Preservice teachers' practical knowledge and their sources

Ferry, Magnus; Åström, Peter; Romar, Jan-Erik

Published in:
Journal of Teacher Education and Educators

Published: 26/04/2022

Document Version
Final published version

Journal of Teacher Education and Educators
Volume 11, Number 1, 2022, 33-57

Preservice Teachers' Practical Knowledge and Their Sources

(Received on December 16, 2021 – Accepted on April 26, 2022)

Magnus Ferry[1], Peter Åström[2] and Jan-Erik Romar[3]

Abstract
Becoming a teacher requires preservice teachers (PSTs) to interpret experiences from different perspectives because of the reversal role from being a student to being a teacher. For teacher education programs to be most effective, they need to understand the knowledge that PSTs hold and develop in order to optimise professional learning. With an exploratory mixed-method design, this study's overall aim was to investigate the content of practical knowledge and perceived sources among a group of Swedish physical education PSTs (n=97). Their practical knowledge, operationalized through the concept of didactical milestone, were expressed in five different themes: the curriculum (what), the teacher (who), instructions (how), students (whom) and the classroom (where). Furthermore, the results showed that PSTs' practical knowledge was influenced by situations before entering and during teacher education as well as from media, and to some extent, the PSTs' work experiences. The results also showed that the type of source related to the different themes of practical knowledge. With the help of practical knowledge as construed in this study, teacher educators can assess PSTs' capacity to reflect on teaching, as well as adjust their own instructional focus.

Key Words: Didactical milestones, physical education, teacher education, Sweden, mixed-method design

Introduction

During teacher education programs, preservice teachers (PSTs) develop their knowledge about teaching and learning. The preparation of PSTs is a complex effort, though an important area of research. In addition, learning to construct their knowledge as PSTs and having to deal with the situations they encounter in their course work is a way to foster teacher development (Allas, Leijen, & Toom, 2017; Schepens, Aelterman, & Van Keer, 2007). Johnston (1992) referred to the knowledge teachers use in complex classroom situations holistically when describing teachers' practical knowledge. As PSTs' knowledge is constructed in the context of their teacher education program, their practical knowledge integrates experiential knowledge, formal knowledge, and personal beliefs (van Driel, Beijaard, & Verloop, 2001).

PSTs' thoughts and experiences from teacher education as well as their individual backgrounds are interesting for teacher educators and researchers. Furthermore, this construct of PSTs' practical knowledge suggests a shift in research on teaching where PTSs are no longer consumers of others' knowledge; inversely, they are in a situation of producing knowledge for their own career and professional community (Chaharbasho,

[1] Umeå University, SWEDEN, magnus.ferry@umu.se, ORCID: 0000-0002-0748-7144
[2] Umeå University, SWEDEN, peter.astrom@umu.se, ORCID: 000-0002-0531-5429
[3] Åbo Akademi University, FINLAND, jan-erik.romar@abo.fi, ORCID: 0000-0002-9694-3999

Gholami, Aliasgari, Talebzadeh, & Mousapour, 2020). By constructing their own practical knowledge, PSTs learn how to not only identify their knowledge related to teaching but also adjust their knowledge according to the actual teaching context. Therefore, it is important to understand the practical knowledge that guides PSTs' actions.

Research has further shown that the sources of PSTs' practical knowledge play a central role in understanding whether their practical knowledge develops over time (Cobanoglu, Capa-Aydin, & Yildirim, 2019). If researchers and teacher educators want to develop teacher education, the relation between the contents and the sources of PSTs' practical knowledge needs to be understood. Thus, in this study, we are interested in the content of practical knowledge of PSTs and the sources thereof.

Theoretical Framework and Literature Review

The professional teaching activity is a multifaceted endeavor, and the concept teacher knowledge has expanded and widened considerably over time. The international educational community have used alternative, maybe confusing, and a range of different conceptualizations to describe teachers' knowledge (Borg, 2003; Herold, 2019; Stenberg, Karlsson, Pitkaniemi, & Maaranen, 2014). However, Verloop, van Driel and Meijer (2001) described practical knowledge as an overarching, inclusive concept that includes a variety of from conscious and well-balanced opinions to unconscious and unreflected insights that are grounded in teachers' actions in practice. Thus, teachers' practical knowledge is interdependent of their teaching, and it supports their work within any given context in which they teach (Ben-Peretz, 2011; Gholami & Husu, 2010; Meijer, Verloop, & Beijaard, 2002).

Even though teachers' practical knowledge is clearly related to personal experiences and individual situations, there will be features of teachers' practical knowledge, which are shared by many teachers, for instance, all teachers who teach students from a certain age level (Gatbonton, 2008; Verloop et al., 2001). Researchers in general education have identified categories of in-service teachers' practical knowledge as (a) subject matter, (b) students, (c) student learning and comprehension, (d) purposes, (e) curriculum, and (f) instructional techniques (Chaharbashloo et al., 2020; Tiilikainen, Toom, Lepola, & Husu, 2019; Verloop et al., 2001).

As with the conceptualizations of knowledge, researchers have structured the content of PSTs practical knowledge in somewhat different ways (Buitink, 2009; Horgan & Gardiner-Hyland, 2019; Levin & He, 2008; Khalid, Iqbal, & Hashmi, 2020; Maaranen, Pitkäniemi, Stenberg, & Karlsson, 2016, Pitkäniemi, Karlsson, & Stenberg, 2014; Romar & Ferry, 2020; Romar, Åström, & Ferry, 2018). However, our review of these studies, shows that researchers have used similar categories, such as teacher, teaching and instructional activities, classroom context, students, sociocultural aspects, and curriculum. Similarly, PSTs' main focus has been on students as well as teaching and instructional activities.

Although practical knowledge is an overarching concept, and according to Elbaz (1983), "the complex set of understanding which teachers actively use to shape and direct their teaching" (p. 3), Richardson (1996) showed that PSTs' prior beliefs influenced what they learned during teacher education and acted as a filter during education. In addition, teachers' practical knowledge is person specific, which arises from their experience and background, teacher education, and reflection (Black & Halliwell, 2000; Fenstermacher, 1994). Although teachers usually obtain most of their knowledge in an interaction with a variety of systems, Elbaz (1981) presented four sources of teachers' practical knowledge: situation, personal, experiential, and theoretical. Further, in Levin and He's (2008) model, the three major categories of sources for PSTs were the teacher education framework, teaching observation/experience, and earlier experiences from family/sports or own schooling. Bråten and Ferguson (2015) further developed these categories into formalized, experiential, and social and popular media sources. Formalized sources relate to formalized knowledge, including textbooks, research articles, and professional literature. Experiential sources are related to experiences as sources of practical knowledge, including observational and collaborative experiences with other PSTs, and personal experiences with being a student. Lastly, social and popular media sources related to social media (e.g., Facebook) and popular media (e.g., television) as sources of knowledge. However, PSTs in general education rely strongly on experiential and practically-derived sources (Bråten & Ferguson, 2015; Horgan & Gardiner-Hyland, 2019).

If we, as researchers and teacher educators, want to develop teacher education, we need to understand the relation between the contents and the sources of PSTs' practical knowledge. In general teacher education, Levin and He (2008) have studied these contents and sources and reported that PSTs' practical knowledge seems to come equally from their teacher education coursework, their practical teaching experiences, their own personal experiences as students, and their family background and upbringing. The researchers also noted that PSTs' teacher education experiences seemed to have the most influence on their practical knowledge about instruction and students in school, while experiences before teacher education had a strong influence on their practical knowledge about classroom context and teachers.

Furthermore, Pitkäniemi et al. (2014) identified a developmental approach when pedagogical theory from teacher education influenced students' practical knowledge at the final stage more often than at the first stage, or when it was influenced by the teachers' practical teaching experiences. In contrast, teachers' own school experiences were more influential at the beginning of their teacher education. However, more research is needed to apprehend further the process by which PSTs' practical knowledge from different sources is merged into a conceptual framework that guides their future teaching.

Regarding a practical subject such as physical education (PE), it is assumed that not only their own school experiences are influential in shaping PSTs' practical knowl-

edge. As in most international studies, PE PSTs have a strong background and life history in sports (Dowling, 2011; Ferry & Romar, 2020; Kari, 2016; Mordal-Moen & Green, 2014) and it is assumed that the perceived competence and attitudes toward teaching PE are strongly related to their PE experiences as students and their personal history of physical activity (Kari, 2016; Morgan & Bourke, 2008). However, research is needed to further apprehend the process by which PE PSTs' practical knowledge from different sources are merged into a conceptual framework that guide their future teaching.

Research has suggested that the impact of physical education teacher education (PETE) is weak (cf. Curtner-Smith, Hastie, & Kinchin, 2008), though more recent research reports that teacher education can promote change in PSTs' knowledge (cf. Richards, Templin, & Graber, 2014). It also seems that the research methodology and the structure of PETE is central. For example, Hemphill, Richards, Gaudreault and Templin (2015), have through a case-based learning approach, demonstrated enhanced cognitive growth and PSTs' enriched engagement and reflection. Moreover, Herold and Waring (2018) noted that many PSTs started during the PETE to appreciate more fully that 'how you teach' is as important as 'what you teach' and proceeded to pay increased attention to the teaching process. In addition, Ní Chróinín and Coulter (2012) reported a change in PSTs, understanding of PE and highlighted the alignment between the principles guiding the TE program and pre-service teachers' experiences.

Although university-based learning and school-based teaching practice contribute to knowledge and skill development among PSTs, there is a need for university-based learning to be aligned with practices in school-based teaching, and for them to complement each other in the development PSTs' knowledge and understanding of teaching PE (Herold, 2019). Thus, further research is needed, particularly on the content of PSTs' practical knowledge and how different experiences and different parts in PETE support their knowledge development.

In this study, we see practical knowledge as an overarching inclusive concept that includes a variety of conscious, well-balanced opinions on the unconscious and unreflected insights grounded in teachers' actions in practice (van Driel et al., 2001), and we define teachers' practical knowledge as the intertwined whole of the knowledge, insights, skills, and beliefs teachers use to manage teaching actions in their profession.

PE PSTs' thoughts and experiences from teacher education as well as their individual backgrounds are interesting for teacher educators and researchers. Furthermore, it is essential to know how the underlying principles of teaching and learning are part of a student teacher's practical knowledge. Therefore, the overall aim of this study was to investigate the content of practical knowledge and perceived sources for a group of PE PSTs.

Our specific research questions are as follows:

- What are the contents of preservice teacher's practical knowledge?

- What are the sources for their practical knowledge?
- What is the relationship between their practical knowledge and the sources that refer to this?

Methods

Participants and context of the study

The participants in this study were 97 first-year PE PSTs (60 male, 37 female) from four cohorts of students enrolled in a teacher education program at one major Swedish University between 2016 and 2019. During the teacher education program (300 European Credit Transfer System [ECTS]), PSTs in Sweden study general education courses (about teacher development and regulations, 60 ECTS), main subject courses (e.g., PE, 120 ECTS), secondary subject courses (e.g., mathematics, English etc., 90 ECTS) and undergo practicum in the two subjects (30 ECTS). At the University in this study, the PSTs begin the program with a semester of general education courses with PSTs in other school subjects. The program is dedicated to the teaching profession from the start, and has the overall aims to educate teachers in the PE subject matter and prepare PSTs to teach PE at all levels in school with a special focus on upper secondary school (for a further description of the program, see Romar et al., 2018). At the time of the data collection, the students in each cohort had finished a semester of general education course (30 ECTS) focused on the teaching profession, and regulations for the Swedish school system. During the second semester, the students were reading their first semester of PE subject matter, which consisted of three modules: PE subject matter and pedagogy (18 ECTS), nutrition and health (4.5 ECTS), and sports medicine (7.5 ECTS).

Data collection methods

The study was exploratory and used a mixed-method design with written assignments during the PE subject matter and pedagogy module, and semi-structured interviews in connection to the end of the semester. The data were not collected only for research purposes. This research was also the first step in the process of encouraging PSTs to reflect on learning and teaching in PE.

To operationalize and capture in writing PSTs' expressions of practical knowledge, we have developed and used the concept of didactical milestone (DM). A DM is defined as a thought, theory, or philosophy that the PSTs believed could guide their future work as a teacher in PE (see also Romar et al., 2018; Romar & Ferry, 2020).

Written assignment

Texts PSTs generate have previously been used in studies to gain insight into their teacher education learning (Allas et al., 2017; Atkinson, 2004). Further, Ní Chróinín and O'Sullivan's (2014) have used, in PE, preservice classroom teacher's reflective

writings to generate texts about their needs and experiences. Taking this as inspiration, we wanted to capture PSTs' voices in their path in learning to teach by generating and interpreting their written texts. Thus, the aim of the written assignment was to get students to make implicit learning explicit and to give students the possibility to reflect on coursework in the form of structuring their practical knowledge in writing (through the concept DM). Based on their experiences PSTs were in the assignment, asked to describe 10 DMs and instructed that each DM should have a heading and a short description of what the DM meant for them. Before being asked to answer the assignment, the PSTs were also informed that a DM was an example of practical teacher knowledge, which we defined as "the teacher's knowledge of teaching and practical challenges, and could thus be seen in meaningful actions" (Romar et al., 2018, p. 117).

Interviews

After submitting the written assignment at the end of the PE subject matter and pedagogy module, PSTs were asked to participate in interviews with one of the researchers in the study. The interviews were carried out in one of the researchers' offices and the schedule was flexible to fit the PSTs' other commitments during the semester. Using open-ended questions, the interviews aimed to expose PSTs' concrete reasoning about each DM, and therefore stimulated recall interviews took place (Schepens et al., 2007). To stimulate the semi-structured interviews, their submitted DMs assignment were used, and PSTs were asked what had inspired them to come up with each specific DM(for example *Where did you get the inspiration for this DM? How did that experience become a DM for you? What experience is the basis for this DM?*). The researchers helped PSTs talk about their sources by applying appreciative and active listening techniques, such as nodding, humming, showing empathy, repeating, summarizing, etc. The interviews were recorded and lasted between 15 to 30 minutes.

Data analysis

The data were analysed qualitatively through content analysis and categorisation of the written assignments and interviews. This method is used to analyse data within a specific context in view of the meanings someone attributes to them (Krippendorff, 1989). This analysis was done separately for the first cohort of PSTs (n = 26), through an initially mainly inductive process in several phases. Based on findings from the first cohort, the following cohorts thereafter were analysed deductively. In addition, quantitative analysis of the frequencies of the identified themes and categories and their relationship was performed, and figures were created.

Written assignment

The analysis of the first cohort of PSTs' written assignment was carried out by two of the authors in several phases. In the first phase, the submitted documents were read

several times and the DMs' (n = 260) headings, words, and phrases were sorted into conceptual categories describing the content for further coding. In total, 17 categories were identified for the DMs based on this initial coding and discrepancies were resolved through negotiation between the two authors. In the following phase, a coding manual was created with category labels and specific examples from the data for each category (see Table 1). In the third phase, the authors compared the coding labels to related literature on teachers' practical knowledge to identify the relationship among the categories. This resulted in five themes of common aspects that previous researchers have described (Buitink, 2009; Levin & He, 2008; Maaranen et al., 2016; Stenberg et al., 2014). These were the curriculum (What) that the teacher (Who) teaches through instructional strategies (How) to the students (Whom) in the classroom (Where). In the final phase, the authors used the 17 categories to recode all the written assignments. Initially, the authors had 78% intercoder reliability (Miles & Huberman, 1994) during this phase, and all conflicts were resolved collaboratively by discussing the milestones' heading and content, and a consensus was reached with regard to coding the few discrepant DMs.

In the analysis of the following PST cohorts (n=71), two of the authors independently used the earlier created coding manual to analyse the submitted DMs. Some of the PSTs in these cohorts submitted more than 10 DMs and in total, 723 DMs were analysed. In this process, the authors initially had 80% intercoder reliability and after discussions, consensus was reached. In total, 983 individual DMs were collected from the 97 PSTs through the written assignment.

Table 1.
Themes and Categories for the Content of Practical Knowledge (DMs)

Themes	Categories	Examples of expressed practical knowledge
What (Curriculum)	Curriculum, steering documents	"The subject is called physical education and health, but my experience is that 90 percent is about sports. The health (education) part is forgotten."
Who (Teacher)	Professionalism	"PEH teacher is your job, not your hobby."
	Teacher development	"I, as a teacher, do not want to get stuck in old patterns; rather, [I] want to dare to try new things all the time to become a better educator."
	Subject matter knowledge	"That teachers do not know how it is performed with the correct technique. I myself have experienced this in other subjects and I completely lost respect for that teacher."
	Personal and private	"That you actually should not be a friend to your students but, in fact, a teacher."
How (Instructions)	Adapt and adjust lesson content and activity	"Break down exercises; make them different but with the same/similar rules."
	Methods	"Something that I myself will work on and try to strive to develop is to know which method is the best [in each] situation."
	Lesson structure	"Gather the group before the lesson and inform them of what will happen during the lesson. Gather them after as well."
	Planning and having a plan B	"It does not always go as you intended; have the courage to change from your initial plan."
	Clear instructions	"You can prevent a lot of irritation and inefficiency by being very clear in explaining the lesson content."
	Feedback	"Give students a lot of feedback. Help students develop by giving them feedback."
	Attention to all students	"As a teacher, I think it is important to not focus on only certain students, but all should be seen."
		"Always conduct the lesson so that

Whom (Students)	Inclusive intentions	everyone is included and can participate even if they have different abilities."
	Student-centred approach	"To be receptive to students and listen to their suggestions for changes."
Where (Classroom)	Classroom climate	"I value a positive atmosphere during PEH classes and creating an environment where students feel that it is acceptable to do errors."
	Arousal of motivation	"To initiate some sort of motivation for the pupils, so they find interest in playing sports outside [of school]."
	Controlling the classroom	"Of course, one should not be mean and unfriendly with the students, but you have to dare to be authoritarian and decide, if it comes to it, to show who's the boss."

Interviews

During the analysis of the first cohort of PSTs interviews, two of the authors initially listened to the recordings several times and inductively made notes of themes, describing the sources for further coding. This process entailed considering relevant literature about sources influencing teacher knowledge and beliefs (Bråten & Ferguson, 2015; Levin & He, 2008; Shulman, 1987). In the second phase, the researchers discussed the emerging themes and categories, and four themes of influential sources were established: the PE subject matter course PSTs were reading, the general education courses PSTs had taken the previous semester, PSTs' work experience, and personal experiences and media. Some of the DMs had more than one source and in total, 297 sources were identified during this process. In the final and third phase, a coding manual was created with labels and specific examples from the data for each category (see Table 2).

Table 2.
Themes and Categories of the Sources of DMs

Themes	Categories	Examples of expressed sources
PE subject matter course	Talked about	"Something we talked about during a lesson", "the lecturer talked about that."
	Practically performed	"I realised that when we had dance", "one of the teachers did so during a lesson."
	Read about	"From a book during the PE course", "inspired by one article we read."
	Other content	"That was part of one of the examining tasks."
General education course	Talked about	"That was taught during a lecture", "one lecturer was talking about how important that is."
	Read about	"From one book during the course."
	Other content	"I learned that from one examining task."
Work experience	Teacher	"I did it that way when I was a substitute teacher", "from my experiences of teaching PE."
	Coach	"I have learned that as a coach", "from my experiences as coach."
	Other experiences	"Experiences from working with children."
Personal experience and media	As pupil in school	"My PE teacher at school did it that way", "my PE teacher was a bad example."
	As athletes in sport clubs	"That was something my coach used to do."
	PSTs' own skills	"I am that kind of person."
	PSTs' own perceptions	"From my own experiences", "something I am striving for", "[I] learned that during my upbringing."

	TV and social media	"Inspired by a YouTube video", "discussed in a "Facebook group I follow", "from a TV program."

In analysing the interviews of the following cohort of PSTs, the authors used the earlier created coding manual and found 809 sources. In total, 1,106 sources were found to the 97 PSTs' DMs.

Quantitative analysis

For the calculations of frequencies of themes and categories of DMs and sources, the number of sources related to each theme of DMs, and for creating the figures and tables, we used Microsoft Excel 2016. The statistical analysis was performed with Chi-square tests and Cramer's V (w) as an effect size measurement (Cohen, 1988). The significance level was set at 5% ($p < .05$).

Credibility and ethical considerations

Several steps were taken to ensure the trustworthiness and credibility of our data and the analysis and to ensure the ethical requirements. The written assignment used in the study was part of the course and in did not involve any additional work for the PSTs. To prevent socially desirable answers and expectance effects, the assignment was only graded as "pass" when they were turned in regardless of the content and they were not used for assessment purposes. Aware of that because we were their teachers, and this could have impacted the PSTs' responses during the interviews, clarifications were made that there were no correct or incorrect answers. In addition, we analysed all data after the PSTs had completed the course to minimise the grading power. Considering ethical requirements, PSTs were when introduced to the written assignment informed about the study's purpose, and before the interviews informed about conditions for participation, and the code of ethics. In the beginning of the interviews, approval for recording the interviews was obtained.

Results

Based on our research questions, this section will begin with a presentation of the PSTs' practical knowledge expressed through their written assignment, followed by the sources to these according to the interviews, and finally present their relationships.

PSTs' practical knowledge

The analysis showed that the 983 individual DMs that the 97 PSTs provided, which was a written operationalization of their views on practical knowledge, could be seen as expressions of different themes connected to the classroom situation and

personal beliefs teachers value in developing their teaching. Furthermore, the interaction with the students and managing the students and the actual content, as well as connecting the content to the curriculum, were other themes in their DMs (see Table 3). Almost two thirds (66%) of the DMs were related to the two main themes *How* (n = 381, 38.8%), which was the planning and instruction of lessons; and *Who* (n = 270, 27.5%), which was related to their role as teachers. Less common was the themes *Where* (n = 144, 14.6%), that is, focusing on teachers' work in classrooms; Whom (n = 126, 12.8 %), that is, concerning given all students attention. Least common was the theme What (n = 62, 6.3%), which was related to different aspects concerning curriculum and steering documents.

Table 3.
Distribution and Frequencies of 97 PSTs' Practical Knowledge (%)

Themes	Categories	f
What (Curriculum) *n* = 62 (6.3%)	Curriculum, steering documents	62
Who (Teacher) *n* = 270 (27.5%)	Professionalism	95
	Teacher development	70
	Subject matter knowledge	68
	Personal and private	68
How (Instructions) *n* = 381 (38.8%)	Adapt and adjust lesson content and activity	98
	Teaching methods	82
	Lesson structure	67
	Planning and having a plan B	58
	Clear instructions	42
	Feedback	34
Whom (Students) *n* = 126 (12.8%)	Attention to all students	50
	Inclusive intentions	43
	Student-centred approach	33
Where (Classroom) *n* = 144 (14.6%)	Classroom climate	64
	Arousal of motivation	55
	Controlling the classroom	25
Total		983

Sources of PSTs' practical knowledge

The analysis of interviews about their inspiration to the DMs provided in the written assignment, show that they were influenced by situations before entering PETE (e.g., personal experiences of PE in school as pupils and participating in sport clubs), during the PETE (e.g., experiences of the two first PETE semesters), as well as from media and to some extent the PSTs' work experiences (see Figure 1).

Almost half (46.2%) of the total 1,106 sources to the DMs, originated from the PE subject matter course the PSTs had read at the time of data collection. When refer-

ring to these sources, PSTs mainly talked about the practical experiences of different typical PE activities and the leadership (teaching) skills the courses covered, or the peer-teaching and teaching assignment during the course. Only in some cases, the PSTs were referring to specific aspects PETE teachers had said or done during a lesson or a seminar.

Another major source for the DMs were from personal experiences and media (30.6%). When describing their sources, PSTs mentioned their own PE teachers in school showing good or bad examples of how to conduct PE lessons, or they mentioned their coaches in sports clubs' behaviours. In addition, the PSTs talked about influences from media, for example TV series and different kinds of social media that highlighted PE, sport, and health.

To some extent, the general education course the PSTs had taken the previous semester also influenced them (15.9%). When talking about these sources, the PSTs mainly mentioned topics treated during lectures and seminars, for example, teachers' knowledge and teachers' mission, role, and behaviours.

Among the PSTs, 20 had large experiences of working in schools as unauthorized teachers or as coaches in sport clubs before entering PETE, which also was mirrored in the small proportion of sources from this category (7.3%). However, a closer analysis showed that PSTs with these experiences in a significantly higher degree leaned towards these experiences when justifying the sources to their DMs ($chi^2 = 11.571$, $p < .05$, $w = .345$).

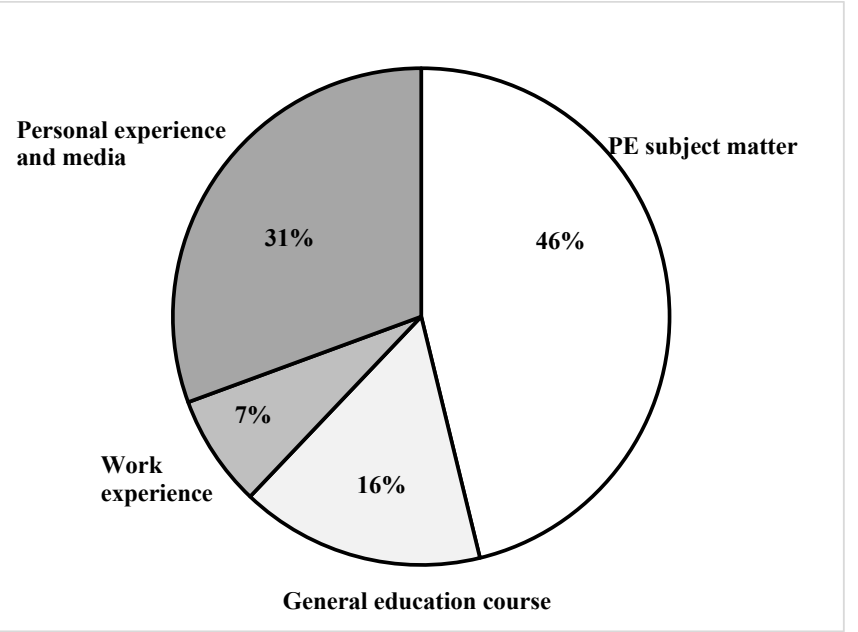

Figure 1. Sources of the PSTs' Practical Knowledge (%)

The Relationship Between Sources and Practical Knowledge

Figure 2 presents the relationship between the 1,106 sources given to the 983 DMs. According to the lines' thickness, some sources had stronger relationships with certain themes, for instance between the PE subject matter course and *How* (25% of all sources) and *Who* (10%), and between personal experience and media and *Who* (10%). Overall, the statistical analysis showed a significant difference in the type of sources related to the different themes of practical knowledge ($chi^2 = 119.2$, $p < .05$, $w = .190$).

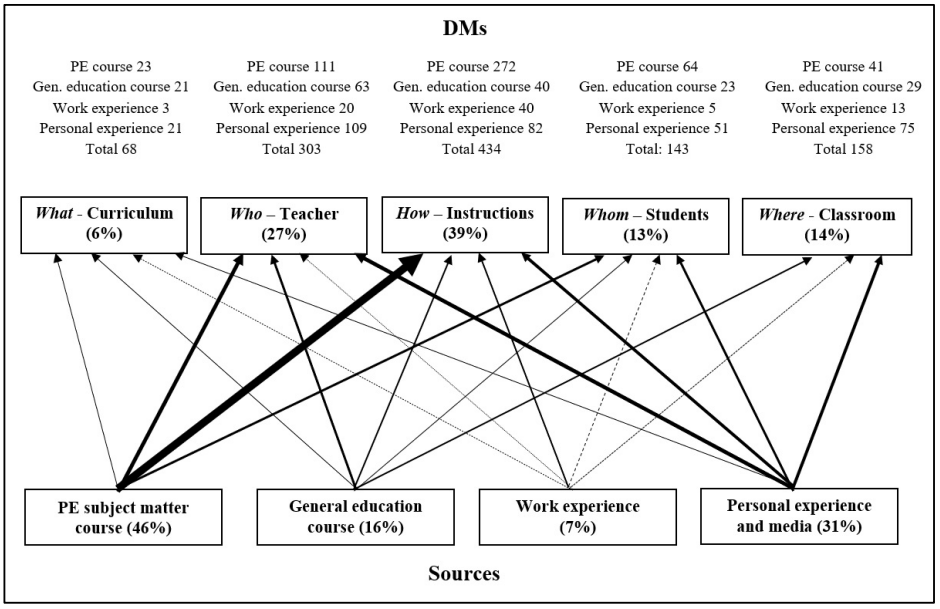

Figure 2. The Relationship Between Sources and Different Themes of Practical Knowledge (DM), n (%). Note. The thickness of the lines corresponds to the proportion of all sources, thicker lines imply a higher proportion of sources

Sources of What

In total, 68 sources were given to the theme What (curriculum), evenly distributed between the PE subject matter course (33.8%), the general education course (30.9%), and personal experiences and media (30.9%). Only 4.4% of the sources for this theme were from work experience.

Sources of Who

The theme Who (teacher) was influenced by 303 sources. The major sources were PE subject matter course (36.6%) and personal experience and media (36.0%), to some extent the general education course (20.8%), and only to a little extent work experience (6.6%). The statistical analysis showed a significant difference in the relationship

between sources and the DMs in this theme (chi2 = 77.12, p < .05, w = .291). The PE subject matter course was in a higher degree related to the category subject matter knowledge, the general education courses to personal and private, and personal experience to professionalism (see Figure 3).

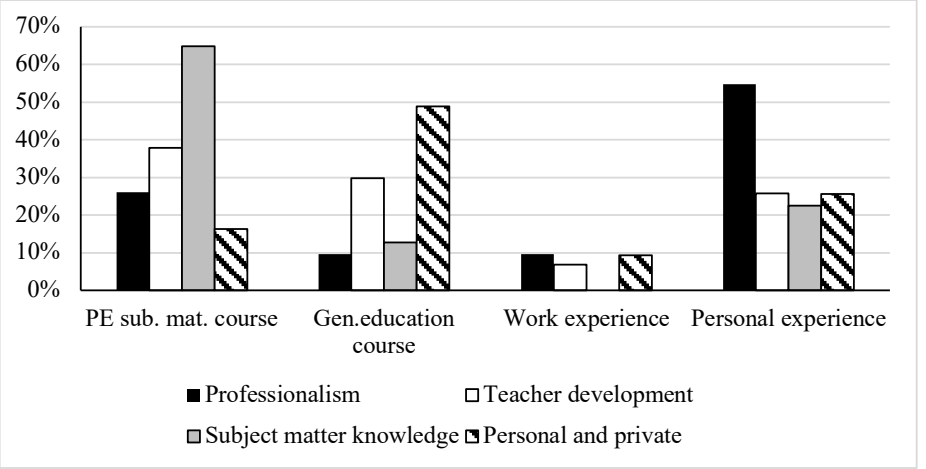

Figure 3. Source to DMs About Who (Teacher), %

Sources of How

To the theme *How* (instructions), 434 sources were given in total, with the major source being PE subject matter course (62.7%,) followed by personal experience and media (18.9%), general education course (9.2%), and work experiences (9.2%). The statistical analysis showed a significant difference in the relationship between sources for the different DMs (chi^2 = 43.93, p < .05, w = .184). A smaller proportion of the source PE subject matter course, simultaneously as a higher proportion of the general education course and work experience, was related to the DMs planning and having a plan B, and clear instructions compared to the other categories of DMs (see Figure 4).

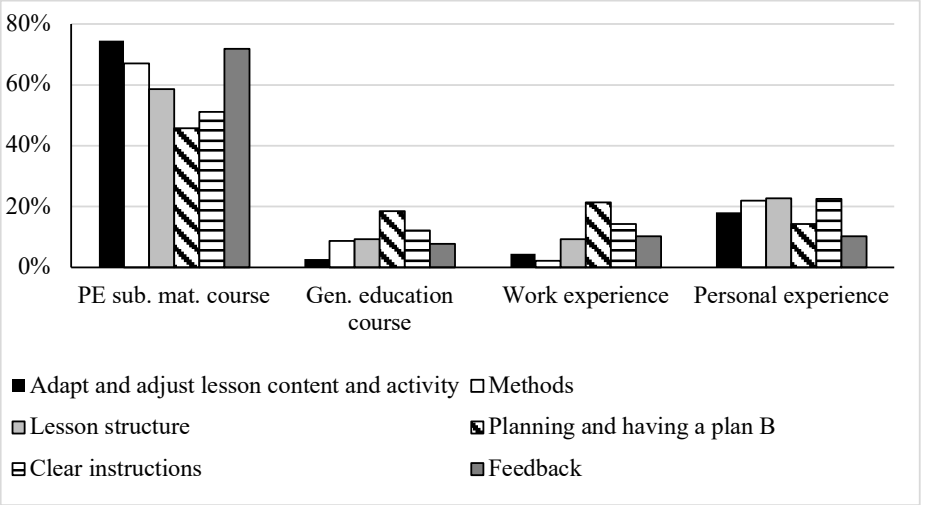

Figure 4. Sources to the DMs About How (Instructions), %

Sources of Whom

For the theme *Whom* (students), a total of 143 sources were given, with no significant difference in the relationship between sources and DMs in this theme ($p > .05$). The most common sources for the theme were PE subject matter course (44.8%) and personal experiences and media (35.7%). The different categories of DMs had a somewhat even distribution between the sources (see Figure 5).

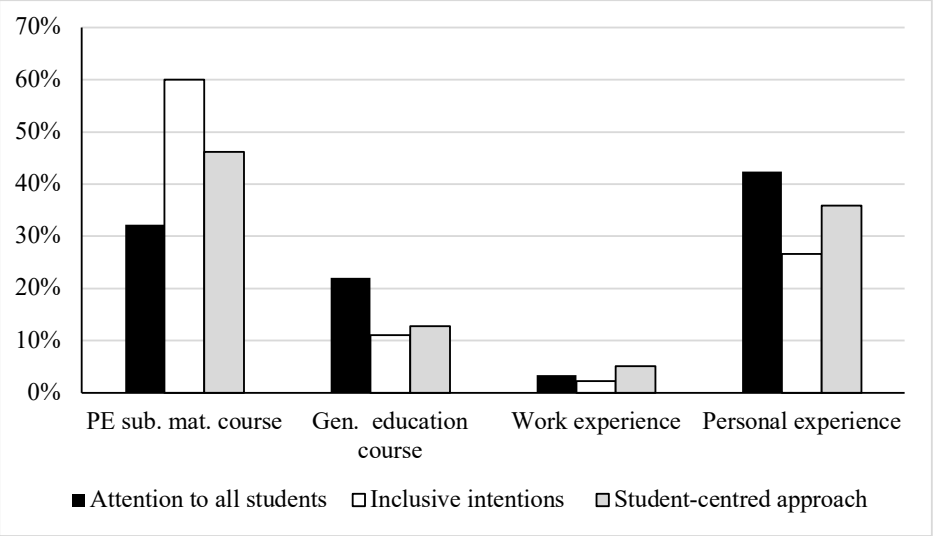

Figure 5. Sources to the DMs About Whom (Students), %

Sources of Where

In total, 158 sources were given to the theme *Where* (classroom). The sources for this theme were mainly rooted in personal experiences (47.5%) and the PE subject matter course (25.9%). The distribution of sources was evenly distributed for the different categories of DMs in the theme (see Figure 6), with no significant difference ($p > .05$).

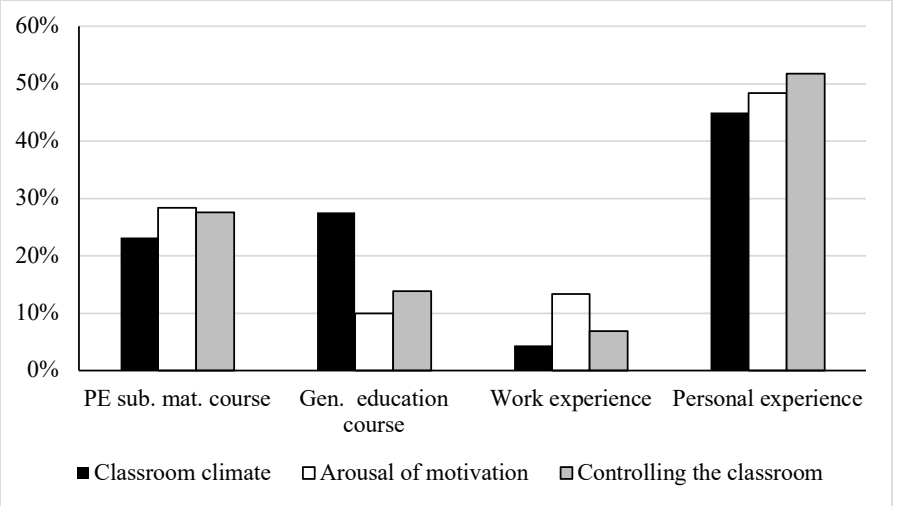

Figure 6. Sources to the DMs About Where (Classroom), %

Discussion

When entering PETE, PSTs brings knowledge, ideas, and attitudes on PE and what it means to be a PE teacher. Their learning and development is a complex process that brings together a host of different situations (cf. Capel, Hayes, Katene, & Velija, 2011). One important goal of PETE is to develop practical knowledge because it supports PSTs' work in any given context (Ben-Peretz, 2011; Gholami & Husu, 2010).

Practical knowledge

By constructing their own practical knowledge, PSTs learn how to not only identify their knowledge related to teaching PE, but also adjust their knowledge according to the actual teaching context. Therefore, it is crucial to understand the practical knowledge that guides PSTs' actions. The results show that the practical knowledge, expressed as DMs in this study, are shared and similar among the PE PSTs (Gatbonton, 2008; He, Lundgren, & Pyes, 2017). Mainly, the practical knowledge was pedagogical and focussed on instructional strategies for delivering the curriculum (*How*) followed by the roles and responsibilities of the teacher (*Who*), the classroom (*Where*), and finally on students' qualities and interactions (*Whom*). These DMs are indeed a central

part of the teaching profession, and particularly, teaching PE (Tannehill et al., 2013). However, few of the PSTs emphasized curriculum issues (What) as an important part of teaching PE. The low prevalence is not surprising because it cannot be expected of the PSTs as it is a content that has been little covered during the first two semesters of the PETE in this study and are in more focus later during the program.

These results are in line with the practical knowledge categories Meijer et al. (2002) defined, and in addition, the result follows previous research findings in general education (Levin & He, 2008; Khalid et al., 2020; Maaranen et al., 2016) and PE (Romar et al., 2018), which concluded that PSTs' practical knowledge was related to planning, instruction, organisation, classroom management, the qualities of a good teacher, and their knowledge about who students were. In summary, the themes and categories in this study indicate that PSTs' practical knowledge represents a complex range of understanding (Elbaz, 1983). Moreover, our findings underline the significance of specific basic properties of teaching PE and support Verloop and colleagues' (2001) conclusion that shared components of practical knowledge can be found among those from a similar context.

Sources

As shown in the results, personal experiences and individual situations influence PSTs' practical knowledge (Elbaz, 1983; Fenstermacher, 1994; van Driel et al., 2001, Shulman, 1987). Furthermore, the sources presented during the interviews were formalized, experiential, and social and popular media sources (Bråten & Ferguson, 2015). The PSTs expressed the formalized when talking about different elements during the PE subject matter course and the general education course, where they had to read and discuss textbooks, research articles, and professional literature. For experiential sources, PSTs stated they were from personal experiences as being pupils in school, athletes in sport clubs, and collaborations with other PSTs and teaching-assignments during the PE subject matter course. In addition, the PSTs also discussed influences from the media. Thus, the way in which sources interact with PSTs' learning varies depending on the individual environment and context each PST encounters.

Unlike Levin and He's (2008) results over general PSTs, where the sources were evenly distributed between the different categories, the sources in this study mainly were from the PE subject matter course the PSTs were studying and personal experience and media. Influence from these sources on our PSTs could be due to their personal history in sports and physical activity (e.g., Dowling, 2011; Ferry & Romar, 2020), which also influences their perceptions of PE and attitudes towards PE teaching when beginning PETE (cf. Kari, 2016). Fewer PSTs referred to the general education course they had studied during their first semester and work experiences. Although fewer referred to the general education course during the previous semester, we want to note that the course impacted how PSTs constructed their practical knowledge one

semester later. In addition, specifically for work experiences, a closer analysis showed that the source was more influential among those PSTs with experiences of working as teachers or coaches.

That the personal experiences were shown to be an influential source for PSTs in this study follows the developmental approach Pitkäniemi et al. (2014) identified, showing that these experiences were more influential in the beginning of the teacher education and decreased in influence during the program for the sake of the content treated during teacher education and practical teaching experiences. However, the result indicates that even though it is early in their education, PETE has already influenced the PSTs' views. The initial semesters of general education courses and the PE subject matter courses seem to make PSTs reflect on central aspects of the teacher profession, crucial for the act of teaching, e.g., what it means to be a professional teacher, and how they can apply and adapt teaching to enhance student motivation. We also conclude that content-specific DMs were given in relation to the content PSTs meet during the first semester of PE subject matter and that the PE subject matter courses seem to incite old memories from personal experiences as a pupil or participating in sports as athletes that have been latent for a long time.

Sources of different kinds of practical knowledge

The results in this study showed a somewhat similar pattern as Levin and He (2008), who noted that PSTs' teacher education experiences seemed to have the most influence on their practical knowledge about instruction and students in school, while experiences before teacher education had a strong influence on their practical knowledge about the classroom context and teachers. In our study, the practical knowledge about What (curriculum related DMs) were evenly influenced by three of the sources: the PE subject matter course, general education course, and their own personal experiences and media. The theme Who (connected to their role as teacher), was mainly influenced by the PE subject matter course, especially the subject matter knowledge and their personal experiences – being professional or acting in a professional manner, and the general education course – being personal and private. Not surprisingly, given the meaning of the theme, How (teaching and instructions) was in a large extent influenced by the PE subject matter course. Regarding the theme Whom (the pupil-centred theme), the influences were mainly from the two sources: the PE subject matter course and their earlier personal experiences. Finally, for the theme Where (classroom situations), the influences were in a large extent from their personal experiences, especially from their own school time. Their time as a pupil in school seemed to have left strong traces among the participants.

Overall, in the interviews, situations from the PE subject matter course seemed to bring back memories and examples from their own time in school. Results also indicated the impact of personal experiences and media on the themes Who, How, and

Where. Therefore, this study's findings suggest that it may take time until the understanding of PE during earlier experiences will be internalised and can be used to create the PE PSTs' practical knowledge.

Implications for PETE

Given the limited research base regarding PSTs' practical knowledge and their sources, this study contributes to the literature by demonstrating the importance of focusing on PSTs' practical knowledge. Thus, we offer new insights into the ways PSTs can be supported in their learning. This study provides evidence that, with proper guidance, PSTs are able to reflect on their previous and teacher education experiences and construct practical knowledge for their future professional career. Therefore, PSTs need to critically reflect on their background's impact, as well as that of past and current experiences, and the sources of their practical knowledge (Tsangaridou, 2012). In this study, by having PSTs express practical knowledge in writing and by interviewing them about their sources, we have influenced the PSTs to start critically reflecting on their PE understanding from a teacher perspective. Beginning teachers need to be encouraged to construct their knowledge about teaching (Korthagen, 2010), and reflection can be seen as an instrument for the change where PSTs learn how to not only identify their practical knowledge related to teaching PE, but also adjust their practical knowledge according to the actual teaching context.

Contrary to some other studies showing that PETE has a weak impact on PSTs' knowledge development (Curtner-Smith et al., 2008; Richards et al., 2014), our study indicates that PETE, particularly the PE subject matter course but also in some extent the general education course, impact the practical knowledge PSTs develop. PSTs acquire most of their practical knowledge during their interaction with a variety of systems. Through the content covered, peer-teaching, teaching and course assignments used in this study, the PSTs have started to think about and reflect on their future profession as PE teachers. Similarly, they have had time to concentrate on issues that are central to their future work. Thus, the reflection might be meaningful when it occurs in real situations. The PSTs also need to interpret practical teaching and other sources from a teaching perspective because of the changing role from being a student to that of becoming a teacher. Our next step in the work with PSTs' practical knowledge is to ask PSTs to work together and share practices with learning purposes. The power of PSTs' co-learning, which includes other PSTs in the reflection process, can initiate conscious creation of practical knowledge of all involved. When PSTs share and learn from practices and others' thoughts, they will construct and develop further their own practical knowledge.

We conclude that all university-based work may not be valuable for developing teachers' practical knowledge, rather, it is the connection to teaching in schools that is important for developing knowledge (cf. Capel et al., 2011; Herold & Waring,

2018). A crucial issue for the development is the connection to practicum in schools or experiences that put students in situations where the actual act of teaching and the classroom practices with the relationship and interaction with pupils are at fore. On this topic, Mattheoudakis (2007) points out that, while "student teachers seem to be going through a slow and gradual process of developing and modifying their beliefs" (p. 1281), their participation in teaching practicum may have a low impact on developing their practical knowledge. This can be attributed to various factors in the situated sociocultural contexts, for instance, the prescribed syllabus and entrenched classroom practices. They might also lack practical guidance and support from mentors to develop their abilities and knowledges in a variety of ways. In this study, those PSTs who had teaching and coaching experiences when starting PETE, leaned more heavily on these experiences when articulating their views on practical knowledge. This result indicates that the practicum and similar situations are an important part of PETE, whereby PSTs obtain opportunities to apply learned skills in real-life situations, and learning important knowledge and skills the profession demands (Richards et al., 2014).

To conclude, with the help of PSTs' practical knowledge constructed in the study through their written assignment, teacher educators can assess PSTs' development and understanding of teaching in PE, as well as adapting the content and their instruction in PETE courses. PSTs' work with practical knowledge (in our case DM) can be a practical tool to diagnose and connect university teaching and may assist teacher educators to focus their instruction on the most essential elements of practical teaching. In this context, we recommended that PSTs' work with practical knowledge is a way to make explicit their understanding of teaching PE and to document their learning and experiences.

Limitations

One obvious limitation to this study is that those of us involved simultaneously have been researchers and teachers on the PETE. Therefore, this is a risk that the PSTs have told us what they think we want to hear. Further, the question arises whether a written assignment is the best way into the PSTs' understanding of teaching PE or their construction of a reflection to meet the teacher educator's expectations. From a methodological perspective, PSTs thus may have answered the assignment with the teacher educator in mind; however, all student writings do have an audience in mind and therefore reflective writings are always value-laden and are not completely objective (Hosein & Rao, 2017).

Another limitation to the study, is that PSTs in this study are only from one specific PETE program in Sweden. To provide a basis for a more generalizable result for PE PSTs in Sweden, a larger sample is needed.

Future areas for research

The knowledge base regarding this research project poses more interesting aspects for future research. To understand deeper how PETE affects PST's, it would be beneficial to follow how their practical knowledge develops during the teacher education after their third semester of PE subject matter courses and if the focus/results would change after their future periods of practicum in schools (at the end of their studies). Preliminary analyses also indicate that it would be interesting to examine more closely if there are any gender differences in the patterns shown in this study.

References

Allas, R., Leijen, Ä., & Toom, A. (2017). Supporting the construction of teacher's practical knowledge through different interactive formats of oral reflection and written reflection. *Scandinavian Journal of Educational Research, 61*(5), 600–615.

Atkinson, D. (2004). Theorising how student teachers form their identities in initial teacher education. *British Educational Research Journal, 30*(3), 379–394.

Ben-Peretz, M. (2011). Teacher knowledge: What is it? How do we uncover it? What are its implications for schooling? *Teaching and Teacher Education, 27*(1), 3–9.

Black, A. L., & Halliwell, G. (2000). Accessing practical knowledge: How? Why? *Teaching and Teacher Education, 16*(1), 103–115.

Bråten, I., & Ferguson, L. E. (2015). Beliefs about sources of knowledge predict motivation for learning in teacher education. *Teaching and Teacher Education, 50,* 13–23.

Buitink, J. (2009). What and how do student teachers learn during school-based teacher education. *Teaching and Teacher Education, 25*(1), 118–127.

Borg, S. (2003). Teacher cognition in language teaching: A review of research on what language teachers think, know, believe, and do. *Language Teaching, 36*(2), 81–109.

Capel, S., Hayes, S., Katene, W., & Velija, P. (2011). The interaction of factors which influence secondary student physical education teachers' knowledge and development as teachers. *European Physical Education Review, 17*(2), 183–201.

Chaharbashloo, H., Gholami, K., Aliasgari, M., Talebzadeh, H., & Mousapour, N. (2020). Analytical reflection on teachers' practical knowledge: A case study of exemplary teachers in an educational reform context. *Teaching and Teacher Education, 87*, 102931.

Cobanoglu, R., Capa-Aydin, Y., & Yildirim, A. (2019). Sources of teacher beliefs about developmentally appropriate practice: a structural equation model of the role of teacher efficacy beliefs. *European Early Childhood Education Research Journal, 27*(2), 195–207.

Cohen, J. (1988). *Statistical power analysis for the behavioral science* (2nd ed). Academic Press.

Curtner-Smith, M. D., Hastie, P. A., & Kinchin, G. D. (2008). Influence of occupational socialization on beginning teachers' interpretation and delivery of sport education. *Sport, Education and Society, 13*(1), 97–117.

Dowling, F. (2011). 'Are PE teacher identities fit for postmodern schools or are they clinging to modernist notions of professionalism?'A case study of Norwegian PE teacher students' emerging professional identities. *Sport, Education and Society, 16*(2), 201–222.

van Driel, J. H., Beijaard, D., & Verloop, N. (2001). Professional development and reform in science education: The role of teachers' practical knowledge. *Journal of Research in Science Teaching, 38*(2), 137–158.

Elbaz, F. (1981). *The teacher's "practical knowledge"*: Report of a case study. *Curriculum Inquiry, 11*(1), 43–71.

Elbaz, F. (1983). *Teacher thinking. A study of practical knowledge.* Groom Helm.

Fenstermacher, G. D. (1994). The knower and the known: The nature of knowledge in research on teaching. *Review of Research in Education, 20*, 3–56.

Ferry, M., & Romar, J-E. (2020). Physical education preservice teachers' physical activity habits and perceptions of the profession and subject - development during teacher education. *Journal of Physical Education and Sport, 20*(Supplement 6), 3108–3119. Gatbonton, E. (2008). Looking beyond teachers' classroom behaviour: Novice and experienced ESL teachers' pedagogical knowledge. Language Teaching Research, 12(2), 161–182.

Gholami, K., & Husu, J. (2010). How do teachers reason about their practice? Representing the epistemic nature of teachers' practical knowledge. *Teaching and Teacher Education, 26*(8), 1520–1529.

He, Y., Lundgren, K., & Pynes, P. (2017). Impact of short-term study abroad program: Inservice teachers' development of intercultural competence and pedagogical beliefs. *Teaching and Teacher Education, 66*, 147–157.

Hemphill, M. A., R Richards, K. A., Gaudreault, K. L., & Templin, T. J. (2015). Preservice teacher perspectives of case-based learning in physical education teacher education. *European Physical Education Review, 21*(4), 432–450.

Herold, F. (2019). Shulman, or Shulman and Shulman? How communities and contexts affect the development of pre-service teachers' subject knowledge. *Teacher Development, 23*(4), 488–505.

Herold, F., & Waring, M. (2018). An investigation of pre-service teachers' learning in physical education teacher education: schools and university in partnership, *Sport, Education and Society, 23*(1), 95–107.

Horgan, K., & Gardiner-Hyland, F. (2019). Irish student teachers' beliefs about self, learning and teaching: A longitudinal study. *European Journal of Teacher Educa-*

tion, 42(2), 151–174.

Hosein, A., & Rao, N. (2017). Students' reflective essays as insights into student centered-pedagogies within the undergraduate research methods curriculum. *Teaching in Higher Education, 22*(1), 109–125

Johnston, S. (1992). Images: A way of understanding the practical knowledge of student teachers. *Teaching and Teacher Education, 8*(2), 123–136.

Kari, J. (2016). *Hyvä opettaja: luokanopettajaopiskelijat liikuntakokemustensa ja opettajuutensa tulkitsijoina [A good teacher: Class teacher students' interpretations of their exercise history and teacher identity]*. University of Jyväskylä, Studies in Sport, Physical Education and Health 233.

Khalid, M., Iqbal, T., & Hashmi, A. (2020). Content and sources of prospective teachers' personal practical theories (ppts) at University of Punjab. *Journal of Elementary Education, 29*(2), 139–150.

Korthagen, F. A. (2010). How teacher education can make a difference. *Journal of Education for Teaching, 36*(4), 407–423.

Krippendorff, K. (1989). *Content Analysis.* Oxford University Press.

Levin, B., & He, Y. (2008). Investigating the content and sources of teacher candidates' personal practical theories (PPTS). *Journal of Teacher Education, 59*(1), 55–68.

Maaranen, K., Pitkäniemi, H., Stenberg, K., & Karlsson, L. (2016). An idealistic view of teaching: teacher students' personal practical theories. *Journal of Education for Teaching, 42*(1), 80–92.

Mattheoudakis, M. (2007). Tracking changes in pre-service EFL teacher beliefs in Greece: A longitudinal study. *Teaching and Teacher Education, 23*(8), 1272–1288.

Meijer, P. C., Verloop, N., & Beijaard, D. (2002). Multi-method triangulation in a qualitative study on teachers' practical knowledge: An attempt to increase internal validity. *Quality and Quantity, 36*(2), 145–167.

Miles, M. B., & A. M. Huberman. (1994). *Qualitative data analysis: an expanded sourcebook.* 2nd ed. Thousand Oaks.

Mordal-Moen, K., & Green, K. (2014). Physical education teacher education in Norway: The perceptions of student teachers. *Sport, Education and Society, 19*(6), 806–823.

Morgan, P., & Bourke, S. (2008). Non-specialist teachers' confidence to teach PE: the nature and influence of personal school experiences in PE. *Physical Education and Sport Pedagogy, 13*(1), 1–29.

Ní Chróinín, D. N., & Coulter, M. (2012). The impact of initial teacher education on understandings of physical education: Asking the right question. *European Physical Education Review, 18*(2), 220–238.

Ní Chróinín, D., & O'Sullivan, M. (2014). From initial teacher education through induction and beyond: a longitudinal study of primary teacher beliefs. *Irish Educational Studies, 33*(4), 451–466.

Pitkäniemi, H., Karlsson, L., & Stenberg, K. (2014). The relationship between Finnish student teachers' practical theories, sources, and teacher education. *International Journal of Higher Education, 3*(4), 129–141.

Richards, K. A. R., Templin, T. J., & Graber, K. (2014). The socialization of teachers in physical education: review and recommendations for future works. *Kinesiology Review, 3*(2), 113–134.

Richardson, V. (1996). The role of attitudes and beliefs in learning to teach. In J. Sikula (ed.), *Handbook of Research on Teacher Education* (2nd ed., pp. 102−19). Macmillan.

Romar, J. E., & Ferry, M. (2020). The influence of a methods course in physical education on preservice classroom teachers' acquisition of practical knowledge. *Journal of Teaching in Physical Education, 39,* 374–383.

Romar. J-E., Åström, P., & Ferry, M. (2018). Preservice physical education teachers' practical knowledge: The content and influence of acculturation. *The Journal of Physical Education and Sport, 18*(1), 114–126.

Schepens, A., Aelterman, A., & Van Keer, H. (2007). Studying learning processes of student teachers with stimulated recall interviews through changes in interactive cognitions. *Teaching and Teacher Education, 23*(4), 457–472.

Shulman, L. S. (1987). Knowledge and teaching: Foundations for a new reform. *Harvard Educational Review, 57*(1), 1–22.

Stenberg, K., Karlsson, L., Pitkaniemi, H., & Maaranen, K. (2014). Beginning student teachers' teacher identities based on their practical theories. *European Journal of Teacher Education, 37*(2), 204–219.

Tannehill, D., van der Mars, H., & MacPhail, A. (2013). *Building effective physical education programs.* Jones & Bartlett Publishers

Tiilikainen, M., Toom, A., Lepola, J., & Husu, J. (2019). Reconstructing choice, reason and disposition in teachers' practical theories of teaching (PTs). *Teaching and Teacher Education, 79*, 124-136.

Tsangaridou, N. (2012). Educating primary teachers to teach physical education. *European Physical Education Review, 18*(3), 275–286.

Verloop, N., van Driel, J., & Meijer, P. (2001). Teacher knowledge and the knowledge base of teaching. *International Journal of Educational Research, 35*(5), 441–461.