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Professional development for physical education teachers: A participatory approach to identifying learning needs

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Predetermined professional development (PD) programmes delivered by external experts are the usual approach to enhancing the teaching of physical education (PE) in disadvantaged school contexts. This generally does not result in sustained learning and development once the PE professionals withdraw. Addressing the lack of teacher- and context-driven PD, we propose an evidence-based, collaborative, and transformative PD approach that involves teachers themselves in designing, implementing, and evaluating ongoing learning opportunities suited to their context. To enable teachers to improve their practice in a sustainable manner, we adopted a participatory action learning and action research design, using qualitative data generation tools. With this article we report on the first cycle, namely that of action and reflection, where teachers generated and analysed qualitative data to identify their learning needs. Four themes emerged, namely (1) the need to interpret and adapt the Curriculum and Assessment Policy Statement (CAPS) (2); ability to teach PE in their specific low-resource context while; (3) generating support from colleagues and management, and (4) coping with systemic issues impacting on their teaching. We discuss the implications of these needs for the continuing PD of teachers.

Keywords: Foundation Phase; participatory action learning and action research; physical education; professional development; South Africa; transformative learning

Introduction

The International Charter of Physical Education, Physical Activity and Sport states that “[e]very human being has a fundamental right to physical education, physical activity and sport without discrimination on the basis of ethnicity, gender, sexual orientation, language, religion, political or other opinion, national or social origin, property or any other basis” (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2015:2). Yet physical education (PE) is a neglected subject in many schools throughout the world, particularly those in socio-economically deprived areas (Burnett, 2021). The teaching of PE in schools is important to enable all children to benefit from the associated cognitive, physical, affective and social gains (Bailey, 2018). PE also contributes to children experiencing “well-rounded” educational opportunities (Jones & Workman, 2016; Sundaresan, Dashoush & Shangraw, 2017:36–37).

South Africa can be said to have two school systems: the private system, where the quality of the education is equal to that of most developed countries, and the public system, where children form part of dysfunctional schools that cannot provide quality education (Jansen, 2019). The coronavirus disease (COVID-19) has exposed these inequalities in education, with children living in impoverished communities being particularly negatively affected by school closures and the lack of access to food (Shepherd & Mohohlwane, 2022). In the more disadvantaged areas, PE is marginalised in the curriculum (Burnett, 2021). Despite the changes in recent years to make quality education accessible to all children and to close the gap between those who can afford to pay and those who cannot, schools in historically disadvantaged areas continue to fall short of departmental expectations (Spaull, 2015). In an attempt to improve learner performance there is a strong focus on academic subjects (Burnett, 2021) to the detriment of subjects such as art, drama, music and PE. This is a global phenomenon (Hardman, Murphy, Routen & Tones, 2014), which is complicated in South Africa by poverty-related factors that impact negatively on the education system as a whole (Omoniyi, Gamede & Uleanya, 2019). For example, in the site where this study was conducted in the Eastern Cape, schooling is beleaguered by frequent protests and school closures by dissatisfied parents demanding improved service delivery from the Department of Basic Education (Chirume, 2015). In such contexts, these systemic barriers compound the personal barriers that teachers face, such as low self-efficacy (Kahts-Kramer, Du Randt & Wood, 2022), especially in primary schools (Stroebel, Hay & Bloemhoff, 2017) where teachers are generalists rather than subject specialists.

The South African government has noted the need for change and is supportive of redrafting the international Quality Physical Education (QPE) policy guidelines proposed by McLennan and Thompson (2015) for the South African context (Goslin, 2017). Under the leadership of Burnett (2021) UNESCO commissioned a national research study on the state and status of PE in South African schools to inform policy and encourage collaboration between multiple key stakeholders. One of the key conclusions that emerged from the study was that “professional development of teachers [is] at the heart of reform” as “a well-trained teacher component is essential” (Burnett, 2021:192).

The lack of effective PD for generalist teachers is a worldwide problem (Hardman et al., 2014). A different approach to supporting such teachers is needed, especially for teachers in developing countries working in low-resource schools (Evans & Yuan, 2018). In a global survey on the PD needs of teachers, Stromquist (2018:42) found that teachers preferred to learn through “collaboration with other teachers (87%)”, “reading printed teacher resources (62%)” and “working with individual mentors [...] (45%).” Popova, Evans, Breeding and Arancibia (2021) found that of the 14 low- to middle-income countries that provided PD for teachers, the programmes that yielded better student learning gains were subject-specific, were based on experiential learning, incorporated follow-ups and mentoring, involved teachers in deciding their learning needs, and were responsive to the local school contexts. PD in South Africa for Foundation Phase teachers (who teach children aged 5 to 9 years old) does not adhere to all these guidelines, as an expert-driven approach to PD tends to be the norm. Teachers report feeling “workshopped” (Dixon, Excell & Linington, 2014:140) rather than empowered to transform their teaching. Although recent South African research has developed guidelines on how PD for PE teaching should be done in primary schools (Stroebel, Hay & Bloemhoff, 2019; Zeller & Roux, 2020), limited guidance is provided on how teachers’ voices can be incorporated in PD for PE teaching in low-resource school contexts. A dearth of research exists on teachers’ experiences of PD for PE teaching in the Eastern Cape where this study was conducted. This is a concern as this province is dubbed the poorest in South Africa, with inequality in children’s education deemed a failure if action is not taken (Equal Education, 2016).

Burnett-Louw (2020:9) suggests that “a valuable angle for future research would be to explore innovative in-service teacher training models and strategies to enhance the quality of PE teaching in South African public schools.” The need for these types of in-service training in disadvantaged schools in the Eastern Cape is a necessity, particularly since not all children are privy to quality PE and teachers do not have access to external PD opportunities (Schälle, 2020). One such study in which the focus was on sustainable PE interventions in disadvantaged schools in the Eastern Cape was by Arnaiz, Adams, Müller, Gerber, Walter, Du Randt, Steinmann, Bergman, Seelig, Van Greunen, Utzinger and Pühse (2021:3). However, this research did not include the exploration of participatory PD interventions with teachers, and instead focused on providing “tailored, ready-made teaching material toolkits.” Our study was aimed to fill this PD gap in the research by engaging primary school teachers to

identify their PE needs in their specific low-resource school contexts as a precursor to transforming their thinking about, and ultimately their teaching of PE.

To transform thinking we adopted the transformative learning theory (Mezirow, 1985) for this study. Transformative learning provides teachers with the opportunity to reflect on content, process and premises, or assumptions (Mezirow, 2003). A platform was thus provided to help teachers disrupt their assumptions about PE and assist them to unlearn “problematic frames of reference” so that they can be “more inclusive, discriminating, reflective, open and emotionally able to change” (Mezirow, 2003:58).

Through learning with others during transformative learning (Taylor & Cranton, 2012) teachers can assess their level of knowledge, change their assumptions regarding the subject, and become aware of how their own perceptions about PE may be affecting their teaching. Realising their collective ambiguity, uncertainty and doubt related to PE, and experiencing this with others, can lead to shared advocacy and the need for action and transformation (Kennedy, 2014; Mezirow, 1985). Transformative learning is underpinned by experiential learning to foster concrete experiences, reflective observation, abstract conceptualisation and active experimentation (Kolb, 2014) through democratic dialogue (Gustavsen, 2001).

In this study, participatory action learning and action research (PALAR) (Zuber-Skerritt, 2011) was employed, as the methodology enables a platform for such transformative learning to take place to empower teachers to direct their own PD (Wood & Zuber-Skerritt, 2013).

Methods

Zuber-Skerritt (2011:5) first explained PALAR as *learning from and with each other in small groups or ‘sets’ from action and concrete experience in the workplace or community situation. It involves critical reflection on this experience, as well as taking action as a result of this learning. It is a process by which groups of people address actual workplace issues or major real-life problems in complex situations and conditions.*

This collaborative platform allows teachers to co-research and co-create knowledge by working towards a common vision (Wood, 2019). It helps to democratise knowledge as teachers’ lived experience and practical knowledge can be combined with theoretical knowledge, rather than dominated by it (Wood, 2019). PALAR is grounded in principles collectively known as the 7 Cs (communication, commitment, competence, compromise, collaboration, coaching and critical self-reflection), which are operationalised by the 3 Rs (reflection, relationship, and recognition) (Wood, 2019:77). The 7 Cs and the 3 Rs encompass many of the transformative learning

theory principles propounded by Mezirow (2003). PALAR is grounded in a critical and participatory paradigm (Zuber-Skerritt, 2011) with a relational ontology, a dialectical epistemology, and a participatory methodology (Wood, 2019). The participatory nature of PALAR allows PD facilitators to be insider researchers, working *with* teachers, rather than doing research *on* them.

This collaborative learning process took place in action learning cycles at and away from school where qualitative participatory methods (Brookfield & Preskill, 2016) were used to foster maximum inclusion. Figure 1 provides an overview of the main activities of cycle 1. Cycle 1 will inform cycle 2. The collaboratively adopted question of cycle 1 was “What do we need to learn to implement PE?” and is the focus of this article.

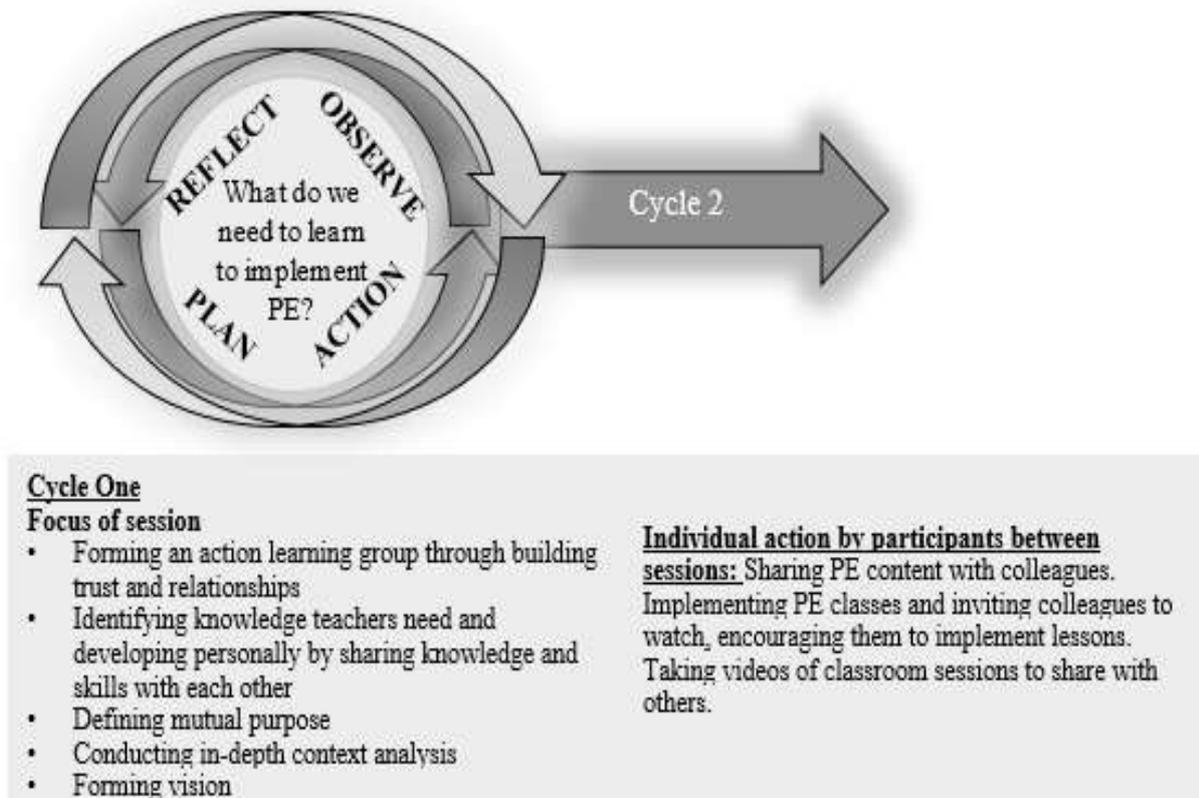


Figure 1 PALAR cycle one

Ten Foundation Phase teachers from two primary schools in a disadvantaged area of Nelson Mandela Bay volunteered to participate in the study. School 1 had access to an enclosed quad area, grass turf hockey field, sport fields with grass, and new netball courts. There were three PE and/or sport programmes at the school. Funding came from an international initiative to alleviate the high crime and gangsterism rates in the community. School 2 had no infrastructure and only a cement quad area between classrooms for PE to take place. Ad hoc PE was provided by international students. Lotto funding supported the acquisition of a Grade R playground. These schools represented the diversity of infrastructure, equipment, and programme assistance at low-resource schools in the area.

The first author had previously conducted interviews with 24 teachers from different primary schools in an earlier study (Kahts-Kramer et al., 2022) and so she invited this pool of volunteers to continue their participation. A combination of teachers from township (historically Black demarcated residential areas) and Northern Area (a suburb in Gqeberha and historically a residential area demarcated for persons of mixed race) schools were included in this sample. The township schools and most of the Northern Area schools had limited infrastructure and equipment. The demographic profile of each teacher who volunteered to participate in this study is presented in Table 1. Randomly assigned codes are used to represent teachers to ensure for their anonymity.

Table 1 Biographic profile of teachers

| Code | Grade | nL | School | Age | YT | Highers qualification |
|------|-------|-----|--------|-----|----|---|
| T4 | 1 | 33 | 2 | 59 | 30 | Bachelor of Education (B.Ed.) Honours |
| T5 | 1, 3 | 30+ | 2 | 52 | 19 | National Professional Diploma in Education |
| T6 | R | 34 | 1 | 44 | 7 | Early learning course (National Qualification Framework Level 5) |
| T7 | 3 | 44 | 1 | 50 | 30 | B.Ed. Honours |
| T8 | 1 | 35 | 2 | 59 | 13 | Diploma (3 years) |
| T9 | 2 | 38+ | 1 | 60 | 33 | Diploma (3 years); Honours in Special Needs Education |
| T12 | 1 | 38+ | 1 | 47 | 10 | B.Ed. Honours |
| T13 | 3 | 30 | 2 | 35 | 5 | B.Ed. Honours |
| T16 | 1 | 34 | 1 | 52 | 30 | Diploma (3 years); Advanced Certificate in Education (Senior and Intermediate phases) |
| T19 | 3 | 38 | 2 | 35 | 11 | B.Ed. Honours |

Note. nL (number of learners); YT (Years teaching).

To collaboratively generate, document and analyse qualitative data with the teachers, we video-recorded all the discussion-based sessions for subsequent transcription and analysis. The sessions were grounded in democratic dialogue (Gustavsen, 2001) and a participatory methodology (Brookfield & Preskill, 2016). The teachers' voices and choices guided our action learning. The first author and the teachers met at a neutral venue away from the schools. The teachers engaged in four sessions over a 7-month period, following iterative cycles of planning, action, observation, and reflection regarding their teaching of PE. The sessions lasted 8 hours on average.

To foster collaborative data analysis, we used a two-pronged approach. In the action learning group, the teachers first analysed the data on a practical level, using participatory strategies such as the hatful of dialogues, newsprint dialogue and the circle of voices (Brookfield & Preskill, 2016). We then analysed the data on a theoretical level, using Braun and Clarke's (Braun, Clarke, Hayfield, Moller & Tischner, 2019) six-step thematic analysis process.

To establish the trustworthiness of the data, the first author ensured outcome, process, democratic, catalytic and dialogic validity (Herr & Anderson, 2014). Due to the collaborative nature of the data analysis process, themes, categories and subcategories were shared with the teachers, enhancing the truth value of our interactions (Guba, 1981). To improve my (first author) reflective learning (Bager-Charleson, 2014) and help me adhere to the values of PALAR (Wood, 2019), I kept a reflective journal.

The study was granted ethics approval by the University in question (ethical clearance number H14-HEA-HMS-015), which indicates that it met stringent ethical requirements. Since we were doing a participatory form of action research, we negotiated the processes that the teachers wanted to follow and the outcomes that they wanted to reach (Wood, 2019).

Discussion of Findings

Four themes emerged, namely that teachers need to learn how to (1) interpret and adapt the CAPS, to be able to (2) teach PE in their specific low-resource context, while (3) generating support from colleagues and management, and (4) coping with systemic issues impacting their teaching.

Theme 1: Interpret and Adapt the Curriculum and Assessment Policy Statement

This theme captured generalist teachers' need for CAPS-related pedagogical content knowledge (PCK)ⁱ that is specifically focused on teachers' knowledge of PE as subject and its assessment. It also refers to how teachers have to adapt their time management to meet CAPS outcomes.

The teachers requested actual examples and clarification of fundamental movement skills (FMS) concepts (such as galloping) in CAPS, as each teacher understood these concepts differently. They thought that having content knowledge would improve their ability to adapt their lesson plans to a low-resource context:

For me, the concepts of the actual things. Because when you explained it to us, we could see it was not only what we thought it was, but it was also that [something else]. For example, gallop for me is difficult. The steps on how to get to it. Because now most of us rely on demonstration. We don't have a written thing to say you must do this and then that [and] the lesson plans and so forth, as that will help us to get structure into our lessons. (T7)

The need for this type of PCK (PE concept and application knowledge) is not surprising. CAPS only provides generalist teachers with a list of activities without any guidance on pedagogical strategies to use to teach fundamental movement and perceptual-motor skills through play, sport and indigenous games (Department of Basic Education [DBE], Republic of South Africa [RSA], 2011).

Generalist teachers need content knowledge to understand the subject of PE (Ward, P & Ayzazo, 2016). Creating their own written examples in the form of a lesson plan is therefore expected.

According to Iserbyt, Ward and Li (2017), instructional tasks (e.g. tasks to teach motor skills) and representation (how the task is presented, or how it is verbally and visually displayed) can be referred to as specialised content knowledge, which the participating teachers did not have. Teachers need to learn how to design lesson plans and learn different teaching strategies and styles to teach PE.

The teachers wanted knowledge of how to assess FMS in CAPS: *“I’d like advice on how to create an assessment sheet for each of these skills. A rubric. But for each level of skill. What do I give that child if they master it?”* (T9). Assessing children’s movement abilities can be difficult at times – even for speciallists (Ward, B, Thornton, Lay, Chen & Rosenberg, 2020). Teachers, therefore, need help with understanding and developing assessment sheets. Knowledge of assessment forms part of teachers’ PCK (You, 2011).

Adapting the curriculum due to time management difficulties was also identified as a learning need: *“I think what demotivates me, or what causes me not to do the full 2 hours, is the pressure of completing your curriculum... your prescribed curriculum in the time frame that is allocated to us”* (T19). Teachers are required to teach four subjects in the Foundation Phase, namely life skills, home language, first additional language and mathematics (Dixon, Janks, Botha, Earle, Poo, Oldacre, Pather & Schneider, 2018). The subject of life skills is divided into four study areas, namely PE, creative arts, beginning knowledge, and personal and social well-being (DBE, RSA, 2011).

Theme 2: The Need to Learn how to Teach PE in their Specific Low-resource Context

This theme encompassed teachers’ need to apply content knowledge to the real-world context, and to explore whether it worked. This form of PCK is known as knowledge of the instructional environment (You, 2011) and it comprises knowledge related to class organisation and management, discipline and behaviour management techniques, motivating pupils to participate, conveying instructions successfully and providing appropriate behaviour and corrective and skills feedback (Parrott, 2016). It also includes knowledge of how learners learn (You, 2011). The teachers wanted to know how to integrate PE into their academic schedules, considering the perceived lack of available equipment:

There is no use we sit with all this information and we don’t apply it and see if it is workable. We are just adding on and on to our group and knowledge. But we are not implementing and seeing if it makes a difference or if there are challenges in the concepts on paper. So, for me, our aim should be to focus on a specific skill that we have learnt. We have the wheel [movement analysis framework].

We have [video] clips on all the FMS. We need to apply it. (T7)

The opportunity to apply what teachers have learnt in their low-resource school context is often missing in Foundation Phase teacher training (Zinn, Geduld, Delpont & Jordaan, 2014).

The teachers wanted to engage in the physical activities themselves, as they believed that they needed to improve their own fitness and their familiarity with different movements: *“My next session I’d like to be more fit for all these things [PE activities]. Because I am not fit. How can a PE teacher not be fit?”* (T12). The teachers were thus becoming mindful of their physical self-concept (an important part of forming a professional identity as a PE teacher (Pérez-Pueyo, Hortigüela-Alcalá, Hernando-Garijo & Granero-Gallegos, 2020), which, if improved, could increase the likelihood that they will teach PE.

At first, to apply practically what the teachers had learnt, they wanted me to *“visit our schools”* (T5), so that I could *“see what we do [and] help us further and give us advice”*, while they *“take [...] children out and apply these concepts, [because] you are learning whilst you are out there. You gain confidence, and they [the learners] gain confidence”* (T4). How to prevent *“lesson [that] will go haywire”* (T19) was another learning outcome that the teachers voiced. Our concern with the requests to visit the teachers’ schools was that if we did this, it would reinforce the dominant culture of the “expert” helping the teacher (Stroebel et al., 2019:9). Instead, we encouraged the teachers to explore how they could learn collaboratively.

In their specific school context, the teachers felt that they needed to learn how to teach children that *“don’t listen”* (T6) and children that *“don’t want to share”* (T4). They also believed that they needed to support learners’ basic development in PE, as learners are *“neglected by their parents”* (T16). In low-resource schools, teachers have to cater for learners who may have been exposed to infectious diseases, psychological stressors and malnutrition (Jensen, Berens & Nelson, 2017) and/or may have been neglected by their parents. Through the transformative interactions with colleagues in PD, teachers could share a different point of view regarding children’s development: *“Then there is the difficult child, but we have learnt here that there are ways we can work with that child. You don’t see it that there is a child with a problem anymore”* (T12).

The teachers believed that applying what they had learnt would also assist them in solving the problem of the perceived lack of equipment: *“That equipment and mats. I don’t think it is now a barrier. It is something you should work on”* (T7). Low-resource schools tend to struggle with access to PE infrastructure and equipment (Burnett, 2021).

Collaborative learning gave the teachers the opportunity to not only identify their problems, but also to disrupt their assumptions that they could not do anything to bring about change. This kind of process reflection where teachers identify what affects their PE teaching and premise reflection where teachers reflect on how their assumptions affect their actions (Kitchenham, 2008) are important in the PD journey. Dependency-producing assumptions, or distorted meaning schemes and perspectives (Mezirow, 1985) were unpacked and debated in the collaborative learning platform.

Theme 3: The Need to Learn how to Generate Support from Colleagues and Management

The teachers were very aware of how the social context affected their teaching of PE, and their need to think carefully about how they would gain support from key stakeholders, such as colleagues and management. They realised that for sustainability and practical application of learning, “*we need to go share with the rest of the group*” (T9) and “*to invite other Foundation Phase teachers*” (T8). They also shared that “[t]his needs to grow, because we need to share what we’ve learnt, because we not always going to be there to drive programme at the school. We need to find new champions” (T7).

The teachers believed that gaining support from colleagues and leadership was important:

My aim would be to invite my other Grade 1 colleagues, and then to the rest of the Foundation Phase, to come and see my lesson. And then to involve management to see what we are doing. Then we can take up problems related to not doing what we want to do. At a school level in the group. (T4)

This approach to gaining support from colleagues and changing the context of teaching is in line with a bottom-up approach to change management (Skedsmo & Huber, 2019), that is, starting with colleagues, then management, and then the broader community. The reason for the need for support from management was that the teachers indicated that some of their colleagues feared management: “*People are intimidated somewhat by management. So, what happens is that teachers fear, and [they] stay away. They’re not being themselves*” (T19). Having “*a good relationship*” (T19) with management was deemed essential for this perception to change.

Theme 4: The Need to Learn how to Cope with Systemic Issues Impacting on their Teaching

The teachers’ experiences of their day-to-day teaching seemed to stem, in part, from budget decisions, which resulted in (1) funding being allocated to other priority areas and/or (2) learners who are not at the required level of readiness for a grade being accepted, or learners who are too

young being accepted for Grade R. For example, in Section 20 schools (which is a primary or high school in South Africa where finances are managed by the provincial education department, versus self-managed), the budget requires careful consideration. Government mandates where the funds are allocated, which may not align with the specific PE needs:

For a Section 20 school you get told what you can spend your money on. What we found [was] that not every year you use your budget the same. So, it won’t be used for PE every year. It goes for different types of needs. It depends on the learning area needs of the child. (T7)

Low-resource schools often struggle to get enough funding to support all their needs (Equal Education, 2016) and PE is not considered a priority.

Another problem was that learners were accepted into Grade R at a too young age or were progressed to the next grade before they were ready. This no-repeat policy for Foundation Phase learners (Parker, 2019) placed a burden on teachers’ workloads, and it threatened learner success: “*I have 15 in my class. I think 10 I got, 10 that must still turn 6*” (T6). This implies a developmental age gap of nearly a year between learners. The impact of this situation on PE teaching was that it increased teachers’ stress and workload, as they had to reteach academic basics, leaving little time for PE teaching in an already highly administrative-based curriculum (Du Plessis & Marais, 2015).

The policy changes needed to address the issue of funding and how children are progressed from one grade to the next. These issues were difficult for the teachers to manage, as the issues were not within the scope of what the teachers could directly change, yet they indirectly affected their teaching. The transformative learning space created provided teachers with an opportunity to share their concerns, but also to realise that certain barriers to PE were within their control, and others were not. Changing the focus to what can be changed and what can be influenced was deemed important: “*We [have] all the negativity and excuses to propose, but did not realise that these [are] only excuses*” (T13). The transformative learning platform helped teachers see that the challenges they perceive regarding PE were instead “*changed into possibilities*” (T7). This change in thinking formed part of the teachers’ premise reflection in their transformative learning (Kitchenham, 2008) and it helped the teachers gain awareness of how their own perceptions or assumptions affected their actions.

Disruptions during the day also affected PE teaching: “*Disruptions in the class, I counted one day, it’s 15 times the disruptions for the day. And in our cases, when we have to close down school, time is lost*” (T4). School closures often take place in these communities (Chirume, 2015).

Conclusion

The transformative learning platform helped the teachers to identify what they needed to learn and to do to change their perceptions on how to turn barriers into possibilities. The teachers were able to critically assess their knowledge related to PE and to discuss their shared areas of concern. This kind of content reflection, namely reflecting on what has been done in PE and what is needed to teach PE, forms part of the steps in transformative learning (Kitchenham, 2008) as it provides teachers with a platform to critically assess their own needs and their feelings of ambiguity, uncertainty, and doubt regarding what they know about PE. The teachers also engaged in process reflection and premise reflection, which enabled them to reflect on their PE teaching, to identify factors affecting their PE teaching, and to explore how their perceptions or assumptions influenced their actions (Kitchenham, 2008).

Teachers experienced the first steps of transformative learning. The teachers disrupted their meaning schemes and perspectives regarding PE. Not only did they collaboratively identify and acknowledge their needs but they also moved towards putting actions in place. As depicted in Figure 1, initially the actions that teachers engaged in were individually based. However, although these individual explorations led teachers to learn about their PE needs, their actions also made them realise that in their next action learning cycle they needed to continue building their confidence to teach PE in their specific school contexts and with others. By engaging in action learning cycles, the teachers could work towards building self-confidence and reintegrating PE into their daily teaching lives.

These findings cannot be generalised, however the evidence provided illustrates the value of including a collaborative and transformative PD approach. Future studies can explore this PD approach within different contexts and diverse groups of teachers to validate findings. Furthermore, a mixed method approach can be included to substantiate qualitative findings. The process of engaging in democratic dialogue (Gustavsen, 2001) and using participatory methods (Brookfield & Preskill, 2016) can help teachers to transform their thinking about how they teach PE. The implications for PD include the adoption of transformative learning principles and the PALAR methodology, not only in the field of PE, but in other disciplines as well.

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Authors' Contributions

SKK did the data collection; SKK and LW did the data analysis. The authors contributed equally to the conceptualisation and creation of the article. Both authors reviewed the final manuscript.

Notes

- i. According to Karaman (2012:56), PCK is "one of the most critical elements of improving teacher quality." PCK refers to "knowing what to teach, how to teach, and how learners learn in a variety of conditions", and it also refers to "the ability to discern learner knowledge, learning preferences, and to provide accurate assessment with appropriate remediation of task representations" (Parrott, 2016:19).
- ii. This study is based on the doctoral theses of Samantha Kahts-Kramer, the first author.
- iii. Published under a Creative Commons Attribution Licence.
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