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Studying teacher professional development in China: How teachers in an educational experiment bring play practices into their programs

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Abstract

System wide professional development must embrace ongoing and sustainable processes, such as critical reflection, being within a community of practice, and the co-creation of new practices within and across early childhood systems. However, most studies into sustainable system change through professional development are not oriented to the Asian region. This paper draws upon the wholeness approach to investigate how Chinese early childhood teachers' professional development can be meaningfully designed through an educational experiment to support sustained learning. By the adaptation of a Conceptual PlayWorld model, teachers and researchers studied how to bring new play practices into kindergarten programs. It was found that an educational experiment created a new kind of social situation for teachers, amplified reflective practice, and in so doing, acts as an important source of professional development for sustained practice change.

Keywords

Curriculum reform; cultural-historical; play; professional development; professional learning

Introduction

Over the past twenty years early childhood education has become a key area for “quality improvement” (Isik-Ercan and Perkins 2017, 351) and Early Childhood (EC) teachers have been seen as the primary agents (Chen, et al., 2017) for increasing child outcomes (Egert et al. 2018). Curriculum reform has also emerged as a major catalyst for change, but this has played out differently across the globe (Fleer and Li in press). In the European and North American countries, the formalisation of curriculum has emerged to bring greater academic outcomes into early childhood education, while in countries within the Asian region, Governments have mandated for more playful curricula (Fleer and van Oers 2018). But even within this diversity, curriculum reform on its own is not enough.

A large number of studies have shown that curriculum reform needs professional development (PD) for system change (Chen, et al. 2017; Jensen and Iannone 2018). Using a cross-analysis conducted in ten European countries, Jensen and Iannone (2018) revealed that in order to achieve innovation in EC settings, continuous PD is needed. Consistent with international research into the PD of EC teachers, Jensen and Iannone's (2018) research has shown that it is not just the support of teachers' professional knowledge and skills, but system wide PD must embrace ongoing and sustainable processes, such as critical reflection (Hadley, Waniganayake and Shepherd 2015), being within a community of practice (Giamellaro and Siegel 2018), and the co-creation of new practices within and across early childhood systems (Thornton and Cherrington 2019; Wingrave and McMahon 2016). But most studies into sustainable system change through PD are not oriented to the Asian region.

What we know is that the Chinese government, for example, has made an effort to lift the qualification of EC care and education services through PD (Hu, Zhou and Li 2014). We also know that improvements in EC teachers' competence and quality of the teaching is now on the research agenda for China. But the current research into EC teachers' PD does not yet appear to include the study of reflective practice (Hadley, Waniganayake and Shepherd 2015), or teachers' personal motives (Nuttall, et al. 2015), or sense of their own learning (Wingrave and McMahon 2016). Therefore, what appears to be missing from this literature is understanding how EC teachers' PD can be meaningfully designed to support sustained learning in relation to the reforms seen in China, so that teachers can bring new play practices into the curriculum.

The purpose of this paper is to present the results of an educational experiment of teacher PD during the process of curriculum reform. This study recognises that PD that is personally meaningful to EC teachers values "the complex teaching and learning environments" in which teachers work (Opfer and Pedder 2011, 377). Consequently, the focus of this paper is on the PD of the teachers over time, as they meet new institutional demands, engage with the societal conditions associated with the curriculum reform, and bring play practices into their programs.

To achieve the goals of this paper, we begin with a methodological discussion of our educational experiment and the concepts used to analyse and theorise the results. This is followed by details of the study design and the findings. We conclude the paper with a discussion of the unique societal, institutional and personal conditions for effective PD for EC teachers in a context of curriculum reform and sustained system change.

An educational experiment: A cultural-historical conceptual model of teacher PD

In order to study how EC teachers, engage with the curriculum reforms in China, we designed a study that brought researchers and teachers together to focus on the central problem of how to bring play practices into their programs. We drew upon Hedegaard's (2008) educational experiment as the key methodology of our teacher PD. An educational experiment is a collaboration between researchers and teachers in relation to a theoretical problem, and not a problem of practice. In our educational experiment, this meant focusing on the theoretical problem of how play could be the core dimension of the curriculum, as directed by Chinese Government (Pan, et al. 2018).

As a transformative approach, an educational experiment refers to an intervention that is planned as the new teaching practice, and it is based on a theoretical system that creates the conditions for learning and development around that practice - such as play within a content driven formal curriculum approach. The theoretical problem is not simply a teaching agenda (Hedegaard 2008), but rather it is ‘intervention research where everyday situations are systematically intervened, combining an educational perspective with a research perspective’ (Lindqvist 1995, 67).

An educational experiment requires teachers and researchers to collaborate over the course of the experimental period so that the theoretically driven interventions are developed over time. Hu et al., (2014) has reported that Chinese EC teachers need professional feedback related to their strengths and weaknesses while implementing evidence-based recommended practices. The research collaboration between teachers and researchers in the educational experiment encourages this kind of professional practice and enhances teachers’ PD in a sustainable way. Furthermore, Hu et al. (2014, 73).’s research suggests that PD needs to “target a specific quality concept ... and provide lots of demonstrations with follow-up practice opportunities for teachers until they have gained a deeper understanding about what constitutes that quality concept, what it looks like in an authentic setting”. Therefore, working on a theoretical problem in partnership is not too removed from the practice tradition of working with others on a practice problem of deepening concepts in authentic settings. What is new in our educational experiment, is that the collaboration between researchers and teachers was the vehicle for teachers PD.

An educational experiment as a methodology was conceptualised within a cultural-historical tradition. The central cultural-historical concepts that are important for our educational experiment are derived from Hedegaard (2019) wholeness approach. In a wholeness approach the societal values (curriculum reform), institutional practices (need for play in teaching program), and the personal motives of the teachers (how to bring play into a learning program) are studied relationally (See Table 2). Teachers enter into the activity settings of the new practices. It is through the educational experiment, with its focus on the theoretical problem of how to bring play into learning, that teachers and researchers as collaborators study the new demands and change in teacher motives in authentic settings.

PlayWorlds as an intervention

Fleer’s Conceptual PlayWorld approach (2020) as a pedagogical intervention was used in our educational experiment to support teachers to bring play into their practices. The approach begins with a storybook with different characters, collectively selected by children, teachers and researchers. Children and teachers build emotional connections with the characters before they enter the playworld where they play as a character from the storybook. Within the imaginary situation, teachers act as a co-player and dramatise the emotionally charged conceptual problem, which can be solved by using a particular concept. Children and teachers need to collectively solve the problem that arises within the shared imaginary situation. Within that problem-solving process, children’s play is enriched and their learning of concepts is motivated.

This approach has already been introduced to Chinese teachers and implemented in China in 2018 (Fleer and Li in press). But that research did not study how an educational experiment could create motivating conditions for curriculum reform and thereby act as a source of PD for

EC teachers. In this paper we discuss our investigation of teachers' PD while they collaboratively solve the theoretical problem of bringing play into a formal program. As a new teaching approach we were interested in studying teachers' personal sense and motive change, as part of the dynamics of the changing institutional practices, in the context of societal values. Therefore, the intervention of a PlayWorld for Chinese preschools was the foundation of the theoretical problem of how to bring play into formal programs in kindergarten settings. This problem drove the collaboration of teachers and the researchers in the educational experiment.

Overview of research context of an educational experiment

The educational experiment took place within one public kindergarten in Guangzhou. For the purpose of this paper, one focus teacher's (Teacher Liu) PD experience was selected to illustrate the results. Teacher Liu completed a Diploma in EC from a Technical College in 2005, and had 14 years experience in EC when the project began. 30 children aged 3-4 years (mean 3.8) from her class joined the educational experiment. We followed her PD experience for two years.

Ethical approval was received and informed consent was obtained from families, teachers, and principles of the kindergarten for the use of collected data for the purpose of research and education.

Data generation procedure

Data were collected over two semesters. In each semester four weeks of video recordings were made using two video cameras. One camera was focused on the teachers' interaction and the other one filmed the whole playworld activity settings. Pre and post stimulated recall interviews and three snapshots of her playworld are presented in this paper as exemplars of her PD experience. The four phases of data generation procedure is summarised in Table 1.

Table 1: Data generation procedure

Research procedure	Research period	Research purpose
Baseline: Video observation at the kindergartens by researchers	6 hours x 2 cameras=12 hrs	Examining the interaction between teacher and children in play
Filmed stimulated recall interview with the focus teachers	1 hour	A selected video clip is used as a prompt to interview the teachers and get to know their views on children's play and learning

First Training workshop focusing on the play, scientific concepts and Conceptual PlayWorld approach on site	2 hours	Researchers and teachers explore the conceptual playworld and how it can be implemented in the kindergarten
The first playworld implementation plus ongoing reflection after each filming.	Four weeks implementation 1.5 hours per week 4 weeks x 1.5 hrs x 2 cameras=12 hours	Collaborative approach during implementation of educational practices for practice change through the educational experiment. Ongoing discussions by WeChat between researchers and teachers
Second Training workshop on playworld implementation and focus group interview by zoom	2 hours	Teachers' reflection on their PD and how they will move forward.
The second playworld implementation plus ongoing reflection after each filming	Four weeks implementation 1.5 hours per week 4 weeks x 1.5 hrs x 2 cameras=12 hours	Same as first playworld
The follow-up interview by WeChat	1 hours	Teachers' reflection on their PD and how they will move forward
Total	42 hours	

Analytical concepts

The analytical constructs are summarised in Table 2. We used these, but in relation to how teacher PD dynamically changes (Column 3) as a result of the new processes that shape and are shaped by the planned intervention (Column 2), in the context of the structures - societal perspectives, institutional practices, activity settings, and personal perspective.

Table 2. Hedegaard's (2019, 19) planes of analysis

Structure	Process	Dynamic
Society	Tradition	Societal conditions and demands
Institution (Home, kindergarten)	Practice	Value motive objectives demands
Activity setting	Social situation	Motivation/engagement/demands
Person	Activity	Motives, intentions and demands

Societal: In the context of the theoretical problem of how to bring play into teacher practices we have to begin by understanding the societal values in China. The societal plane of analysis illustrates the societal demands made on the institutional practices including policies and regulations, and traditional cultural values etc such as the *Guidelines for Early Childhood Education (Trial Version)* in China (MOE, 2001). This also makes demands on the play-based learning program in EC settings. Furthermore, the diversity of cultural traditions also provide the societal conditions for the institutional practices.

Institutional: The institutional plane of analysis examines the childcare, kindergarten, home or other community practices that create demands on teachers while participating in the practice traditions of the different institutions. It refers to the examination of the play-based learning programs applied in China. How the play-based learning program can be designed for the teachers to meet the societal demands and cultural traditions might be varied. That is, the demands made on EC teachers might be differentiated. Therefore, the PD as part of institutional practices needs to be culturally sensitive and designed to meet EC teachers' needs in China.

Activity setting: The activity setting needs to be considered as it shows how the teachers and children meet the new demands of the curriculum reform and contribute to the social situation while they engage in the institutional practices and cope with conflicts between formal lessons and play practices. In relation to teachers' PD, we need to consider how the teachers meet the new demands and how it contributes to their development as part of the educational experiment. In our research, this means paying attention to the PD activities the teachers engage in and how their motives change in relation to the particular practices of the planned intervention of the educational experiment.

Personal: Hedegaard (2019) argues that development means a qualitative change in a person's motives and a change in their competence as they engage in activities within their institutional practices. While considering EC teachers PD, we expect a qualitative change in their motives and competence as they participate in the educational experiment. Taken together, an educational experiment values the societal demands and cultural traditions, institutional aims of teaching, and teachers' personal motives and learning in the activity setting.

Data presentation

We begin this section by showcasing how Teacher Liu participated in an educational experiment of how to introduce a playworld into a formal teaching context. We identify 3 pedagogical shifts in her practices to support PD.

Personally meaningful problem: How to shift from traditional pedagogical approaches

Snapshot 1: Alice Playworld

The first playworld Teacher Liu developed, started with a storybook of *Alice's Adventure in Wonderland*. The story was selected after the children watched a puppet theatre show of *Alice's Adventure in Wonderland*. A conversation whilst watching Alice's Adventure, set up a problem: "Alice changed to be bigger or smaller after eating the cookies, can she change to her original size?". After listening to the children, Teacher Liu planned *The adventures of Alice in Wonderland* playworld. She, using Alice's voice, told the story and helped the children become familiar with the characters. As Alice changed to be bigger or smaller after eating the cookies, she said she would like to go home and wanted to change back to her original size. Teacher Liu, as Alice, dramatised a mathematical problem, "I need to change to my original size, then I can go home. How can I know my height?" All the children wanted to help find Alice's height. Children were invited to be characters from the story and to role-play solutions. But the children chose to be Elsa, Ambulance Team, Superhero etc. and agreed to use a particular sound as a spell "Ma-Li-Ma-Li Hong" to enter into the Alice playworld. Within the playworld activity setting, Teacher Liu encouraged the children to use different materials tools to measure height, such as the mega blocks and paper bricks (see figure 1-2).



Figure 1: Measuring the height.

However, Teacher Liu experienced a challenge. She was worried that she could not meet her planned mathematical goals.

I feel children were very excited to play with teachers, and motivated to engage with the problem solving while I followed the children's desires, however, I spent most of time in regulating children's behaviors such as how to use the materials and play with other players, as they were so excited. Also, the problem-solving process was hardly promoted.

In the next period of the playworld educational experiment, the children were invited to play character roles aligned more closely with the storybook, such as white rabbits.

In the educational experiment that constituted Teacher Liu's PD experience, she met a conflict which drove her to change her pedagogical approach. She identified aim of being in character as Alice to motivate children to solve a mathematical problem, resulted in needing to manage the children's play behaviors. The problem was that the children were focused on their own role in play without considering the collective problem of the educational goal. In the collaborative analysis with the research team, Teacher Liu realised that the child-initiated play also needs teacher's guidance and planning. Teacher Liu commented "*I play with children now and look at the thing through their eyes. Teachers' guidance is very important. In the playworld, children's initiation and teachers' facilitation should be co-related and reciprocal*".



Fig. 2. Solving the mathematical problem

The collective pedagogical problem of bringing play and mathematical learning together in the educational experiment appeared to be personally meaningful to the teachers and this created unique conditions for shifting practices and supporting PD.

Motivating children's exploring and problem-solving

The second challenge Teacher Liu experienced was related to positioning children as active learners. When asking about her PD, Teacher Liu commented that *I look at children in a different way now. Previously I told children answers when they raised some questions. And now I prefer to encourage children to explore with me together.* Snapshot 2 captures this shifting motive from teacher driven to creating room for the child's initiatives in mathematical problem solving.

Snapshot 2: Building blocks

When the researchers first visited Teacher Liu's class for baseline data collection, children collectively built a bridge. As one of the bridges collapsed due to the continuing rain within the last few days in Guangzhou, the teacher suggested children build a bridge together to help people cross the river. After that, the children built the bridge and tested if the cars and trucks could go through smoothly. A few issues were raised including: *Why the car didn't go through and easily fall off* (See Fig. 3)? *Why is the block not stable* ? (See Fig. 4)



Fig.3. The truck was blocked.



Fig.4. The block is not stable.

Teacher Liu encouraged the children to think and find a solution. Unfortunately, the children could not fix the problem. Then, Teacher Liu talked to the researcher [the first author] on site and discussed this moment to see what it is the best way to support children. The researcher asked, “*Usually what do you do when this kind of situation occurs?*”. Teacher Liu answered, “*Usually we directly tell children the correct solution*”. Then, the researcher and Teacher Liu collaboratively reflected on this moment and discussed an alternative way to encourage children to test different materials and see what would happen and explore with children why it is not stable etc.

The challenge of giving space for children to problem solve and find solutions, became an important component of the educational experiment. For instance, after the first playworld, Teacher Liu identified that,

Teachers and children should become a collective learning community...Teachers could show weakness to children and play with children...In conceptual playworld, I always listen to children's ideas, I need to control my mouth to look, not to talk too much, or I observe how they explore and provide more opportunities for children's exploration...we should trust children's problem-solving competence.

Snapshot 2 presents an example of conceptual and pedagogical contradiction that Teacher Liu experienced. She set up a goal to teach children the engineering concept by building the bridge for transportation. She was wondering if she needed to directly tell children about this relevant concept when the problem was raised or if she should provide more opportunities to explore with children. The societal and institutional demands made on teachers in China is to teach children

concepts in play (MOE, 2010). However, the ways to teach these concepts are not explained. In Teacher Liu's case, according to her daily practices, she was used to directly telling and explaining the concept to the children.

*Previously, I always set up a teaching plan with a specific goal according to my own understanding of children's learning, and while implementing the plan, I took most time to focus on meeting the pre-designed goal without realising children's engagement. Now, **I am quite confident to listen to children's interests and what they like to explore in the play.** I am quite surprised that I pay more attention to children's intentions in the playworld. By doing so, I found that children are more motivated to solve the scientific problem in the playworld.*

As the result of our educational experiment, Teacher Liu was open to solving the pedagogical problems she faced. As argued by Isik-Ercan and Perkins (2017), reflective practice can be considered as an engine for teachers to make meaning of their pedagogical practice and strive for their higher level of quality in their practices.

Increasing the competences and confidence in teaching STEM concepts

In line with the general literature on teacher confidence and competence in STEM, Teacher Liu experienced some challenges as shown in Snapshot 3.

Snapshot 3: Dramatising the conceptual problem

*... When proposing the problem, I need to use a concept such as symmetry to solve the dramatised problem, Am I right? For instance, when children make the airplane... **my aim is to ask them to explore the concept of the symmetry pattern... Do you think it is an appropriate way to dramatise the problem?***

In the educational experiment the symmetry pattern as a mathematical concept should be considered in service of solving the problem by flying to the secret garden. Teacher Liu realised the purpose of concepts was how to create the dramatic conditions to motivate children to explore the concepts instead of directly and explicitly teaching symmetry. In this snapshot, the educational experiment encouraged Teacher Liu to reflect and inquire on her own playworld practices for teaching STEM.

*I found myself **having more confidence in teaching STEM concepts** now after the implementation of playworld... When children asked me some questions I don't know the answer, I will tell them, 'I don't know, can you think about a better solution?' ...When new problem is raised, I will search the relevant referencing books. This also helps myself develop professional knowledge continually...As long as we try to implement it [playworld], the children will get more benefits. Although **at the beginning I feel so challenged and I was not good at teaching scientific concepts**... Now I feel **more confident** to do this [Playworld]... also I feel myself **I developed my teaching skills**. At least I **don't feel scared** to plan and implement the STEM related play activities now.*

Teacher Liu critically reflected on her change in teaching practices. She realised that her own confidence had increased. Within the educational experiment, the ongoing collaborative reflection and discussion between Teacher Liu and researchers offered the opportunities for her

to extend her own conceptual thinking and generalise the theoretical problem for practice change.

Teacher Liu's comments exemplified the transformative PD experience that occurred. The educational experiment as PD offered an opportunity for timely ongoing critical reflections and inquiries. Over the course of the educational experiment, her own perceptions changed gradually from, "*I wasn't good at teaching scientific concepts*" to "*I have more confidence in teaching STEM concepts now...I developed my teaching skill*".

Teacher Liu also found,

The ongoing and on-site support from the research team is more effective to support my professional learning...It is quite different to listening to a lecture. We might be impressed by one or two ideas from the lecture. But in practices, we lack theoretical guidance. By applying the theory to practice, I think that is the best way promoting our PD.

Discussion

Through an in-depth analysis of Teacher Liu's PD experience, we identified three interrelated experiences which were - Personally meaningful problem: How to shift from traditional pedagogical approaches; Motivating children's exploration and problem-solving; Increasing the competences and confidence in teaching STEM concepts. But we also identified 3 requirements for PD to support practice change:

1. Societal conditions create new curriculum realities
2. Collective reflection on practice acts as the source of teacher development
3. A theoretical problem for practice change is personally meaningful

They are discussed in turn.

Societal conditions create new curriculum realities

In China, the role of play in early childhood education (ECE) in China has been markedly increased. Part of the reason is the early childhood policy reform. In 2001 the *guidelines for Kindergarten Education Practices-Trial Version* was issued by the Ministry of Education (2001) promoted the curriculum reform. Some researchers have explained that in China, kindergarten has adapted western educational ideas valuing play-based teaching and learning, thus one of the reform goals is to shift the teacher-centred group instruction to child-centred pedagogical play practices (Lin, Li and Yang 2019; Pan, et al. 2018). However, this imported educational theories and models are incompatible with Chinese traditions, which highly values the collective spiritual and self-discipline (Lin, Li and Yang 2019; Fler and Li 2020). In our study, we identified that an educational experiment appears to be a culturally sensitive way to organise PD for practice change to meet these societal demands and cultural traditions.

The educational experiment emphasises the collectiveness through the shared imaginary situation that children and teachers created in play to support children's problem-solving process and help children understand the meaning of the academic concepts. This not only meets the government demands of the EC educational reform on play-based practices, but also the traditional values in

collectivism (Fleer and Li in press). This also confirms that PD should promise to create “contexts of need” as it encourages the teachers to reflect their own learning and co-create the situated meaningful knowledge (Moran, et al. 2016). In Teacher Liu’s case, as her implementation of playworld activities met the cultural traditions, her personal motives and competences in teaching STEM concepts were realised.

Collective reflection on practice acts as a source of teacher development

Previous research of teachers PD in early childhood education focus on professional in-service training, the follow-up consultations, or critical reflections (Fonsen and Ukkonen-Mikkola 2019; Jensen and Iannone 2018). Whereas this study found that the PD training needs the collaboration and collective reflections between teachers and researchers through shared understanding of the intervention to stimulate teachers’ professional inquiries. The application of theory into practices is needed as commented by Teacher Liu. The power of collaboration through different ways (e.g. zoom, WeChat or on site) provides the collective social situation for the teachers to address the conflicts or concerns in practices, thus have a deeper understanding of the intervention, and make their own qualitative changes of teaching.

Vygotsky (1987) explains how and why there is a qualitative change in the psychological structure and states “The social situation of development represents the initial moment for all dynamic changes that occur in development during the given period” (p. 198). In the social situation of development, the contradiction between the child’s needs, desires and capabilities, and the demands and possibilities of the environment as a moving force drives the development (Chaiklin 2003). In considering Teacher Liu’s social situation created by the educational experiment, three key conflicts or challenges she has experienced become a driving force for her PD. For instance, in the first snapshot, Alice’s playworld, as required by the educational experiment, Teacher Liu and children together played their character roles to join the collective imagination to explore the dramatised conceptual problem. However, she spent most of her time in the behavior management as children were very excited to play their self-chosen favorite character roles from other books or movies. At this moment, her desire was to focus on conceptual problem solving, however, she had to spend time managing the behaviors due to the chaos in the classroom. The contradiction between her desires and the demands of the social interactions in teaching has made her inquiry the teaching strategy. That is, the tensions among what she desired and what she has confronted, shaped the contradictory situation of her teaching. The onsite collective reflection between teachers and researchers has made Teacher Liu unpack the issue and how it can be addressed. Teacher Liu’s social situation of development is realised through her interaction with researchers and her contribution to the implementation of the playworld. Her theoretical knowledge of teaching has been advanced through the critical process of pedagogical thinking including reflecting, generalising the conflicts, and evaluating her teaching practice. Therefore, we argue that when the teachers experience the conflicts in the social situation and working with other expertise, they are able to develop a deep critical reflection, apply the new ideas into the practices and evaluate the new approaches with researchers, thus making a qualitative change in their teaching.

A theoretical problem for practice change is personally meaningful

While taking personal perspective of learning and development, this study found out that the PD training requires to acknowledge teachers’ motives and their personal sense of the intervention

with cultural meaning in their situated contexts, thus teachers' meaningful professional learning can be transformed through the educational experiment to reflect and generalise the theoretical problem for practice change.

Hedegaard (2019) has emphasised the importance of a person's motive orientation. She brings forward the intentions and the situation within the activity setting. In the case of Teacher Liu's playworld intervention through educational experiment, her professional learning experience was dependent on how she understood the teaching circumstances affecting her and her competence to reflect and simplify these circumstances. Teacher Liu met demands of the playworld intervention, but also put her demands on the playworld activity settings and researchers when she met the challenges. This reflects her perspective of the social situation created by the educational experiment. As discussed by Hedegaard, when a person's motives are oriented to the practices within the institution and when new practices are introduced, a developmental crisis arises. It is through the development of new competences, that we see new motives develop. For instance, in the snapshot 3 of Teacher Liu's professional learning experience, when she was introduced and stimulated to Conceptual PlayWorld model, she developed her new motive orientation to this teaching approach. Within the implementation, her new motivation in teaching the concepts in play-based contexts (e.g. dramatising conditions motivating children to explore the concept of symmetry), conflicts with her earlier competences in directly telling them the concept of symmetry. This developmental crisis drove her professional changes in practice. She tested out her understanding of the teaching strategies, critically analysed the situation with other expertise and finally synthesised her emerging understandings of the playworld approach. The critical discussion and onsite support from the researchers have supported her coping with this developmental crisis. Within this process, the theoretical problem for practice change (how to bring play into a formal program) becomes personally meaningful for the teachers.

Conclusion

Our research project brought teachers and researchers together in an educational experiment in order to study the central theoretical problem of how to bring play practices into kindergarten programs. The overarching research question of our study that we reported in this paper focused on how the processes of an educational experiment could support teachers PD. In keeping with the theme of the special issue of this journal, we were interested to know if this new kind of PD could contribute to enhancing the quality of the EC education and care workforce in China, and thereby add to what is known about this area in the Asia-Pacific Region.

In this study we identified that an educational experiment created a new kind of social situation for teachers, which acted as an important source of PD for sustained practice change and the amplification of reflective practice. Our study identified a set of characteristics of the educational experiment for creating developmental conditions for the teachers who participated in our study. They were both 1) content of the educational experiment and 2) the process of the educational experiment that came through as important for teacher development in a context of curriculum reform:

Content of the educational experiment -

- Personally meaningful problem: How to shift from traditional pedagogical approaches

- Motivating children's explorations and problem solving
- Increasing competences and confidence in teaching STEM concepts

Context for practice change in an educational experiment -

- Societal conditions create new curriculum realities
- Collective reflection on practice as the source of teacher development
- Theoretical problem for practice change becomes personally meaningful

Knowing more about teacher motives during PD for the Asia-Pacific region adds to work being done by Nuttall, et al., (2015) who have suggested that the object motives of teachers is foundational for the success of any PD offered. Similarly, the identification of critical reflection as a valued practice during PD of EC teachers by Hadley, et al. (2015) was also found in our study, thus aligning well with this characteristic of an educational experiment. Finally, because the educational experiment took place over time, as a characteristic of effective and sustained practice change, our findings therefore align well with Jensen and Iannone (2018), and Chen et al. (2017).

In the context of the general PD literature, there are on offering an array of models (Steward 2014), elements (Schaap and de Bruijn 2018) and new kinds of digital platforms available (Lantz-Andersson et al. 2018), and where co-teaching (Murphy et al. 2015), coaching (Elek and Page 2019), mentoring (Trevethan and Sandretto 2017), professional learning communities (Schaap and de Bruijn 2018), and lesson studies (Vermunt et al. 2019) feature. But these approaches do not look directly at the Asia Pacific region and the unique societal and institutional practices within China, nor do they focus on EC teachers and the problem they are trying to solve in their practices of how to bring play into formal settings. Because research into EC teachers' PD is an under researched area in the Asia-Pacific Region, our study findings contribute to filling a gap in understanding how to support teachers in China who are charged with creating new practices as a result of curriculum reform.

The conclusion drawn from this in-depth qualitative study, conducted over 2 years, are limited due to the results of this study were based on only one kindergarten and one focus teacher. However, we argue that the educational experiment offers a new way that EC teachers can develop as professionals and meet the new demands placed upon them through ongoing reform. An educational experiment offers a relevant model for teachers' PD in enhancing the quality of EC education and care workforce within the Asia- Pacific Region.

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