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SPECIALTY SECTION
This article was submitted to
Teacher Education,
a section of the journal
Frontiers in Education

RECEIVED 31 March 2022
ACCEPTED 29 July 2022
PUBLISHED 18 August 2022

CITATION
Cooper R and Marangio K (2022) Views
across the boundary: School-based
co-teachers experiences with
co-teaching in initial teacher
education.
Front. Educ. 7:908910.
doi: 10.3389/educ.2022.908910

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Views across the boundary: School-based co-teachers experiences with co-teaching in initial teacher education

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School and university partnerships are widely promoted as an effective means to support the preparation of pre-service teachers (PSTs). However, these partnerships are rarely conceived with practicing teachers working in a university context as co-teachers with university teacher educators. School-based co-teachers (SBCTs) (practicing teachers who contribute to Initial Teacher Education (ITE) by teaching alongside university-based teacher educators) contribute to ITE through their support for curriculum and assessment development, providing opportunities for observation and experiences in schools, and teaching with university teacher educators. However, the role of a SBCT requires some careful navigation and negotiation of the educational spaces that a SBCT must cross as they teach in university classrooms and foster a co-teaching relationship. This research articulates the process of boundary crossing that four SBCTs undertook as they supported the development of pre-service science teachers. Boundaries exist between the practices and perspectives of teaching school science students and teaching science PSTs at university. Data were collected from four SBCTs across one academic year, including an initial survey at the beginning of the year, an interview at the end of the year, and documentation from co-teaching meetings across the year. An inductive thematic approach was taken to analyze the data. Five themes were identified that describe the ways SBCTs viewed their role as a co-teacher and their associated learning in this role. Drawing on literature around boundary-crossing dialogical learning mechanisms, the themes are described with illustrative excerpts to represent the range of SBCTs experiences. Our data indicates that SBCTs found many opportunities to share their wealth of knowledge and experience with pre-service science teachers but also identified, and often sought out, opportunities to professionally learn and grow. Findings include the importance of sharing aims and purposes to understand the context and the generation of shared knowledge through peer reflection on teaching. This article offers insights to others who are looking to form and sustain productive relationships with SBCTs to support learning for PSTs in ITE courses.

KEYWORDS

co-teachers, boundary crossing, Initial Teacher Education, science education, identity

Introduction

Initial Teacher Education (ITE) programs are frequently set up in such a way that reinforces the often noted disconnect between pre-service teachers (PSTs) experiences in schools and universities. PSTs go between university and placements at schools (in a variety of permutations) and are supposed to take what they have learned at university and put into practice on placement (Korthagen and Kessels, 1999). While on these placements, PSTs are supported by practicing teachers (mentor, co-operating, etc.) who play a significant role in developing PSTs' knowledge and practice, especially during the initial stages of their development (He, 2009). However, the support provided is often haphazard, with very few mentor teachers being well-prepared to work with PSTs (Goodfellow, 2000). Zeichner (2010) suggests that very few mentor teachers have knowledge of what PSTs have experienced at university prior to coming to placement and thus, PSTs often find that there is little connection between what happens at university and what they experience on placement. Darling-Hammond (2009) referred to this lack of connection between university and placement as the "Achilles heel of ITE." As suggested by White et al. (2015), there are now many school-university arrangements that have brought schools and universities together to support the development of PSTs in ITE programs and has seen practicing teachers become an integral part of teacher education. This article looks to explore the experiences of four practicing science teachers who were involved in a school—university partnership that saw them cross the border from school to university and work as school-based co-teachers (SBCT) in a science education unit as part of an ITE program.

Literature review

School university partnerships

In an attempt to escape the flawed assumption that ITE is the sole responsibility of universities (Clarke et al., 2012), school-university partnerships with a focus on co-teaching opportunities for practicing teachers are being formed (Nissim and Naifeld, 2018). These partnerships take many forms (such as practicing teachers teaching at university, teachers acting as mentors to PSTs on placement, to name a few) and begin to draw attention to an opportunity for shared learning between teacher educators, PSTs, and mentor teachers. Lopez-Real and Kwan (2005) suggest that the focus is usually on the PSTs learning, with little emphasis placed on mentor teachers in relation to their own learning.

In the Australian context, an inquiry into teacher education titled Action Now: Classroom-Ready Teachers (Teacher Education Ministerial Advisory Group [TEMAG], 2014), framed the "problem" of ITE as universities and lecturers

failing to locate the "balance" of theory and practice in ITE. The report states an urgent "appetite for change" in ITE throughout the sector (Teacher Education Ministerial Advisory Group [TEMAG], 2014). In considering this change with reference to locating a balance between theory practice, one way an ITE program may seek to "bridge" the perceived "knowing-doing gap" (Loughran, 2011) is to create school-university partnerships that utilize the best skills and practices of all involved, providing opportunities for shared learning and mutual benefit. Partnerships between schools and universities are widely promoted as effective means to support the preparation of PSTs (Smedley and Rooy, 1996). Although, the nature of partnerships between schools and universities is changing around the world, with experienced teachers taking more of a role whilst remaining in the classroom, as opposed to making the transition to university and becoming a teacher educator (White et al., 2015). Particularly in Australia, partnerships have been formed in response to numerous reports, such as Teacher Education Ministerial Advisory Group [TEMAG]'s (2014), suggesting that there needs to be a much stronger integration between the school-based and university-based components of ITE. While there are numerous school—university partnership models, co-teaching often plays a role in bringing schools and universities together.

The many types of teacher educators

Many researchers have explored the types of teacher educators that are involved in ITE, possibly in search of a simplistic response that they were not able to find (see Ducharme and Ducharme, 1993; Swennen and van der Klink, 2009; Goodwin and Kosnik, 2013 as examples). While Snoek et al. (2011) defined a teacher educator "as someone who contributes in a formal way to the learning and development of teachers" (p. 652), the European Commission (2013) have acknowledged that "many of those who teach teachers might not consider themselves to be teacher educators at all" (p. 8) highlighting the ill-defined nature of the role of teacher educators. A further search through the literature brings to light the mutual influences on PSTs during their ITE that may go unrecognized if only "formal contributions" are acknowledged. While there has been an expansion of teacher educators in the sense that they can be employed in varying ways, work in sole or across multiple contexts and participate in a wide range of activities related to the initial and/or ongoing professional learning of teachers, the literature (White et al., 2015; White, 2019) identifies three types of teacher educators: institute based teacher educators (IBTEs), school-based teacher educators (SBTEs) and community based teacher educators (CBTEs) (Zeichner et al., 2016, p. 12). IBTEs are often seen as those who work solely in a university context and have major responsibility for facilitating sessions for PSTs as part

of ITE. They also usually have a responsibility to complete research based in education and may be involved in teacher professional learning and contributing to the education sector more broadly (being on boards, competing evaluations, etc.). Inspired by the development of school led models of ITE (predominantly in the United States and United Kingdom), SBTEs are often seen as those who work solely in a school context or across school and university contexts perhaps as “dual-role professionals” (White et al., 2015 p. 3), continuing to teach in school classrooms whilst also facilitating teacher learning. They are usually responsible for teacher education in their school; mentoring PSTs on placement, overseeing other mentors, finding learning opportunities for PSTs, and maintaining links with universities. They go beyond the responsibilities of a traditional PST mentor and lead the professional learning of teachers across all stages of career, from pre-service, to experienced. CBTEs are members of the community such as parents, community leaders or elders who bring to light social and cultural issues related to education and support PSTs learning about the role these issues play in education broadly and in classrooms for individual learners.

The three types of teacher educators identified through the literature appear to be bounded by the context of their significant place of employment being institute, school, or community, and perhaps with the assumption that this is also the context for their work in teacher education. For example, in White et al. (2015) research, the SBTE participants were all involved with the School Direct program, had dual roles (teacher and teacher educator) and were,

...involved in planning, leading, and evaluating at least one aspect of the taught course, for instance: subject knowledge development days in school; seminar groups; school-led training sessions and one-to-one tutorials to support students in the directed tasks that focus on developing their subject and professional knowledge for teaching. Some additionally have the role of mentor for a student-teacher in their school (p. 3).

This positions them very clearly as SBTEs with significant teacher education responsibilities that are situated within their school context. White et al. (2015) also identify a subset of SBTEs that they call “teacher tutors” (p. 4), who are responsible for both mentoring and teaching of one student teacher. The authors designation was a deliberate effort to clearly separate the roles of mentoring and teaching in ITE as a way of accounting for the European Commission (2013) acknowledgment that not everyone who teaches teachers will want to identify as a teacher educator and yet, the SBTEs in this subset all identified firstly with the role of mentor, viewing their teaching role as an additional responsibility of their mentoring (White et al., 2015 p. 8). Along with this confusion around their role comes a need for further research into the professional learning needs of SBTEs, which may begin to offer clarity around these roles and what might be offer support to those who fill them. In their

initial exploration of SBTEs professional learning needs, White et al. (2015) found that they include “developing pedagogical approaches suitable for teacher education, especially explicit modeling.” While SBTEs are becoming more prevalent in Australia, the needs of this group have attracted little attention to date (Berry, 2021). This is an area in need of further research as working at the meeting point of teacher education, practicing teacher and academic presents a genuine set of challenges (Reynolds et al., 2013).

Co-teaching

Co-teaching is defined and organized in different ways, and for different purposes. In a co-teaching relationship, teachers are positioned as collaborative equals, with their own set of expertise to drawn upon to co-plan, co-teach, co-reflect, and co-evaluate (Scantlebury et al., 2008). In this study, co-teaching is defined as “two or more teachers teaching together, sharing responsibility for meeting the learning needs of students and, at the same time, learning from each other” (Murphy and Scantlebury, 2010, p. 1). Quality co-teaching utilizes the strengths and expertise of each teacher to provide instruction that is more effective than what either could provide alone (Friend, 2014). Thus, quality co-teaching must be established on the basis of a strong partnership where everyone is engaged and committed to the shared, negotiated outcomes (Rytivaara et al., 2019).

Co-teaching is becoming more common in higher education but is still only found occasionally in the literature. In two United States studies, Bass (2005) and Vasquez-Montilla et al. (2007) it was found that faculty who co-taught valued the opportunity to be creative and reported a sense of fulfillment that they had not experienced before in their professional lives. In ITE, co-teaching is valued as one way of presenting PSTs with models to support development of co-teaching skills (Cook and Friend, 1995; Graziano and Navarrete, 2012), with co-teaching exemplified by mentor teachers at schools and university staff during PSTs school placements (David and Ann Mickelson, 2017). The work of Nissim and Naifeld (2018) who investigated a co-teaching partnership between mentor teachers and university teacher educators found that PSTs who experienced co-teaching at university increased their use of co-teaching while on school placement. As Korthagen (2007) recognized “there is a strong need for researchers and practitioners to build joint communities, bringing together both a research and a practical focus” (p. 304). Responding to Korthagen’s call, published examples of school-based teachers working with teacher educators in university settings have emerged (see examples from Nevin et al., 2009; Downton et al., 2018). While studies are beginning to accumulate about teachers working together in co-teaching roles, it is difficult to find examples of university-based

science Teacher Educators (UBTE) working with school-based science teachers in ITE academic units, a gap this article aims to address.

In this article we have used the term SBCT to describe full-time practicing teachers in secondary schools who take a role in ITE in addition to their work in schools, and who facilitate learning for PSTs at their school and at university. We also use the term University Based Teacher Educator (UBTE) to describe teacher educators who work in universities. In this study SBCTs and UBTEs were co-teaching in science education units as part of an ITE program.

Contextual frame

Boundary crossing and dialogical learning mechanisms

While the TEAMAG report ([Teacher Education Ministerial Advisory Group \[TEAMAG\], 2014](#)) attempts to deal with the so-called practice-theory divide that exists between schools and universities, reconsidering the different fields of expertise for teaching school students and PSTs from a boundary crossing perspective allows for a more complex view of what it means to work in academic units in ITE. “Boundary crossing” is a term used to describe the transition and interactions that occur when professionals move between different sites of practice (different institutionalized and social practices) and enter situations that are new and unfamiliar ([Akkerman and Bakker, 2011](#)). Importantly, boundary crossing is between sites of practices that are horizontal (rather than hierarchical) systems of networked expertise. In moving between these sites with different institutionalized and social practices, people often “face the challenge of negotiating and combining ingredients from different contexts to achieve hybrid situations” ([Engeström et al., 1995](#), p. 319). Boundary crossing refers to these attempts to bridge points of division amidst disciplinary knowledge structures within and beyond ([Akkerman and Bakker, 2011](#)). The learning can be bidirectional and dynamic, and oriented toward both the personal and the collective. In these ways, boundaries can become powerful resources for making connections between sites of practice, such as schools and universities, and the development of intersecting and expanding identities and practices that can be used in different sites.

Boundary objects support the crossing of boundaries and have been referred to as the artifacts that help those people crossing by fulfilling a bridging function ([Star, 2010](#)), or in a very different way, as a shared problem space, with the object becoming the motive for shared activity between sites of experience ([Edwards and Fowler, 2007](#)). Instead of objects, others promote shared “boundary

experiences” that require open and critical relationships between people from different disciplinary fields, because boundary crossing requires “a confrontation of difference and diversity and establishing a new order of practice” ([Clarke et al., 2012](#), p. 255). Therefore, people, objects, structures, facilities, and equipment can act as tools to bring people together to interact and enable shared decision making to facilitate movement across boundaries ([Akkerman and Bakker, 2011](#)). While often difficult to achieve, when such interactions are established and sustained between people who bring different practices together (from different fields), profound and sustained changes in practices and identity can occur.

In [Akkerman and Bakker’s \(2011\)](#) review of 187 studies on boundaries/border crossing, four dialogical learning mechanisms that arise at the boundary were identified, namely: (1) identification of discontinuities; (2) coordination of boundary objects; (3) reflection on practice and identity; and (4) transformation of practice and identity. [Akkerman and Bakker \(2011\)](#) argue that dialogue and collaboration are essential components for learning across boundaries. Each learning mechanism requires a shared dialogue to explore new meanings and enable learning, rather than a monolog where one person gives the information/meaning to another without exploration and clarification of meaning through discussion.

Identification of discontinuities relates to the learning that arises by recognizing the ways one practice differs from another (othering), and the underlying need for legitimating the coexistence of the interpersonal roles, each with different practices and related identities ([Akkerman and Bakker, 2011](#)). SBCT recognizing that they are not able to teach in the same way in ITE as they do in school is an example of discontinuity. Both practices differ from each other, with each providing their own intrinsic value and purpose. The learning potential of discontinuities relates to these renewed understandings of practices and identities.

Coordination of boundary objects relates to movement at the boundary of different sites that goes beyond identification, through various coordination processes to make joint work more efficient and routinized. The learning potential of coordination of boundary objects is in overcoming the boundary, rather than reconstructing it, and therefore facilitating future and effortless movement between the different sites ([Akkerman and Bakker, 2011](#)).

Reflection on practice and identity relates to a person recognizing something new about their own and others’ practices and involves perspective making and perspective taking. [Boland and Tenkasi \(1995\)](#) refer to perspective making and perspective taking as two complementary processes, these being developing communication that strengthens the unique knowledge of the collective, and developing communication that takes the multiple knowledges of others into account.

This learning mechanism goes beyond comprehending the difference within and between distinctive perspectives and practices of one's own practice and that of others but taking these new perspectives to reflect on their practice in new ways (Akkerman and Bakker, 2011). For example, reflection involves the SBCT making their own perspective explicit, reflecting on it in light of other perspectives, which at the same time taking the other perspectives into account for a more complex understanding. Reflection involves making explicit these expanding perspectives and practices and therefore constructing a new identity that informs future practice.

Transformation of practice and identity, recognizes the learning that leads to a significant new and in-between practice, a boundary practice. Transformation typically consists of several processes, consistently initiated with a problem that forces people with different expertise to reconsider their own practice and how it relates to the other. Confronting these contradictions requires realizing and explicitly noticing the differences to learn about one's own practice and that of others. Recognizing a shared problem space often occurs as a direct response to confrontation, and while recognizing these contradictions between different sites carry strong potential for learning, such recognition is not without its challenges. This process can be difficult because ideas from one field may be conceptually difficult, tacit, or unfamiliar, and requires those involved to let go of their usual way of thinking and practice (Land et al., 2016). Overcoming the problem requires joint action to establish hybrid practices. If this change occurs, continuous joint work at the boundary can lead to significant shifts in learning and lasting change, and which ultimately leads to identity development (Akkerman and Bakker, 2011). The boundary crossing lens is particularly relevant for ITE, and the shifts between teaching and learning to teach in different specialized sites, especially universities and schools.

In this study, people who are specialized working in teacher education and teaching school science come together and take on new roles co-teaching science PSTs as an interdisciplinary co-teaching team. The boundary crossing dialogical learning mechanisms (Akkerman and Bakker, 2011) provide a lens for conceptualizing the process of SBCT learning and related changes in practice and identity from moving across the boundary from one specialized and familiar field to one that is new and unfamiliar. In this case, co-teaching with UBTEs in ITE provides a new and unfamiliar site of practice (different institutional and social practices).

Research question

In this study, as part of a larger project, we are focused on the perspectives of SBCTs who work (co-teach) as part of a school-university partnership with university-based Teacher

Educators (UBTE) as part of an ITE program. In these roles for the SBCT, and a new arrangement of co-teaching between SBCT and UBTE in ITE academic (secondary science education) course, we aim to explore the SBCTs' perceptions of the co-teaching role. In doing so, we consider SBCT learning as a result and the possibility of re-imagining this new site of practice for school teachers to co-teach with UBTE in ITE academic units. Our research was guided by the following research question:

In what ways do school-based teachers perceive their co-teaching role and associated learning within an initial teacher education science program?

Materials and methods

Methodologically, this study is embedded in a small-scale research paradigm (Knight, 2002). Small-scale research is appropriate when a study has a focus on a small number of participants for a specific purpose (Dexter and Seden, 2012). Small-scale research is a purposeful approach to explore a range of ways of thinking about a given phenomenon and is often helpful when time and resourcing is limited, although it has its limitations in terms of generalizing findings (Poulson and Wallace, 2003). For this study, a small-scale approach was appropriate as it provided a way to sense-make four SBCTs views of their learning and practice as co-teachers in science education units as part of an ITE program.

When education research is looking to consider the complexities inherent in teaching and learning and bring to light lived experiences, qualitative methodologies are often the best fit (Atkins and Wallace, 2012). For this study, which is probing teachers' views and considering the influence of an experience on perspectives and practice, a qualitative lens is appropriate and will allow for rich, "thick" descriptions of experiences (Merriam, 1998). A qualitative approach in the traditions of narrative inquiry and analysis methods, has been embraced in this article to represent and critically examine participants' experiences and thinking in a way that reflects and honors the participants' voices (Clandinin and Connelly, 2000). It is acknowledged that the small data set—such as the one in this study with a survey and one-off interviews with four SBCTs—impacts on the ability of this research to offer generalizable outcomes. However, the small sample size provides insights into the participants' perspectives and practices, and by drawing on aspects of narrative inquiry this article forefronts their voices as valued informative sources (Guest et al., 2006). This study does not seek to make generalizations but does look to explore the insights derived from the experiences of the four participants. This section will detail the context and participants involved and how they were selected before describing the data collection and analysis processes.

Context and participants

For our research, we arrived at the term SBCTs because all of our participants are full-time practicing teachers in secondary schools who take a role in ITE in addition to their work in schools. However, our participants' work in ITE goes across contexts; sometimes their teaching in ITE is at the university as part of a formal workshop or lecture and other times, it takes place in their school. Their work also encompassed a shift in perspective, sometimes they were modeling teaching practice as if they were teaching one of their classes at schools, other times they were observed teaching a class at their schools and on other occasions, they were in more of a reflective or metacognitive space articulating the thinking behind their practice. Further, some SBCTs may have a role in mentoring PSTs while they are on practicum, but this is not part of the SBCT role or responsibilities. For instance, in this study only half of our participants were involved in mentoring a PST on practicum. In our research, SBCTs were involved in planning, teaching, and evaluating several aspects of the ITE program they were part of but were not responsible for any assessment of PSTs assignment or teaching practice. A further point of difference is that the SBCTs were always co-teaching with a university-based Teacher Educator (UBTE) and were never solely responsible for facilitating any aspect of the ITE program. SBCTs and UBTEs typically work together in a school—university partnership designed to utilize the best skills, knowledge, and practice of all involved, through a co-teaching arrangement. In contrast, the role of SBCT, as briefly outlined above, co-teaches in the ITE academic units, and therefore needs to transition across different systems (across boundaries) into a new site of practice that may challenge their professional practice and sense of professional identity. This article looks at the learning experience of SBCTs through a lens of learning mechanisms of boundary crossing.

The research took place over one academic year in an ITE program in an Australian university. Four SBCTs were employed on a sessional basis by the university to work with UBTE to inform the design and teaching of four different science method units. Each SBCT supported a different secondary science education unit (see [Table 1](#)). Each SBCT was recruited on the basis of their reputation as an excellent science teacher and their self-expressed interest in working at the university to support PSTs' learning. Preparation and induction were not formally facilitated by the university, it was up to the UBTE and the SBCT for each of the ITE science education units to establish what was needed. The university asked that SBCTs contributions be based on their current knowledge and expertise related to classroom practice, but they also expected each individual UBTE and SBCT to negotiate the role and commitment of the SBCT. However, the university was clear that SBCTs were not to formally assess the PSTs work. In their SBCT role, they were not employed as mentor teachers working with PSTs during school placement. University ethics were applied for and granted prior to the study commencing, and adhered to. For the presentation of the data, pseudonyms were used.

TABLE 1 School based co-teachers experience and science area.

School based co-teacher (pseudonym)	Secondary science unit	Years of experience as teacher	Years of experience as co-teacher
William	General science	36	4
Belinda	Psychology	18	1
Elise	Chemistry	12	2
Lucy	Physics	9	1

Data collection

At the beginning of the academic year, SBCTs completed a survey investigating their views and expectations of their role as a SBCT. The survey was conducted online using Google forms, took 20–30 min to complete, and consisted of five open-ended questions (see [Appendix A](#) for questions). The survey was constructed by three academics, the two authors of the article who were teaching in science education and a colleague who was not part of the teaching team but is an experienced researcher. The questions sought to elicit the SBCTs reasons for wanting to be an SBCT and what they hoped to get out of the experience. At the end of the academic year, each SBCT was interviewed about their co-teaching experiences. Using a semi-structured protocol designed by the same three academics who constructed the survey and was influenced by the data collected from the survey, the SBCTs were asked to consider their experiences, insights and learning about their role, the perceived benefits for different stakeholders and the implications for their teaching practice in relation to learning and teaching science (see [Appendix B](#) for questions). The interviews ranged in length from 45 min to over an hour. They were all audio recorded and then transcribed for analysis. While data may be richer because of the shared context between researcher and participant, we recognize that shared understandings can be problematic when collecting data ([Kanuha, 2000](#)). As a way of acknowledging the potential power dynamic (in terms of the authors/researchers of this article interviewing our own co-teachers), we invited our colleague who was part of constructing our data collection instruments but was not involved with the teaching or the teachers in these units to conduct the interviews.

Data analysis

An inductive thematic approach ([Bryman, 2016](#)) was used to analyze both the survey and transcribed interview data in order to identify views on the practice and learning arising from co-teaching in an ITE program, as described by the four SBCTs. Data analysis took place after the conclusion of the academic year. It is important to state

that each author co-taught with some but not all of the SBCTs, and in all but one, different SBCTs. While insider data analysis has its limitations, we also recognized that our deeper understandings of the contextual elements during the data analysis would produce authentic findings (Corbin-Dwyer and Buckle, 2009). With this in mind, we met regularly to reflect on this aspect and integrate each other's reasoning during the data analysis. In light of the research question, we followed an iterative coding procedure. Initially, the data was analyzed independently by both authors who then compared to confirm agreement. Regular meetings during the analysis were held, and in each meeting, we questioned our assumptions behind each coding decision before reaching agreement on the ways they related to the research question. Six themes were originally identified in the data, and then reconsidered. After an extensive process of meetings to enhance the rigor of our study, five themes were identified in the data.

Findings

The themes identified in the data analysis are now discussed in turn to address the ways the SBCTs perceive their co-teaching role within an ITE science program, and what have they learnt in this role.

Communicating their school teaching experiences and expertise to support the profession

Right from the beginning, each SBCTs perceived their role in the science education program as providing expertise to PSTs. They wanted to share the realities of the “dailyness” of their teaching “I talked about what I was doing in my daily teaching, what was needed” (Lucy, interview) and bring the realities of the science classroom into ITE and “share front line experiences” (Belinda, initial survey). By sharing these experiences, the SBCTs were able to draw on their experience both current and past which they saw as “paying it forward” to the profession in the sense that they were offering their accumulated wisdom from over their career, “I want to give back what I know from 34 years’ experience, to inspire the next generation of teachers. To give what I have learnt over the years, so new teachers start with experience” (William, initial survey). The SBCTs also perceived this an opportunity to share their practice beyond the walls of their school. All the SBCTs were respected members of their school community and were recognized for their high-quality teaching practice. Working with PSTs was seen as a chance to “share knowledge with

more people than just my school” (Elise, interview). In other words, the SBCTs were able to see themselves as knowledgeable, experienced professionals who have something of value to share with PSTs, UBTE and ITE providers. They realized the school teacher expertise that they bring into the new site of practice. They identified the bigger picture of the profession, claiming their part as experienced members of it and working toward shaping how it looks in the future.

Re-examining and articulating their school-based practice

School-based co-teachers soon understood that the co-teaching role required more than communicating their school teaching experiences. It considers how the SBCT saw their role as involving the re-examining and articulating their own school-based practice, and in turn, having their professional knowledge affirmed. To move between school and university sites of practice meant they needed to unpack their teaching for PSTs, and this created new understandings and actions in both sites of practice.

For the SBCTs, their openness and willingness to learn often lead to a reconsideration of their science teaching practice. One of the ways this came about was through being questioned by both UBTE and PSTs and having to articulate their practice, beyond what they did, to reason through the purpose underpinning the pedagogy. Elise explains, “I would be talking to the PSTs about something and I’m like, well, why do I always do it that way? And does that actually have the impact that I want it to have on the students?” (Elise, interview). Considering purpose and analyzing practice was also seen as a benefit for Belinda who, began to question what was implicit in her practice,

We do a lot of things as teachers, which are implicit and that we just do as a matter of course, but we don’t actually break it down and analyze it. I have found that really valuable. Having that underpin . . . I started observing my teaching from that perspective. . . a more analytical point of view (Belinda, interview).

Co-teaching PSTs with UBTE was embedded in these new realizations. For Belinda, the relationship and learning from STE work enabled a language to examine and reinforce what she did in her school classroom:

You’re articulating the structure of teaching. That’s the common language, that’s something I found and as a co-teacher, sort of hearing the concepts. reinforced and made those, enabled those connections, or maybe reminded me of what I do (Belinda, interview).

Similarly, for Lucy, who valued such open display of critiquing her practice:

It helps me share my understanding and add value to someone else or someone else who is learning. It makes me reflect on my teaching so I can celebrate it and show it. It makes me stop and think, “What have I done?” It allows me to look at what didn’t work add share that too because I think there is a lot to learn from what doesn’t work for somebody (Lucy, interview).

Furthermore, co-teaching PSTs was also seen as an opportunity to reconsider and almost refresh practice, using the PSTs new ideas as stimulus, “I think we get quite stale as teachers . . . and having discussions with fresh minds about various aspects of teaching that you have sometimes forgotten . . . has been really good because you stop and think” (Lucy, interview). Working in this new and surprisingly unfamiliar site of practice, the teachers reconsidered their teaching practice with their own secondary school students and justifying their practice as part of their teaching in ITE.

While reconsidering practice was viewed as valuable learning, the affirmation of the SBCTs practice was also powerful. The affirmation of SBCTs’ practice sometimes came as a surprise for the SBCTs and generated a cause for pause and reflection,

You realize there are a whole lot of things you have developed. As so, in terms of a confidence boost. . . I had no idea I had developed so . . . in 6 years [of teaching]. So, it was a good—a pat on the back moment where you go, well, I have developed because I have come a long way and I have answers to all those questions that I wouldn’t necessarily have had at the start of the journey. So that, in terms of confirmation, was really good (Lucy, interview).

For others, it was a moment of validation of their practice and professionalism, “What it has brought is inspiration and validation and reinforcement of what I do” (Belinda, interview). These new understandings about their own school practice likely entails new complexities regarding their professional identities.

Cultivating the school-based co-teacher and university-based teacher educators co-teaching relationship

This theme discusses the ways the co-teaching relationship and practices developed in this new and unfamiliar site for both SBCT and UBTE. The development of an effective co-teaching partnership between SBCT and UBTE was described by Lucy as “a synchronized dance” of sharing expertise where “there’s one

person teaching this aspect of the course with their expertise and then they are passing it [teaching] almost very smoothly to the next person to share their expertise but we are both bound by the same understanding of education” (Lucy, interview).

Initially, Belinda saw her purpose of co-teaching to “share how skills and knowledge in the course might translate within a school environment” and thought she would be “challenged to understand the time required to juggle her roles as a teacher and co-teacher” (Belinda, initial survey). Like Lucy, the expectations of the co-teaching role changed over the year. Belinda discusses how her role as a co-teacher developed overtime, with the initial awkwardness and problem of working out how to make it work in the best possible way:

Initially I came in as more of an observer. I wasn’t 100% sure whether I should jump in at points, as the year has progressed obviously that’s exactly what we do. . . without hesitation. . . We’re bouncing off each other really well. I think that you’ve got that initial stage where you’re assessing, acclimatizing, understanding, then you’re getting into the next stage, which is consolidating what you’re seeing, before you’re able to then take that next step to put it into practice. I think it’s a process. . . I think co-teaching and understanding the role of co-teaching is not an isolated snapshot, I think it is an evolving thing (Belinda, interview).

Interestingly, William who was in his 4 year as a SBCT, identified challenges that did not shift over the year, such as “being a good role model, making sure it is quality time with the PSTs and their learning is quality learning” (William, initial survey). His expectations of his role stayed focused on the learning outcomes for the PSTs, rather than establishing the co-teaching partnership, as seen with the other three SBCTs. For William, his role as SBCT and the interplay between SBCT and UBTE and shifting from school and university sites was already established.

Developing a better appreciation of pre-service teachers learning during Initial Teacher Education and their role in supporting pre-service teacher learning

This theme relates to their learning about the ways PSTs learn while working in this new site of practice. Co-teaching in the ITE programs enabled SBCT to consider the various perspectives of the PSTs, and with that the different starting points and school experiences that they bring to the ITE course and ways to support their learning. For example, Lucy, who is co-teaching 40 PSTs, states, “you have got 40 different experiences that I haven’t had, that I can learn from. . . and everybody

else is gaining from that too, which is fabulous I think and fascinating” (Lucy, interview). Some SBCTs felt like novices working in this new (ITE) site, despite their expertise in the school site. This learning involved reflecting and unpacking assumptions about PSTs journey during ITE. In doing so, the SBCTs gained a better understanding of PSTs learning and ITE programs has offered the SBCTs new insights into the experiences of PSTs at university.

Seeing how preservice teachers are taught from the other side. Seeing the type of pedagogical support that they are getting, getting a better understanding of what sort of types of assessments they are given. . . watching how they work together has been really interesting (Belinda, interview).

William expressed a similar sentiment and connected his understandings of the PSTs university experiences with his role in their learning,

I know where they [PSTs] come from when they come down to teach with me. I’m working with and seeing [the] requirements of the student teachers. . . so it’s this whole linear path you see and it’s all interconnected (William, interview).

Further, this experience helped Elise to reconsider the way she perceived and worked with PSTs when they came to her school on practicum, “Made me realize that they’re just students as well, but they’re just bigger students. . . I just assumed. . . well, you know what you’re doing; just hurry up and get in the classroom and start teaching. . .” (Elise, interview).

For all the SBCTs, co-teaching opened a window into the learning of PSTs, what PSTs focus on in ITE, and the range of placement experiences PSTs can have. For our SBCTs this was a shift in their understanding that took them beyond their often-limited view, which was based on their own experience in ITE or their experiences as a mentor teacher of PSTs on placement experiences in their classroom. Being an SBCT has allowed them to think differently about the ways PSTs learn and develop their professional knowledge for teaching, from a variety of starting points. PSTs do have valuable contributions to make but also require rich conditions for learning that happens in university settings and goes beyond what happens on placement experiences.

Valuing their professional growth and transferring their new learnings

In the previous four themes, the SBCTs’ understandings, and value of co-teaching with UBTE in ITE was evident, including their renewed sense of the value of their school

teaching practice, learnings about ITE and PST learning, and their expanding perspectives and practices from being in the co-teaching relationship. This theme relates to the ways the SBCT value on their own professional growth, including what it means for their transferring such learnings from this new site to their familiar school sites. The SBCTs identified this experience as an opportunity for their own professional growth and learning through working closely with academics in their field, as already discussed. However, opportunities to apply their new learnings from co-teaching to their school sites was possible for some, and difficult for others. Support from school leadership and colleagues varied, and therefore, schools valued their professional growth to various extents.

The SBCTs could see the benefits of a co-teaching working relationship for both themselves and their UBTE co-teachers. For instance, “You’re always learning off each other, you can’t help it. Learned about their philosophy and like I said, we’re pretty compatible” (William, interview) and “She’s got some strengths, I’ve got other strengths, and what we do is we I suppose model, so we’re doing a lot of modeling for our students and to each other. We learn” (Belinda, interview). For Elise, the co-teaching experience enabled her to add to her understandings of contemporary science education research: “I just found it a really positive experience overall. . . working with the university and seeing the new research, the current theories that are out there” (Elise, interview). The co-teaching experience gave Lucy the opportunity to reflect on her professional learning journey throughout her career in new ways: “from my benefit, I think it helps me work out how I have developed my growth” (Lucy, interview).

The SBCTs’ experiences working in ITE were seen by them to benefit their professional growth as Belinda states that she was “Working with my co-teacher to further develop my own teaching and learning expertise and how to share my experiences/knowledge within a university setting.” Belinda also said that co-teachers (which could be the STEs as well as the SBCTs) should “Be prepared to be challenged on your own teaching practice. Be willing to work with your co-teacher, like a partnership.” and in turn, you work to your strengths and “You’re actually developing each other’s skills and it’s actually a really powerful form of professional learning. As long as you don’t have an ego and as long as you don’t feel threatened” (Belinda, interview).

All the SBCTs discussed ways they will or have already used their new learnings in their schools. These new practices relate to their own classroom teaching “it actually inspires me to do another thing and apply it into a different situation” (Belinda, interview). While the SBCT role differs from a school mentor teacher role, discussions also included mentoring PSTs

on school placement, with William now supporting large groups of PSTs at a time and designating them their own room:

“They’ll sit in there and they plan as a team what they’re going to teach, how they going to teach it. They plan their PowerPoints, their booklets and all that together. I’m in another office away from them so they can whine, blame and share and laugh and cry and all that type of stuff. It’s easy to survive as a mob than an individual. Individuals would not ask questions, but others will. And they teach together” (William, interview).

Elise, who now oversees the school’s PST program, summed up the recent changes: “I think we do a lot more to induct them [PSTs] and support them coming into the school, and so, as a result, the program at our school has actually gotten better because we also provide support to the mentors and everyone” (Elise, interview).

For some SBCTs, these affirmations of practice were contrasted with a lack of interest and support from colleagues or senior administration at the SBCTs’ school. Belinda was unable to introduce co-teaching at her school because not all the teachers within the possible subject that was timetabled simultaneously wanted to be involved. She was already concerned about sustaining her relationship with the university. “I know next year, I’m going to be really limited, because my school’s a bit difficult that way” (Belinda, interview). While Elise, was feeling conflicted about her multiple roles and her ability to give enough time to all of her responsibilities,

Some staff actually really didn’t like the idea of me working at Monash as well as working at school and so I had to battle that perception. . . I felt guilty that I wasn’t available as much as I wanted to be for the PSTs. . . it was just finding that balance. . . but it is worth doing (Elise, interview).

Conversely, Lucy was well supported by her school and Principal who viewed her role with the university as worth supporting, “My principal at the time was really positive, trying to give me the keys to the school on a weekend, and I ran the [PST] workshop” (Lucy, interview). From their experiences, the SBCTs came to learn a great deal about themselves, their school communities and learning and teaching science, but also learned a great deal about ITE and PST’s learning to teach science. In summary, the SBCTs learning has been, and continues to be, a transformative experience. It has opened up possible ways to positively transfer their learning to other settings within their school, although not all SBCTs feel enabled to do so.

Discussion

The four SBCTs in this research had clear perceptions about the role, especially in relation to what they could offer and how PSTs would benefit, and in turn, started to articulate their learning as a co-teacher with a UBTE in an ITE academic unit. The five themes identified in the data can be reconsidered with respect to the boundary crossing dialogical learning mechanisms (Akkerman and Bakker, 2011). First, the SBCTs initially recognized communicating their school teaching experiences to support the profession as the key component of their role and identity as a school teacher. This recognition relates mostly to the *identification of discontinuities* with working in this new site (Akkerman and Bakker, 2011), as co-teaching renewed SBCTs understandings of their school science practice and identity. Second, the co-teaching experience created conditions for SBCTs to re-examine and articulate their school-based practice as they navigated the new site of practice. In creating these conditions, the SBCTs established ways to overcome the boundaries to *facilitate movement* between school and university sites as they co-taught in a new site of practice (Akkerman and Bakker, 2011). Third, the SBCTs recognized the importance of cultivating the SBCT and UBTE co-teaching relationship to create new and shared ways of working together. This theme relates to the *coordination of boundary objects* (Akkerman and Bakker, 2011) to practice as co-teachers and reflect on different perspectives in the new ITE site, while seamlessly returning to the school site. Fourth, the SBCTs discussed the ways they had developed a better appreciation of PSTs learning during ITE and their role in supporting PSTs learning. This learning involved *reflection* (Akkerman and Bakker, 2011), and unpacking assumptions about PSTs journey during ITE. Finally, while they all valued the co-teaching experience and professional growth and shared a desire to transfer some of this new knowledge back to their schools, some SBCTs discussed this learning to a greater extent than others, and support from school leaders and colleagues varied. For some, this learning is likely to indicate *transformational change in practices and identity, expanding their learnings from one site to another* (Akkerman and Bakker, 2011). The following discussion will work through the many and significant benefits that were recognized both by and for the SBCTs.

A new form of professional learning for school-based co-teachers

As identified in the literature there are many school—university partnerships and co-teaching arrangements that have been set up as part of ITE programs all over the world (see for example Clarke et al., 2012; White et al., 2015; Downton et al., 2018). They vary greatly in their arrangement but are typically designed to benefit PSTs. Interestingly, this is what

our SBCTs came in thinking too, yet, what the SBCTs came to recognize was that this was a valuable learning experience for them as they worked as a co-teacher in this new and unfamiliar site of practice. As experienced teachers, this was an interesting insight because it afforded them new and different opportunities for learning. With the increased regularity of ITE programs (universities) calling for involvement from schools and practicing teachers, this is important knowledge as it offers insights into what these SBCTs experienced in their role and what an arrangement, such as this one, could offer to other universities, schools, and teachers by way of collaboration and professional learning opportunities. Co-teaching partnerships, such as the one in this study, gives both school-based teachers and university-based teacher educator permission to engage in shared dialogues to explore and clarify new meanings and enable new practices and identity (Akkerman and Bakker, 2011), thereby providing the conditions to enhance SBCTs and PSTs learning. The UBTE and the co-teaching relationship could be seen as boundary objects in that they serve as a bridging function to allow boundary crossing, and as boundary crossers, to advance the scholarship of teacher education and school teaching.

Reflection of school-based co-teachers teaching practice and awareness of pedagogical content knowledge

School-based co-teacher's reflection on their own practice is what really brought their professional learning to the fore; "a sense of am I really doing what I am promoting with PSTs and how well am I doing it?" leading to an affirmation of their teaching practice and thus a greater awareness of their pedagogical content knowledge (PCK). As stated by Carlson et al. (2019) PCK "describes the complex layers of knowledge and experiences that shape and inform teachers' practice throughout their professional journey and, in turn, mediate student outcomes" (p. 82). The important aspects to highlight here are the complex layers of knowledge these teachers already had that were being deconstructed and reconstructed due to their experiences co-teaching PSTs with a UBTE in ITE. The ongoing experiences that then shaped and informed their practice as part of their ongoing professional journey and mediated students' outcomes in their classrooms at school. As this is not a PCK study, any further discussion is beyond the scope of this study. However, it is relevant to point out the PCK insights as we view these as being assisted by the SBCTs' experiences in ITE and in particular, this co-teaching arrangement.

To assist SBCTs to work through the reflection that led to enriched PCK, there needed to be "space" and time made for SBCTs to be supported to reflect effectively on their teaching

practice in light of their experience in ITE. This is where a co-teaching arrangement can be valuable as co-plan, co-teach, co-reflect and co-evaluate (Scantlebury et al., 2008) are central to the relationship and, in this case, to the professional learning of both the SBCTs and the UBTEs (UBTE data is not reported here, but is the focus of a future paper from this project). Ensuring SBCTs are value adding in their area of expertise, provides space for university STEs to be in their best space and provide the best combined and highest quality learning experience for PSTs, but all of this needs to be nurtured through consistent co-reflection and co-evaluation. Such dialogical and collaborative environments allow exploration of new ideas and practices and demands exploration and clarification of meanings through discussion (Akkerman and Bakker, 2011), which pushes everyone's learning in this new site of practice.

School-based co-teachers gain a better understanding of pre-service teacher learning and Initial Teacher Education

The experience of working in an ITE program gave the SBCTs the opportunity to see teaching differently, that is more aligned with a vision for learning to teach teaching. Seeing teaching differently may stimulate the SBCT to re-clarify their role in terms of working with PSTs. All of our SBCTs had a reputation for being excellent science teachers, and many had also been mentor or placement teachers supporting the learning of PSTs while they were on placement in schools. This new role as a SBCT in an academic unit is different again, which necessitates a different view of teaching. It was an opportunity to not only re-think teaching, but to also rethink how you teach teaching and how PSTs learn teaching. The experience presented a chance to better understand teacher education as a whole and move beyond views of ITE formed during their own time as a PST, and shift to a more nuanced view based on current practices in ITE programs; a start at addressing some of the gaps highlighted by Darling-Hammond (2009) and Zeichner (2010). It also provides an opportunity for the SBCTs to keep thinking about their own professional learning and different pathways or focuses for the ongoing professional growth.

With such a range of forms of school-university partnerships, it is easy to see how views of ITE and the level of shared responsibility for ITE vary so greatly and the suggestions of Clarke et al. (2012) are realized. This is not an argument for uniformity, but more a call to nourish open conversations about the opportunities and complexities that arise with genuinely sharing the responsibility for ITE in ways that generate professional learning for all stakeholders. As school—university partnerships become more prevalent, these conversations

become a necessity to ensure clarity around roles and responsibilities and guidance for quality professional learning for SBCTs and UBTE.

School-based co-teachers seeing themselves as teacher educators

We have found (through comparing data from the beginning of the academic year to data from the end of the academic year) that there is a period of transition where some time needs to be spent considering what SBCTs who are coming into university teacher education need to learn and know to begin to see themselves as teacher educators. Our data suggests that there is a need for SBCTs to relax some “teacher like” behaviors (Cooper, 2019) and begin to recognize the different sites of practice they are working in and the different needs and characteristics of students in a teacher education setting. Our SBCTs were keen to share their practice in an effort to almost “give” PSTs their experience and thus, skipping some essential opportunities for PSTs to learn and develop their own practice. SBCTs have been shifted out of their school context and into a university context, but the boundaries are blurry as they are regularly being asked to draw on their school context. The SBCTs came to the role confident in who they were in their current context (school) and ready to “give” their experience and knowledge to the PSTs in their new context (university) as there was value in their experience and knowledge in both their current and new contexts. However, it is important to consider where/how SBCTs can value add to program to assist them to recognize the need for a change from teacher to teacher educator, a move beyond sharing tips, tricks and good activities and a shift into what Korthagen et al. (2005) refer to as the complex dual role of teaching teaching/teaching science. SBCTs need to become aware of and accept the difference between modeling and mimicking which may include a reframing of the SBCTs’ ideas of teacher knowledge, expertise, and pedagogical approaches, which are all areas suggested by White et al. (2015) as being areas of need for professional learning for those working in ITE.

Conclusion

This study shows ways that co-teaching in ITE provides a powerful and positive learning experience for SBCTs as a form of professional learning and a supportive space to reflect on and become aware of their PCK. Crossing the boundary is enhanced through the development of a co-teaching partnership (with UBTEs) that is negotiated and involves a shared understanding of the roles and responsibilities of each co-teacher. Initially, some SBCTs held a view that their contribution was all about

giving back to the profession and sharing experiences from the front line. While this is certainly part of what SBCTs can offer, as they began to see themselves as teacher educators, they also developed an appreciation for the ways PSTs learn to be teachers and the significant contribution they could make to the quality and depth of this learning that would go well beyond providing “tips and tricks.”

Despite the small sample size, this study has indicated that there are some important considerations to make when working with SBCTs in teacher education. It is important to take the time to identify the strengths of the SBCTs and ensure that these strengths are being highlighted in ways that truly add value to the ITE program and to the PSTs experience. There is no point in having SBCTs do exactly what the UBTE are already doing, it should be different, and it should be specific to their expertise. SBCTs need time to become sensitized to the co-teaching and ITE environment. As a co-teacher, UBTE need to play a role in this learning, being open to co-teaching and crossing into a new site of practice and expertise with the SBCT, with the potential to transform and expand both co-teachers practice and identities. Preparation for co-teaching needs to include having STEs and SBCTs arrive at shared understandings of not just the aims of the unit and the ITE program, but of the SBCTs role in the unit and program. If this is not shared and mutually agreed, it could lead to miscommunication and confusion for all stakeholders. Finally, we (the authors) will continue to look for ways to make our SBCTs experience more than the work of an individual co-teacher and will endeavor to get whole schools on board as part of the ITE program, as our data suggests that having the support of the SBCTs school does make things easier and more rewarding for the SBCT. Further research should explore the influences of SBCTs on PSTs learning and on the STEs learning as part of furthering all stakeholders learning about learning to teach science. Future research could also consider the roles and dynamics that occur in the co-taught classes between SBCTs and UBTEs, and whether this effectively makes the most of each individual’s strengths and experiences.

School—university partnerships are an essential part of ITE, but their potential as professional learning sites for UBTE and SBCTs is yet to be fully realized. In this article, we focused on the learning of four SBCTs and highlighted the many ways that their experiences co-teaching in ITE have provoked their thinking about themselves and their practice. Co-teaching gives permission to all participants to bring their knowledge and expertise to the fore and have it valued and sets the conditions for UBTE to work as boundary objects to support transformational learning. The co-teaching relationship is fueled by the dialogical learning mechanisms that provide the conditions for such professional growth. In this way, co-teaching enables knowledge and expertise to be shared as a source for the creation of new practices and identities within this site of practice and beyond (transferring back to the school site of practice).

Pre-service teacher learning is then enriched through the many perspectives that are shown, the way these perspectives are valued and the way they are open and honestly critiqued through ongoing dialogue.

Furthermore, the “magic” of the co-teaching relationship is when something new emerges during teaching in this new site of practice, for which the SBCT found quite satisfying and contributed to their own professional growth, as Belinda summarizes:

“Every so often you meet in the middle, and you diverge again and meet in the middle and diverge again. The reason I say that is that there’s a lot of commonalities in what we do and how we think and the way that we teach, but then every so often there is something that’s divergent and exciting. I think to myself, oh, I haven’t thought about teaching that way” (Belinda, interview).

Data availability statement

The datasets presented in this article are not readily available because of the personal nature of the data. Requests to access the datasets should be directed to RC, rebecca.cooper@monash.edu.

Ethics statement

The studies involving human participants were reviewed and approved by the Monash University Human Research Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

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Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

Acknowledgments

We wish to acknowledge the support of our Science Education Colleagues and the enormous contributions of the co-teachers in this study.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Appendix

Appendix A

Secondary science school-based co-teachers initial survey.

1. Why have you decided to be a SB co-teacher this year?
2. What do you think is the purpose of your role as a SB co-teacher this year?
3. What are you looking forward to the most this year?
4. What do you think will be the challenges within this role?
5. What do you feel you can offer pre-service teachers in the way of knowledge, skills or dispositions?

Appendix B

Co-teacher interview questions.

Background:

- . Subjects/years teaching/types of schools

1. Motivation:

- . Why did you decide to become a co-teacher?
- . Have you had any prior experiences as a co-teacher? If yes, what?
- . Did you have any expectations of what you wanted to learn/gain/offer from taking on this role?

2. Understandings of co-teaching:

- . Can you explain what you think “co-teaching” is?
- . (How) have your ideas about co-teaching changed over your experiences of working in this role at Monash?
- . How did your expectations of the co-teaching role compare to your actual experiences of co-teaching?

3. Understandings of own science/chem/physics (insert specialism here) teaching:

- . How has the experience of working as a co-teacher influenced your own (specialism) teaching? (If at all).
- . Can you identify any changes in your *thinking about* (understanding of) your practice and/or your actual classroom practice? What? Why? (Follow up, press for examples and elaboration).

4. Understandings of learning to teach science (specialism):

- . What, if anything, has changed in your *thinking about* (understanding of) *learning to teach science* from your co-teaching experiences? (Follow up, press for examples and elaboration).
- . Has your approach to working with PSTs in the method classes changed at all over the co-teaching period? If yes, how? Why?
- . Do you supervise any PSTs in your school/support others to supervise PSTs? Is there anything that you do differently or that you would like to do differently to support PST learning based on your experiences as a co-teacher?
- . Can you describe an example of something that surprised/puzzled/made you stop and think about pre-service teachers’ learning to teach science (specialism)? Why did that surprise you?

5. Benefits:

- . What do you think have been the main benefits for you of the co-teaching experience?
- . What are the main challenges of co-teaching for you? What do you think might be the main challenges for PSTs?