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Using professional colleagues as interviewers in action research: Possibilities and pitfalls

Anne Hume and Jenny Young-Loveridge
Faculty of Education
University of Waikato

Abstract

In this study of her university teaching practice in science education, an action researcher sought the collaboration of a colleague to address research design issues related to researcher bias. The colleague worked in another field of study (mathematics education) but was experienced in qualitative research, notably interviewing. Acting as an outside interviewer, the colleague used her skills related to the dynamics of interviewing and her knowledge of the content of the study to elicit pertinent information from interviewees about the effectiveness of the first author's teaching. The additional expertise enhanced the quality of the study considerably and highlighted how "two heads can work better than one". In the process both researchers gained appreciable professional knowledge from each other. The first author gained a greater understanding of the interview process while the second author acquired an appreciation of how pedagogical content knowledge (PCK) is viewed within the context of science, raising the possibility that there are some differences in the way that PCK is conceived within science versus mathematics. The collaboration also raised some unforseen issues that may have impacted on the nature of the findings. This paper discusses the positive outcomes of using a colleague as an interviewer in an action research project as well as some of the pitfalls that can also accompany such teamwork. Consideration is given to the issue of balancing the costs and benefits of this approach to data gathering.

Key words

Action research, interviews, pedagogical content knowledge (PCK), researcher collaboration

Introduction

Action research is a form of systematic self-reflective inquiry undertaken collectively by participants in social situations, where the intention is not just to understand and

interpret their world but also to change it (Cohen, Manion, & Morrison, 2007; Kemmis & McTaggart, 1988). In the educational context this combination of research with action typically sees teachers and/or researchers as collaborative researchers, studying problems in their everyday professional lives and acting on the findings. In bridging the gap between research and practice, practitioners can achieve improvement in their understanding and in the quality of their practice (Engstrom, Engstrom, & Sunito, 2002; Keeves, 1998; Kennedy, 1997). Collaboration with professional colleagues holds much promise when the contribution that collective wisdom, experience, and perspectives can bring to problem solving are considered. The potential for sharing workload and gaining professional knowledge is also considerable.

This paper reports on our collaboration as professional colleagues where I (Anne), as an action researcher in science education, sought the assistance of my colleague and mentor Jenny to address research design issues related to researcher bias. While Jenny works in another field of study (mathematics education), she is experienced in qualitative research, notably interviewing. Her role was to act as an outside interviewer using her skills, related to the dynamics of interviewing and her knowledge of the content of the study to do with pedagogical content knowledge (PCK; Shulman, 1987), to elicit pertinent information from my student teachers (the interviewees) about the effectiveness of my teaching. The additional expertise enhanced the quality of the study considerably and both of us gained appreciable professional knowledge from each other. The collaboration also raised some unforeseen issues that may have impacted on the nature of the findings. In this paper we discuss the positive outcomes of using a colleague as an interviewer in an action research project as well as some of the pitfalls and give consideration to the issue of balancing the costs and benefits of this approach to data gathering.

Background to this paper

This paper emerged from my initial study into the use of Content Representations (CoRes) and their accompanying Pedagogical and Professional-experience Repertoires (PaP-eRs) to introduce, model, examine, and develop awareness of PCK for my science student teachers (Loughran, Berry, & Mulhall, 2006). In my view, the format of CoRes and PaP-eRs allowed the reader access to many facets of the PCK possessed by experienced science teachers in content areas commonly taught in junior science programmes. So as part of an ongoing action research programme concerned with the impact of various initiatives on the quality of student teacher learning, I decided to introduce CoRes and PaP-eRs into my secondary science and chemistry education programmes through a series of reflective and discussion tasks. I rationalised that through exposure to the CoRes and PaP-eRs of expert teachers, along with opportunities to design their own CoRes, my student teachers might gain access to the thinking and basis upon which expert science teachers make decisions about their pedagogy for particular science topics/concepts. The findings reported here do not relate specifically to the research questions that guided this first study, but rather to methodological side issues that surfaced during the study to do with professional collaboration and interviewing.

This paper is set in the second phase of the initiative when I reflected upon insights gained from the first trials with the use of CoRes and PaP-eRs in my teaching programme and used these findings to redesign the approach. In the second phase of the

initiative, my pedagogical purpose became more focused on helping student teachers acquire a set of generic strategies for developing the knowledge bases required for attempting to build the PCK components contained in CoRes. The study centred on the experiences of nine students in my chemistry teacher education course and I planned a pedagogical approach that had preparation for PCK development using CoRe construction as a key course objective. This approach included in the first stage a series of learning activities early in a concurrent science education course that familiarised student teachers with many of the sources of information that contribute to PCK development and to the thinking required for the selection and use of relevant information in designing a CoRe. These activities introduced and engaged students in critical analysis and reflection on the purposes of science education; the nature of science; the national science curriculum statement; learning theories and misconceptions in science; pedagogy and teacher beliefs about teaching and learning; assessment including national qualifications; and the worth of various science education websites and texts.

Then in stage two of my pedagogical approach, I set the student teachers in the chemistry education course a number of exercises targeted at the construction of a specific CoRe (for details of the pedagogical approach, see Hume & Berry, 2010). This stage began approximately 10 weeks into the 30-week programme after my student teachers had experienced their first teaching practice in schools (six weeks' duration). The overarching research question that guided my inquiry was

- how effective was the scaffolded approach to CoRe construction in providing a possibly useful foundation for the development of PCK for particular chemistry topics?

To guide data coding and analysis, I posed the following sub-questions:

- How did the scaffolding strategies enhance student teachers' abilities to design a CoRe?
- To what extent did the content of their CoRes reflect the components of PCK as identified by Magnusson, Krajcik, & Borko (1999)?

Methodological approach

This inquiry was conducted within an interpretivist paradigm using a case study approach (Bryman, 2008; Cohen et al., 2007), where knowledge of the situation is gained from the viewpoint of individuals taking part in the ongoing action being studied, and using a research design known as *practical action research* (Creswell, 2005). This methodology, as outlined by Creswell (2005), comprises a general spiral of generic steps that allows the researcher to pursue solutions to identify problems in collaboration with other researchers or mentors, and to enter the spiral at any point appropriate to the particular action research project. I had used this practical action research design over a number of years with some success in my role as teacher educator to introduce and evaluate various initiatives in my teacher education programme, including reflective journals and co-constructive teaching and learning approaches (Hume, 2008, 2009, 2010). The CoRe initiative arose as part of this ongoing action research.

To address any conflict of interest—since I was researcher, course teacher and assessor—and reduce the likelihood of researcher bias (Erickson, 1998), I approached

Jenny to act as a collaborator in the research by carrying out the interviews. My rationale was that the student teachers might feel more comfortable with a neutral interviewer and therefore be more open and honest in their conversations. Also the experience and skill of my mentor might provide more insights into the student teachers' views on PCK, and the effectiveness of my scaffolding strategies and the CoRe design work on their PCK development. To understand the contribution an outside interviewer can make to the quality of a study like mine, I think it is valuable at this point to share some of what I have learned about the nature and function of interviews as a research tool since undertaking this collaboration with Jenny.

Interviews as a research tool

Researchers who seek information from the perspectives of the participants engaged in the action under study commonly use interviews as a key tool for producing knowledge related to their research goals (Cohen et al., 2007; Burns, 1994). An interview, as its name suggests, involves the interchange of views about a theme of mutual interest between an interviewer and interviewee in a professional conversation (Kvale & Brinkmann, 2009). What distinguishes an interview from a conventional conversation is the question and answer approach initiated by the interviewer. According to Kvale and Brinkmann (2009), "an interview is a conversation that has a structure and a purpose … a careful questioning and listening approach with the purpose of obtaining thoroughly tested knowledge … the interview researcher defines and controls the situation." (p. 3). Through this focused and responsive approach, the effective interviewer facilitates the active and collaborative construction of often strongly contextualised and thoroughly tested knowledge through interactions between himself/herself and the interviewee.

When considering research design, the decision about interviews as an appropriate research tool within a chosen paradigm depends very much on the nature of knowledge sought and "fitness for purpose" (Cohen et al., 2007, p. 354). The researcher needs to be clear first about the "why" and "what" of the study before the "how" can be determined (Kvale & Brinkmann, 2009). Once the purpose and content of the study are defined, and interviews are accepted as a component of the research methodology, then the degree of structure put upon the interview must be decided. In qualitative research, often the research topic is "uncharted territory" and requires great flexibility in the research design.

In educational research, semi-structured interviews are frequently used as exploratory tools to seek participants' interpretations and conceptions of phenomena about which the researcher has little knowledge. Such interviews have little structure by way of procedures for carrying out the interview and would typically comprise a sequence of themes to be explored as well as some suggested questions. This format provides the openness and autonomy needed by an interviewer in an exploratory interview. As in all interviews, the interviewer is the research instrument, but in semi-structured interviews the role of interviewer is vital in ensuring the validity of the knowledge produced. Many of the methodological decisions have to be made by the interviewer on the spot as he/she follows up on and formulates new questions to probe and expand upon answers provided by the interviewee during the conversation. The quality of the knowledge produced in this mode of interview relies heavily on the skill, knowledge and judgments of the interviewer and is determined by how well the knowledge co-constructed in the conversation answers the research question(s). The

competence and craftsmanship of the interviewer is contingent on him/her knowing what they are asking about and why they are asking; that is, the content of the interview, and their ability to promote the dynamic dimension, in other words, good interview interaction and flow of conversation (Kvale & Brinkmann, 2009).

Thus in our study, to capitalise on Jenny's craft as an interviewer, I opted for a semi-structured interview format using a set of standardised, open-ended questions with prepared prompts should they be required (see Appendix 1). These questions were designed to give some structure to the interview by addressing the content of the study and facilitating later data analysis. They were also designed as "conversation starters", giving Jenny latitude to use her craft to explore the topic and engage in an exchange of views with the interviewees in a relaxed and semi-formal fashion (Bell, 1999; Kavle & Brinkmann, 2009). The schedule of questions served as checklists for Jenny to ensure all relevant topics were covered, while also allowing her to explore the responses and views of the individual interviewees as she saw fit.

Findings

Jenny interviewed four of the student teachers individually. These interviews proved to be a valuable source of data for answering the research questions (see Hume & Berry, 2010, for a full account of the findings), due in large part to the skill of Jenny in drawing out pertinent information from the research participants. My student teachers were appearing to gain deeper understanding of PCK and its components as a direct result of my strategies including CoRe design. Jenny followed the semi-structured question schedule in all interviews, but each interview was characterised by sub-questioning that was responsive to and particular to the student teachers' viewpoints. Of particular note was Jenny's ability to relax the interviewees such that they spoke freely and naturally. The transcripts clearly show lengthy contributions from the student teachers regularly punctuated by short confirmatory comments or questions from Jenny that encouraged rather than stopped the flow of conversation. Active listening and curiosity on her part were strongly evident. The following excerpt from an interview with a student teacher Isla (a pseudonym) is representative of the nature of the interactions that occurred in the interviews. (Note Jenny's comments are in bold in the following excerpts from the interview transcripts and the interviewees' comments in plain text)

> **Right … so thinking about workshop activities … like you had scenarios that Anne presented that you talked about. How helpful were they?**
>
> With me … it's been really helpful, it's not PCK, it's actually content knowledge … cos I'm returning from the workforce. And so I've found some of the approaches are good to help PCK, but also to actually help with just refreshing content. I think that actually applies to everybody … cos you're targeting content knowledge at a different level, aren't you. … **Mmm**. … So the exercises that she's had us do … we had … fair testing exercise was really good. So we were actually doing a fair test, so she was demonstrating to us, I guess, that … how you actually go about giving feedback and feedforward as part of that whole process, … **Okay** … so we were the learners and … **Oh** … doing a fair test and then

> presenting and of course modelling that feedback and feedforward approach … **Right** … which is really, I think, helpful … **Right** … cos in fact you don't really think about feedback and feedforward and if there's a difference. Now I know there is. I found … well a whole range of things … some of the misconception work … **Mmm** … understanding misconceptions … and being aware of those and getting insight in where you go and look for those, so that you can build that into your PCK, so you're aware of how you approach learning … the impact that can have later on.
>
> **So where do you go and look for them?**
>
> Well, the website, but then there's the … chem … chemsource? … chemsource, I mean she's given us some references [… …?] …
>
> **So basically on the Web that you can go to various places and get that information.**
>
> And we had to actually do a project on misconceptions and I chose atomic structure. So you're actually having to do the doing. So it's that double whammy once again … **Mmm** …, when you do it as well as hear about it. … **Mmm** … And if I relate that to some of our other courses, I think we hear it, but not necessarily doing it. … **Mmm, okay**.

The interviewer's generic understanding of the concept of PCK enabled her to engage with ease during the early phases of the interview. In this excerpt she initiates the discussion by exploring how a student teacher, Carol (pseudonym), views PCK.

> **So we're looking at what Anne's been doing in terms of developing your pedagogical content knowledge. So do you want to start by telling me what that term means to you?**
>
> How you teach a certain subject. So for every different subject there's different ways of getting across different information. Like for Science, certain things like experiments, yeah things like that will be better for getting across the science information than if you're doing a different subject. Knowledge that is drawn upon, it comes from experience as well, yeah.

The interviewer's genuine curiosity about how the foundations of the student teachers' specific PCKs were being formed during their learning experiences then provides the momentum for continued engagement throughout the rest of the interviews. After some initial discussion about the lecturer's approaches in workshops, the interviewer encourages Carol to elaborate on a specific strategy that reveals aspects of her professional learning about the nature of science.

> **Okay … just zoom in on the post box activity … tell me a bit more about that.**
>
> So, there'd be stations around the room and I think we did it for "the nature of science", so there were statements … this was probably in the first week so I can't remember what they were exactly. We'd have to write what we thought about it and it was all anonymous so you put it in the box. But we actually did it in partners, so it was good to have a bit of

> a discussion first … put it in the box, move round to the next station and then write about the next statement and then, at the end, everyone would be assigned a box and then have to write up a poster of all the … what everybody had put in that box. So it would be like a display of what everybody thought. So … yeah all the different ideas about a statement to help our understanding of the nature of science … it was kind of an introduction kind of thing.

As stated earlier, analysis of the interview data in relation to the research questions did substantiate the findings that were emerging from other sources of data like the reflection journals and completed CoRes. However, there were instances as I listened to Jenny and my student teachers in the recorded interviews and read the transcripts that I felt the need to know more. Sometimes my student teachers raised certain points/issues in the conversations that I wanted them to expand upon but Jenny had instead moved on to different topics. In each of these instances I experienced a sense that Jenny had missed a "golden opportunity" by not delving further into the student teachers' views and revealing new insights. For example, here Isla talks about the benefits of creating a CoRe collaboratively and mentions bringing in expert teachers to help.

> **Okay … the CoRes … you've mentioned the CoRes … that's been quite particularly …**
>
> Yeah, I think they're really good. It was actually quite … hard … hard to do. And I found in Chemistry, we've done a couple and we've done them as a team and I found that really good …
>
> **Cos you can all be putting in?**
>
> Yeah, and I think you could improve even further by … if you could bring in expert teachers and actually help … even if you had an interview situation to try and [drive?] out some of the … best ways of delivering the material.
>
> **Okay … what about unit planning?**
>
> We only touched on that towards the end.

In this interchange I was curious to hear more from Isla about why and in what way an expert teacher would have been able to help her with the CoRe design task. Such a discussion line may have revealed more about Isla's perceptions of PCK development and how it might happen best for her.

On another occasion, when interviewing Carol, Jenny prompted the student teacher about some of the pedagogical strategies that had been used in the sessions.

> **Okay, what about … she used scenarios … I can't exactly imagine what they were like, but do you remember having scenarios in class to think about and discuss?**
>
> Yeah, she did say … "If you were asked to plan a unit, what would you do?" So, for example, if on our practicum you were just thrown in the deep end, how would you start? So that was how she introduced all the different places we could go to find information.
>
> **And you mentioned group work. Was that quite a useful approach?**

> So we've done a couple of presentations in groups. That was quite good because we've been able to all work together and do separate parts using Google Docs. So we've been able to collaborate and add bits online each and then at the end present it … say our own bits.

Reflecting on this exchange, I would have liked Jenny to probe and encourage Carol to expand upon her response about the planning scenario before moving onto the group work strategy. I wanted further information because I had deliberately used this planning scenario in my pedagogy to introduce the notion of teachers' professional knowledge base, as proposed by Shulman (1987), including the PCK concept. Feedback from the participant student teachers on the effectiveness or not of this strategy for raising awareness of the knowledge base they need for teaching was significant to my investigation.

In other instances, Jenny pursued points that led the discussion away from the content of the study. Both Jenny and the interviewee in these "interludes" exchanged views with great interest and enthusiasm. However, although the data often bore little direct relevance to the research goals, they did potentially enable Jenny to gain better access to the participant's worldview. Here, for example, a student teacher, Alice (pseudonym), was discussing her realisation that PCK development came only with classroom experience of teaching, and also how much cultural differences between New Zealand classes and her homeland classes could impact on her PCK in each of these educational contexts. She referred to her sons' experiences in a local New Zealand high school as being "under less pressure and more interactive". Jenny encouraged her to elaborate on these experiences to reveal potential new insights into Alice's understanding of PCK, when the topic of music arose. (Music is an area of great love and interest to Jenny!)

> **And are they in a school that has a more engaging kind of approach to their learning, do you think? You know, just thinking about the teacher on practicum where you were….**
>
> You mean in my sons' schools?
>
> **Yes, I am just wondering how much difference there is there … whether they're being given more involvement, more group work and things or …?**
>
> Yes, they're in …… High School. There's lots of activities and they are very involved in music. So I think that in music there's a lot of interactions and group work and they have to present their work in solos and ensembles and all that.
>
> **Perform?**
>
> They have to perform and they get a chance to … they're also in the university music programme. They are thoroughly enjoying themselves.
>
> **They're not Suzuki violinists, are they?**

At this point an animated conversation about music continues for four minutes before Jenny attempts a return to the content of the interview, namely development of science PCK.

Conversely some other instances where Jenny pursued lines of inquiry linked to her own personal interests did ultimately reveal important information about a particular component of the student teachers' emerging PCK. For example, Jenny's personal interest (because of her own children's experience of it at school) in pursuing the student teachers' opinions of the New Zealand Certificate of Educational Achievement (NCEA)—a national qualification for school students—exposed some of their beliefs and values concerning the teaching and learning of science In this excerpt Matt initiates a discussion about NCEA when he comments on a workshop where I had introduced the student teachers to the qualification.

> Well, I look at this NCEA, and we did a workshop and we could … we were trying to find out to see the difference between school hours at another school and Internet access. They were getting … kids were getting like eighty percent … eighty, ninety percent … external they were going down to thirty, forty percent. And I thought … you know, what's the difference between this? And then I was … I have quite a few classes where I just sat with the kids and chatted with them. And some of them they don't really care as long as they get that "Achieved" … who cares [… ?] ….
>
> **The "Achieved", you mean?**

For over seven minutes Jenny encouraged Matt to voice his opinions on NCEA where he expressed strong views that the qualification demotivates students in their learning, promoting superficial rather than deep understanding of science. Later in her interview with Carol, Jenny actually instigates a conversation about NCEA. Again, while first appearing "off topic", these interchanges eventually revealed some important beliefs that Carol had about teaching and learning science, which could potentially influence her future PCK when teaching school students how to undertake scientific investigation.

> **Does it [NCEA] capture all the things that you would want to be encouraging in kids or … you know, are there other things that you might be wanting to encourage that aren't captured by the standards and the credits and all of that?**
>
> I guess … like … skills aren't really assessed by NCEA sometimes … even like experiments maybe, and I guess in class, as a teacher, you have to be aware of who's doing experiments right and who's using their things appropriately and using the right techniques … whereas that's not really assessed but I think it's still really, really important to be able to do experiments properly, especially in science and chemistry … even like measuring things properly with pipettes and things like that … I guess it's kind of assessed in their chemistry, but it's more about the results, I guess, rather than the actual techniques.

Discussion

This foray into collaborative research using a colleague as a neutral, outside interviewer proved to be a very successful venture. Key to the success of this collaboration was Jenny's skill in promoting the dynamics of the interviews (Kvale & Brinkmann, 2009)

in ways that enabled the participants' perspectives to be elicited easily. Her ability to relax research participants and draw from them extensive information to inform the study came from her in-depth knowledge and personal experience of the interview as a research tool in a range of projects (e.g., Young-Loveridge, Taylor, Sharma, & Hāwera, 2006; Young-Loveridge, 2005). She specialised in questioning that was concise and pertinent to the study, yet sufficiently open-ended to give the participants freedom to express their views fully and in their own fashion. Her frequent and timely use of phatics (expressions signalling to the speaker the continued interest and attention of the listener e.g., "mmm", "right") engendered a sense in the participants of her attention and involvement in what was being said without disturbing the flow of conversation (Bull & Roger, 1988). By showing willingness to exchange views and contribute her personal feelings and thoughts to certain aspects of the conversation, Jenny gave further evidence to the student teachers of her genuine interest in listening to and responding to their views with understanding. The non-involvement of Jenny in the delivery of the course, coupled with her genuine desire to draw out the student teachers' perceptions of their experiences, lent support to her neutral researcher role and gave me confidence that we were reducing researcher bias effects (Erickson, 1998).

The involvement of an experienced colleague in interviewing enhanced the overall trustworthiness of the study (Guba & Lincoln, 1989), but what prompted or motivated her to assist the study in this way? After all, she had not initiated the study nor had she been party to the implementation of the intervention. Why would she commit her time and energy to such an undertaking? The literature on motivation distinguishes intrinsic motivation (arising from internal factors like natural feelings of curiosity, excitement, confidence, and satisfaction from performing a task well) from extrinsic motivation (where there are tangible rewards) (Krause, Bochner, & Duchesne, 2007). Doing an activity that one finds interesting may simply be the goal (Deci & Moller, 2007). Here in her own words, Jenny describes her recollection of how she became involved and her reasons for responding positively to a colleague's request for help.

> Reflecting back on why I agreed to be involved in interviewing Anne's students, I can't quite remember precisely how it came about. We had had some interesting discussions about PCK, a concept not well recognised or understood by many of our colleagues. In mathematics education, the traditional approach to teaching involves the teacher demonstrating the (one) right way to solve a problem (using a rule-driven procedure), then asking the students to practice by doing a large number of similar problems out of a textbook. Reforms in mathematics education over the past couple of decades have shifted the emphasis away from instrumental/procedural/rule-governed/calculational approaches towards a conceptual/relational approach that is designed to foster understanding by students. In order for teachers to develop the PCK necessary for teaching conceptually, they need to have a deep and connected personal understanding of the mathematics.
>
> It was heartening to find someone else who recognises the importance of teachers having strong PCK, albeit within the field of science education. I had read considerable literature on PCK in mathematics and I was intrigued to know how that might look in science. Anne had described some of the activities she had developed for her students to help them

> come to understand more deeply about science concepts. I was curious to know more—some might say I was being nosey.
>
> Anne raised the topic of getting a colleague to interview her students. Knowing that I had developed good interviewing skills over many years of doing research with children and adults, I thought it would be an additional challenge to see if I could interview blind—that is, explore an area where I did not know anything prior to the interview about the possible answers to the questions. It meant that I could be genuinely curious. I was aware from the literature that there are many commonalities between mathematics and science in terms of PCK, and I was intrigued to see the extent to which that was true. When Anne offered me the chance to be involved in a new project, I was keen to take up that opportunity as I hoped (expected) to learn something new. I felt there was potential for my own scholarship to be enhanced by working alongside others with similar interests and approaches to their research.
>
> I found the experience extremely interesting and enjoyed conducting the interviews. Using my skills to help a colleague achieve her research goals gave me immense satisfaction. The development of this paper as an account of our experiences has been a professionally rewarding, if unanticipated outcome. Our discussions have raised many important issues of mutual interest and clarified our thinking about the nature of PCK.

When I reflected on the research process, I realised that I had gained a much greater understanding of the interview process. As Jenny reflected on the nature of PCK in science, she raised the possibility that there may be important differences in the way that PCK is conceived within science compared with mathematics. These differences could reflect fundamental differences in the nature of these disciplines especially their ways of thinking. In particular, she wondered about the extent to which PCK can be built through university coursework, prior to the unique experiences in classroom teaching to which each student teacher is exposed.

Any potential disadvantages of collaboration for this study perhaps lay in the Jenny's lack of deep understanding of the contextual content; that is, the conceptual framework of chemistry and the associated pedagogies for student teachers and school students. Consequently she was unable on a few occasions to recognise opportunities for deeper exploration. In hindsight, I could have better prepared Jenny through more intensive briefing, both before and between interviews, about the anticipated nature of responses. However, given that I was uncertain about what findings to expect before the study and only became aware of the need for extra information after the event, such prior discussion may not have proved beneficial. It is more likely that ongoing analysis and discussion of the findings by researcher and interviewer after each interview would have exposed any areas requiring further investigation. Subsequent modifications to the interview schedule could have potentially enhanced the quality of the findings. Circumstances at the time of the study prevented this from happening. Re-interviewing participants or requesting more information from them about points of interest that emerged after analysis of the interviews (via phone, email or letter) are other options worth considering in future ventures.

In conclusion, our findings indicate that this kind of collaboration can be extremely profitable to participating researchers. The advantages that a skilled and expert collaborator are able to bring to a research project are obvious from the outset but there can also be other mutually beneficial spin-offs, like personal satisfaction and, in this instance, co-authorship of a paper arising from the research process itself. Both of us also acknowledged growth in our own professional knowledge such as the nature of PCK and how it is perceived in different disciplines, and the nuances of interviewing. In the end, the pitfalls proved to be relatively minor and with more forethought easily addressed in the research design. What appeared initially to be "off-track moments" sometimes resulted in valuable insights. Although we initially saw these diversions as pitfalls to be avoided, further reflection led us to an appreciation that the choice of any particular method for gathering research data inevitably involves a balance between costs and benefits.

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APPENDIX 1

Interview schedule for Core Study

Overall research purpose: to determine the effectiveness of Anne's pedagogical approach in promoting the development of your PCK in science/chemistry.

Opening question

Talk to me first about your understanding of this concept called pedagogical content knowledge i.e., PCK.

Key question 1

How successful was Anne at helping you to begin developing your PCK in science and/or chemistry in the course(s) that she taught and you participated in?

Prompts:

- Why was this? Could you elaborate?

Key question 2

Are there any particular pedagogical approaches and/or strategies that she used in the course(s) that contributed positively to your PCK development and how and/ why? Which strategies were least effective and how/why?

Prompts

- Workshop activities? E.g. use of scenarios, post-box technique, group work;
- Templates? E.g. the lesson planning template;
- Professional tasks? E.g. readings, concept mapping, CoRes, unit planning.
- The Shulman framework?
- 10-minute reflective writing slots in class?
- The use of reflective writing exemplars?
- Keeping the reflective journals?
- Verbal and written feedback and feedforward comments?
- Use of learning intentions and success criteria?
- Achievement criteria in assessment schedule?
- Others?

Key question 3

What skills/capabilities will you take from this course(s) to continue to develop your PCK in your professional life as a teacher?

Prompts: e.g. reflective thinking and writing, constructing CoRes.

Key question 4

Do you have any suggestions you would like to make about ways in which Anne could improve the way she promotes the development of PCK in her course(s)?