding, learning, and action choice that would enhance PST reflective knowledge in subsequent periods (Lamb et al., 2015). Indeed, this approach enables teachers to develop and disseminate a robust practice skill that engages them in the learning process. In addition, this «outside of practice» reflection allow PSTs to discuss with colleagues whether they are researching, planning, teaching, observing or evaluating (Elliott & Norris, 2012). As the PSTs in Lamb and Aldous's (2016, p. 107) study pointed out, these «external structures» allowed them to «look at things in a different way.» Through the outsider perspective, PSTs were able to identify and clarify the meaning of the specific elements of their practice they were beginning to transform, which

often went unnoticed. It then became clear that this structured system was crucial to the reflective process as it brought to light the multiple structures that were responsible for shaping the PSTs' experience (Lamb & Aldous, 2016).

Because video is widely regarded as an effective support tool by researchers and teacher educators (Brophy, 2004; Darling-Hammond, 2006; Goldman, 2007), some of the studies collected in this review have valorised the role of video-based classroom observation (e.g., Crawford et al., 2012; Lamb et al., 2012; Mooney & Hickey, 2017). Video has been able to convey all of the nuances that take place in the classroom or instructional scenario in real time, preserving the complexity, richness, and immediacy that are so difficult to achieve through written records (Brophy, 2004; Goldman, 2007). Video allows one to participate in a classroom experience without actually being present and takes away the pressure to interact (Sherin & Han, 2004), which can only be described as a second-hand experience of teaching (Miller & Zhou, 2007). In addition to fostering a connection between theory and practice, video expands the range of classroom practices available for PSTs to observe, which is otherwise impossible when considering only live observations (Bayram, 2012). The research included in this systematic review shows that PST's reflective capacity about classroom events is greatly enhanced by viewing videotaped classroom situations (Crawford et al., 2012; Derwent, 2015b; Lamb et al., 2013; Mooney & Hickey, 2017; Peralta et al., 2020) Thus, it is clear that being able to observe lessons via videotaped observation increases PST's reflective ability and allows them to conduct more detailed analysis of classroom situations (Crawford, O'Reilly, & Luttrell, 2012; Mooney & Hickey, 2017).

Although the studies selected for this review offer new insights into the development of teachers' reflective skills across participants, contexts, and strategies while making an effort to ensure the methodological quality of these studies, disappointing results were found in terms of reflection levels. Specifically, only five studies (Crawford et al., 2012; Garret & Wrench, 2008; Østergaard, 2019; Senne & Rikard, 2002; Zhu, 2011) examined teachers' reflective development within different levels. This is even more evident since some of these studies (e.g., Zhu, 2011; Garret & Wrench, 2008) mainly reported superficial reflection in reflective practices and rarely delved deeper into critical reflection or reflection-on-reflection (Van Manen, 1991). In particular, in Zhu's (2011) study, teachers limited their reflection to the events described, habitual common sense thinking and acting (technical) at most justifying decisions made during the events or using practical experiences to make judgments (practical reflection). Therefore, future studies should explore and encourage the development of deeper levels of reflection, such as critical reflection that

involves a systemic examination of specific phenomena. In particular, considering ethical or social issues arising from classroom events (e.g., «Did my teaching benefit a particular group of students?») through personal and other individual perspectives. Furthermore, it is crucial that teachers not only act reflexively, but simultaneously pursue a deeper understanding of reflective experiences and their meaning, as well as the types of knowledge they use, as mentioned by Van Manen (1991), or simply put, reflection-on-reflection. Only with this methodology teachers will be able to question or confront the validity of prevailing practices as well as their own practices and beliefs (Bowe, Kjesrud, & Hemsley, 2020). This analytical awareness will allow teachers to reframe their practice and offer insights on how to approach teaching differently and consequently a more equitable, safe, and effective learning environment (Garret & Wrench, 2008). To support a deeper level of teacher reflection, future research should develop frameworks that structure PSTs' cognitive processes (how they reflect), but also the content of their thinking (what they reflect on), the goals of their thinking (why they reflect), and how their thinking influences their classroom teaching practice (what transformative learning they experience) (Liu, 2015).

Conclusion

This review could allow us to establish the conclusions such as:

Despite some studies that have implemented action research in their designs, there is a need to reinforce and clarify the benefits of this design to increase the success of decision making and appropriate adaptation of teachers' reflection.

Aside from the fact that collaborative work can help improve reflective skills and help teachers develop reflection in collaborative settings, such as through the study of communities of practice, there is a need to conduct a careful examination of the environment of this work.

Although some studies have aimed to develop teachers' reflective skills, showing, for example, that written reflections and videotaped teaching situations can improve teachers' reflective skills, there is still a lack of evidence on how to reach a deeper level of teachers' reflective skills.

Practical implications

As reflection is clearly a process and takes time to develop, future studies should implement and examine written reflections to promote deeper levels of reflection (i.e., cri-

tical reflection), since they provide the necessary structure to develop this skill and become a valuable tool for teachers to carefully consider their actions and their impact on learners (Saavedra Jeldres & Campos Espinoza, 2019).

Moreover, future studies should explore more deeply how teachers develop reflection in collaborative settings, for example, by examining communities of practice (Lave & Wenger, 1991) which have been proposed as a means to maximize teachers' experiential learning (MacPhail, Patton, Parker, & Tannehill, 2014; ten Dam & Blom, 2006; Timoštšuk & Ugaste, 2010).

Other information

Protocol, registration and support

The methods and protocol registration were preregistered prior to conducting this review: INPLASY protocol 202130079, doi:10.37766/inplasy2021.3.0079. The review protocol can be accessed at <https://inplasy.com/?s=202130079>.

There were no competing interests between authors of the review. Reports of the data used for all analyses are publicly available and can be found at https://www.dropbox.com/sh/c7mgmjumrb74nhm/AADXnE_Ax8anwh-Duodx8SjpaA?dl=0

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(Footnotes)

- 1For the purposes of this review, student-teachers were considered as PETE students in their curricular year, pre-service teachers as teachers in field experience, novice-teachers as teachers in their first five years of teaching and expert teachers as teachers with more than five years of experience (González-Calvo & Fernández-Balboa, 2018; Jin, Li, Meirink, van der Want, & Admiraal, 2019).