Who's asking the questions in classrooms? Exploring teacher practice and student engagement in generating engaging and intellectually challenging questions

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Abstract

Student engagement that leads to enhanced learning outcomes involves three interdependent facets: behaviour, emotion and cognition. As such, learning activities that encourage deep learning and the intellectual challenging of minds should provide opportunities for reasoning and critical and creative thinking. An approach that resonates strongly with student engagement involves fostering student voice in the classroom, and the generation and utilisation of students' questions is one means of achieving this. Implicit in this approach is the need for both teachers and students to pose questions that engage and intellectually challenge thinking. In this pilot case study, eight volunteer teachers from one school chose to investigate their own practice by either focusing on their own questioning skills to foster student engagement in the classroom or, on how they could support their students to generate intellectually challenging questions that lead to increasing student voice, engagement and deeper learning in the classroom. Key findings were that *who* does the questioning is not an either-or dichotomy, and that significant pedagogical shifting requires a long-term focus. This shift is influenced by teachers making a commitment to use questioning as a pedagogical approach for student learning.

Keywords: questioning; professional learning; pedagogical change; student engagement

Introduction

This study is founded on a sociocultural theoretical perspective (Sewell 1999), wherein teaching and learning are seen as what Siry (2013) describes as a 'social act', during which collaboration, relationship building and everyday experiences and interactions contribute to learning. Furthermore, Ferguson, Hanreddy, & Draxton, 2011, p.56) identify characteristics that include using a range of instructional activities and approaches and, the provision of opportunities for meaningful choice-making and mutual trust between student and teacher. Such descriptions build upon Vygotsky's (1978) theoretical framework that links social

interaction with the development of cognition. As Barak (2017, p.285) describes, socio-culturalism emphasises the unity and interdependence of learning and development.

The study focused on how teachers supported students in generating engaging and intellectually challenging questions. Intellectually challenging and motivating questions, be they teacher or student generated, is critical to student engagement and learning. During the study the teachers chose to either investigate their own questioning practices in order to assist students to raise engaging, intellectually challenging questions or, to focus on supporting their students to generate and utilise their own questions, as a step towards increasing student voice, engagement and deeper learning in the classroom.

'Student voice' is a contested concept (Fielding, 2012, p.48) and has often been equated with elements of student self-governance, for example when planning for school fund raising, but has rarely involved students with integral decision making about their own education. As Groundwater–Smith (2003, p.4) commented,

> Schools exist to educate their students, but it is a curious thing that as the "consequential stakeholders" with respect to the many decisions that go into the organisation of schools, curriculum and assessment practices and the like, they are rarely consulted about what happens in their classrooms, in the playground and more generally in the ways in which the purposes of schooling are discussed.

There are numerous studies on student voice and this is not a new phenomenon, or focus of analysis (Rudduck & Demetriou, 2003; Rudduck, & Flutter, 2004; Toshalis & Nakkula, 2012; Ontario Ministry of Education, 2013), with many focusing on researching the politics and processes of seeking out student voice (Cook-Sather, 2014, p. 132). One current focus on student voice places an emphasis on acknowledging students' rights, upholding respect for students, and addressing the power dynamic between adult and student. Related with this, Hutchings, Huber and Ciccone (2011, pp. 39-40) argue the need for students to be enlisted as "co-inquirers, collaborators, and partners in formulating questions, generating and analysing data, making sense of findings, and lobbying for change".

Others, such as Seiler (2011), focus on student voice as a means of reconstructing curricula through students' choice. As Cavagnetto, Hand, and Norton-Meier (2011, p. 207) found, well-supported student negotiations about content and inquiry increased student ownership

and engagement in tasks. Such cognitive autonomy (Stefanou, Perencevich, DiCintio, & Turner, 2004, p. 105) may have more long-lasting effects on engagement and motivation. In this study we used Seiler's (2011) view of 'student voice' by focusing on student decision-making in their learning space.

Student motivation is another element of improving students' learning outcomes. As Fleming and Panizzon (2010, p. 27) found, intrinsic motivation is maximised when students have some ownership and responsibility for decision-making about their learning. Similarly, Toshalis and Nakkula (2012, p. 2) reported that students were more likely to be engaged in activities when they not only had a voice in how learning activities were conducted, but also in how these activities concluded. An inter-related approach to student engagement involves fostering student voice in the classroom through student generated questions. Learning tasks and activities that encourage the intellectual challenging of minds involve critical and creative thinking, including problem solving, reasoning and, metacognition. The generation and utilisation of students' questions is one means of achieving this and, as Cavagnetto, Hand, and Norton-Meier (2011), referring to earlier work by Lemke (1990), assert,

> Teachers need to create environments where students can talk in real contexts. Language is central to establishing such contexts, not only on the individual level (personally while writing or reflecting), but also at the social level through listening to ideas, questioning ideas, and defending ideas. (p. 193)

Implicit in these approaches is the need for teachers to also pose intellectually challenging and engaging questions in the classroom.

This paper particularly focuses on one element of the study, teacher practice in the generation and utilisation of questions, either their own or their students'. It reports on a case study of eight volunteer teachers who, using an action research based methodology, reflected on and evaluated their pedagogical practices related to questioning in the classroom. The focus on student intellectual challenge through emphasising emotional, behavioural and intellectual engagement is an integral aspect of this school's approach to curriculum.

Background

In South Australia, public school education comes under the authority of the Department for Education and Child Development (DECD). DECD's Strategic Plan (2014–2017) envisions that "South Australia will have a strong public education system, characterised by high achievement, growth, challenge, engagement, and equity."
DECD's Teaching and Learning service priorities focused on:

- Student engagement, intellectual challenge and powerful learning,
- Promoting DECD's Leading Learning website: an online suite of resources and tools designed to support and challenge teachers to think about the Australian Curriculum in innovative ways that engage all learners to think creatively and critically, and
- Positioning teachers as intentional designers of learning, using best pedagogical practice, based on the evidence from South Australia's Teaching for Effective Learning Framework (TfEL) research.

To assist teachers in addressing these priorities, DECD partnered with the researchers in an initiative intended to assist teachers to develop engaging, challenging, and intellectually stimulating learning opportunities through a focus on teacher and student questioning. This focus built upon earlier research that explored how some primary school teachers had encouraged their students to generate and utilize questions in science in order to further their inquiry based learning (Author, 2003). In collaboration with the researchers, DECD's Director of Pedagogy and Leadership decided to trial a questioning-based pilot study in one metropolitan primary school. One of the motives was to determine if the study might have relevance to other schools and thus could be implemented on a larger scale.

The pilot study that is reported on here was conducted in a progressive South Australian metropolitan public school with a dynamic leader and a strong leadership team. At the time of the research, the school had a teaching staff of 42 and an enrolment of 718 students ranging in age from five to thirteen years, with twenty five percent of the student cohort being NESB.

Method

The study involved an action research based approach that was responsive to the school's priorities and the teachers' needs. It was emergent in terms of developing pedagogical practice, and involved critical reflection about past, current and intentional practices. The study investigated whether these teachers' pedagogical practices changed when they chose to investigate either their own questioning skills in the classroom or, how they might encourage their students to ask intellectually challenging questions that lead to increased student engagement and evidence based learning. Thus, dialogic teaching (Sedova, Sedlacek, & Svaricek, 2016, p. 15), wherein students' authentic questions influenced classroom practice, and a teacher's focus on provoking thoughtful answers that are supposed to provoke further new questions, was at the forefront of this study.

The research questions focused on both the teachers' and students' questioning practices in the classroom. However, the teachers were invited to decide whether they would focus primarily on their own questioning practices, or those of their students. This invitation was made so that teachers could first heighten their awareness of questioning and not feel overwhelmed by necessarily having to attend to both simultaneously:

1. What are the teachers' beliefs about, and commitment to, the generation and utilisation of questions (*their own or their students'*) that intellectually challenge learners' minds?
2. How do the teachers describe their practice in the generation and utilisation of questions (*their own or their students'*) that intellectually challenge learners' minds?
3. In what ways do the teachers encourage a culture of question asking that intellectually challenges the learners' minds?
4. How has participating in the project enhanced students' learning?

Data were collected in four ways over fifteen months:

- an introductory on-school-site meeting with the volunteer teachers
- three half-day on-school-site focus groups meetings with the teachers and at least one of the senior management staff (principal and/or assistant principal)
- two on-school-site 30-40 minute interviews with the individual teachers, and principal, pre- and post- pilot

- Examples of each teacher's plans, actions and student learning outcomes.

The two sets of interviews and the three focus group sessions were audio-digitally recorded and notes were taken by each of the researchers to enable triangulation of the data. The data were analysed for themes against the research questions. Ethics approval for this study was given by the relevant Ethics Committees of both the University and DECD.

Participants and process

To initiate the pilot, an introductory session was held during one of the weekly, whole-of-school staff meetings. This session explained the pilot project using an interactive, questions-based investigation of rocks in order to model different questioning strategies, and sought volunteers for the year-long pilot project. Initially, eight teachers volunteered to investigate either their own questioning skills in the classroom, or how to encourage their students to generate and apply intellectually challenging questions that would lead to inquiry-based investigations. However, when the data collection phase of the study began, one teacher had relocated and so seven teachers continued in the initiative. The teachers were all female, ranged in experience from early career teachers (five years' experience) to almost end of career teachers (thirty-five years' experience), and comprised three junior primary teachers, one teacher librarian with an upper primary focus, and three primary teachers. The study was not specific to year level, discipline or age group.

It was originally intended that the project would be science focused, because of researchers' backgrounds. However, at the introductory meeting, the original eight teachers decided that they would initially prefer to choose a learning area that they were most confident about teaching, and thus were able to focus on their questioning practices. As it eventuated, this proved to be a critical step in enhancing the teachers' confidence levels and skill development. Thus, while the initial pitch for the project was to focus on the development of questioning skills within a science-based framework, five of the eventual seven teachers chose to focus on questioning skills in learning areas other than science. These learning areas included history (2), maths (2), English (1), early year's play (1), and science (2). In addition, one of the teachers was particularly interested in the alignment between her own questioning skills and those of her students, and she decided to focus on both aspects during the study. As the project developed, this alignment became a recurring theme as it became that clear that

focusing on one element of questioning (teachers' or students') inherently influenced the other.

To begin the pilot, a whole group introductory meeting of the teachers and researchers was held to further explain and explore project possibilities, and to address any questions. Initial individual interviews of 30-40 minutes were then conducted with each of the teachers and the school principal. This initial interview data identified the teachers' needs and interests, and helped to develop the structure and content of the three half-day school-based focus group meetings. These school-funded meetings concentrated on teacher-identified professional learning needs; the sharing of trials and tribulations; the successes, the difficulties and possible solutions. Throughout the pilot, the teachers kept a record of their plans, actions and outcomes.

Each of the three half-day focus group meetings was conducted in two parts. First the teachers were invited to share and show what they had been doing in and beyond the classroom. This integrated a cyclical approach that involved trialling a strategy, collecting evidence, showing and sharing outcomes with colleagues, and then reflecting and advancing practice. Interestingly, as the teachers' confidence in the questioning initiative grew, and as they developed strategies and collected more evidence of outcomes, this first part of the session consumed the majority of the time. The range of strategies included observing each other teaching; digitally recording lessons and then reflecting on their own or their students' questioning; having students pose questions that involved higher order thinking for which their peers had to find the answers, and asking questions that sought deeper elaborations on student's initial responses.

The second part of each of these sessions focused on a professional learning theme that had either been requested by the teachers, or was suggested by the researchers as additional support and information. These professional learning sessions addressed:

- What is action research?
- The *Bringing it To Life* (BiTL) tool – a pedagogical questioning scaffolding tool designed and developed by DECD (2016a) to address teachers' epistemological understanding as well as targeting Pedagogical Content Knowledge of the Australian Curriculum,

- The Teaching for Effective Learning (TfEL, DECD, 2016b) Compass - an online professional learning tool for teachers to enhance their teaching and learning practices through self-reflection, and collecting feedback from students and trusted colleagues,
- Questioning focused strategies incorporating Bloom's taxonomy (Atherton, 2013) and a question-starters list,
- the Structure of the Observed Learning Outcome taxonomy (SOLO) "a means of classifying learning outcomes in terms of their complexity, enabling the assessment of students' work in terms of its *quality* not of how many bits of this and of that they have got right" (Biggs, 1982).

On completion of the project, in term one of the following year, individual research interviews were again conducted with the teachers and principal. During these interviews, the participants reflected on the action research process and the outcomes of their own investigation of questioning in the classroom, against the research questions.

Findings and discussion

Identifying teacher practice that supported students in generating engaging and intellectually challenging questions, was fundamental to the study. Digitally recorded data from the interviews and the focus group sessions, together with written notes taken by the researchers, were used to answer the research questions. The focus group discussions involved each individual teacher's detailed description of their emerging practice, and evidence of student outcomes, provided the richest data. Five interrelated themes linked to the teachers' pedagogical practices emerged from our analysis of all of the data. These were:

1. challenging and enhancing teachers' existing practices
2. providing learners with engaging and intellectually challenging experiences
3. 'pedagogical shifting' rather than 'adding on' to practice
4. embedding change
5. collecting evidence: the what and the how

These themes have been used to shape the discussion.

1. Challenging and enhancing teachers' existing practices

Each teacher began the project by stating that questions and questioning were an important part of classroom practice. However, comparison of the pre and post interviews clearly identified enhancements in practice. Each teacher could now describe and provide examples of practices that demonstrated a deeper understanding about using, and giving students opportunities to develop and use more intellectually challenging questions, than they had prior to the project. Understandably, given the range of teaching experience in the group, the responses were wide ranging and varied. However, the journey was not necessarily an easy or comfortable one for each of them.

At the beginning of the project, some of the teachers seemed a little apprehensive about the focus on questioning, and their initial responses during the first interview were somewhat guarded. For example, a reception teacher said, "*What I find challenging at this point is how I will be able to do it with Receptions?"* (TVI1). Even so, each of the teachers provided clear examples of the strategies they already used in generating and using questions in the classroom. These included 'circle time' during class discussions when either the teacher or the students raised questions; big book sharing where questions were used by the teacher and/or the students; and questioning related to news of the day items. Despite their apprehension, each teacher expressed a desire to know more about how to develop their own questioning skills or those of their students. They requested resources, sharing of strategies amongst the group and by the researchers, pairing up for classroom observations, and using the planned focus group sessions as sounding boards.

As the project progressed each of the teachers became firmer in their belief that the generation and utilisation of questions, be it their own and/or those of their students, was of great importance. One of the teachers mentioned that, in general, her students had initially seemed reluctant to use their initiative in this area,

> *The children need to develop skills because I noticed [that] children sit there and wait to be told what to do. There's lot of that. And even mine this year, they still wait, and I've given them so many opportunities. And I'll ask those questions all the time but they don't do that independently. (TLI1)*

She also made links with a discipline not formally addressed in the primary school curriculum:

> *I am interested, and I think the topic of questions really interests me. Because I like to use questioning in my classroom and I've done a little bit of, I guess … I've participated in Philosophy for Children as well, which is a lot about questioning and getting kids to think about what they're thinking about and expressing it. And I still do a bit of reading on that as well and try to incorporate that. So, yeah, anything I can do to sort of stretch that in myself is something that I want to be involved with. (TLI1)*

Two teachers talked about question quality rather than quantity. One commented,

> *So I would like to develop that [i.e. questioning] in the middle years and just be able to say, 'We don't need more questions, we just need better ones.' So I think that's what I would like to do. (TLI1)*

In the final interview, two other participants reflected on their growth during what had clearly been a challenge:

> *(I do) less rescuing when students are having difficulties; I can now identify the types of questions that are not being asked by me e.g. reasoning and understanding type questions*. (TBI2)

> and

> *I think I've been moulding them like plasticine instead of creating the learners they could be; I hope it will be a natural practice soon because it's hard work having that level of consciousness all the time. (TDI2)*

When asked for an example of a significant change (Davies and Dart, 2005) that had occurred for her, a Reception/Year 1 teacher responded that the variety of questions she now used was the greatest change for her. She provided examples such as now using flipped, open, and closed questions to help children think outside the square, thus allowing children to show her what they knew and could do. She also encouraged the children to use different formats, such as drawing, to record information emanating from their questions.

2. Providing learners with engaging and intellectually challenging experiences

The opportunity to trial, reflect on, and modify their practices throughout the fifteen month project enabled each teacher to describe a range of questions-based strategies or experiences that had intellectually challenged and extended their students' learning. During focus group meetings teachers described their developing practices, and providing documented evidence of student engagement and cognitive growth. For example, one of the teachers noted that her students were more engaged, reflective, and divergent in their thinking, and were now willing to have a go at answering higher order questions, such as those involving inference and evaluation. Two others commented:

> *Students are thinking more, articulating their problem, using varied strategies, recognising their learning, finding other ways to solve problems, having thinking time before answering, responding more in class; collaborating on problems.* (TBI2)

and

> *I learned that children didn't understand about how to raise questions for investigations, they thought play time was investigating and that play time was free time.* (TJI2)

Another teacher found that effecting change was a lengthy process, commenting that it had taken nearly twelve months to fully develop a questioning approach with the class and by the children: "The children now know what (kind of) questions to ask, they have strategies and tools to use now".

In the second interview, the teachers were asked what they thought the most significant change had been for them. One of the teachers found that she was now able to identify question types that she had not been using nor addressing with children. She found that by monitoring and checking off her questioning against the DECD-developed BITL tool, she could then focus her planning on addressing the missing or scarce question types, for example, those requiring responses that involved student demonstration of reasoning and understanding.

3. 'Pedagogical shifting' rather than 'adding on'

The study focused on identifying teacher practice that supported students in generating engaging and intellectually challenging questions. While its primary focus was not to just provide teacher professional learning, inevitably the data showed that considerable teacher professional learning had occurred. While the nature of this learning varied, it was clear during the presentation of evidence at the focus group sessions, and particularly in the final interviews, that each teacher had: significantly developed her practice, rather than just acknowledging that questioning was important; had acquired and demonstrated new skills related to this; and now realised how powerful questions and questioning could be for student learning.

When providing examples, one teacher (TB) commented that prior to the project she thought she was using questioning well, but the project's focus on questioning had drawn her attention to the type of questioning she had been using, that caused her to reflect and significantly change her pedagogy. She clearly described examples of how she now embedded effective and innovative pedagogies. These included: setting clear learning intentions for her Year 5 students; incorporating questioning through mental routines; problematizing situations; and, drawing out student thinking in mathematics through the Australian Curriculum Mathematics proficiencies (fluency, understanding, reasoning and problem solving).

TB described how she used the BiTL questioning tool to support effective pedagogical practice and further develop her pedagogical content knowledge in mathematics. She was able to demonstrate this to the focus group by videoing herself during mathematics lessons and then recording the questions she asked. She then matched these questions against the mathematics BiTL tool to determine the type of questions she was asking. To her surprise, she found that she was not asking as many reasoning and problem solving questions as she had thought, and so she set herself the challenge to ask more reasoning and problem solving questions, and to develop students' positive dispositions to being asked these type of questions that were more cognitively demanding.

As result, she noticed intellectual growth in students' thinking and increased student resilience in pursuing answers as they went through the productive struggle with more complex questioning. For example, some of the students were able to self-correct as they

became more self-regulated and learned from their mistakes. TB reflected on her pedagogical shift:

> *Researcher: Do you think this would have happened [in your classroom] regardless of the questioning focused project?*
>
> *Teacher: No I don't think it would have. I wonder if I would have noticed how much she (Anne Baker, a 'Natural Maths' consultant) uses questioning if I wasn't thinking about questioning … But, because questioning was heightened in my mind I focused in on that. Cos. (sic) I've worked with her before and that [questioning] hadn't impacted on me before so yes, the questioning project has made a difference … Seeing questioning in action, having questioning in my mind and seeing how she [Anne Baker] uses questions, which made a big leap in my thinking … So I've changed my pedagogy a lot.* (TBI2)

Three other teachers commented on their pedagogical move towards incorporating questions as an underpinning element of planning for learning. For example, in the final interview one teacher stated,

> *Questioning has become part of [my] practice now. It's a big shift, I feel like everything's connected now and integrated – that's the big thing now … The essential questions and their generations of questions has been a big change.* (TLI2)

Another said that the project had opened her eyes to possibilities:

> *I have grown as an educator. I now go deeper in my own questions; look at questions in other learning areas now by using the BiTL tool; like seeing what the children are capable of when given the opportunity. We should not underestimate what children can do [and should] provide opportunities for more ownership of learning by students and for student voice.* (TAI2)

Not all pedagogical shifts require a complex strategy. For example, a third teacher (TV), whose focus was on developing a science inquiry approach with her Reception children, described what she termed "The power of *Might*." She described how, prior to the project, she would ask the students "What will you investigate today?" However, after reflecting on one of the focus group professional learning sessions about question starters, a turning point

for her was the realization that the children felt they had to come up with the "right" answer before they spoke, and often copied what someone else had said first, thinking that was the right thing to investigate. Because she wanted the children to think more creatively and investigate their own ideas, she decided to trial a strategy of changing just one word in her question. She simply changed the word "will" to "might" and asked, "What *might* you investigate today?" To her amazement, the children responded with many different ideas for inquiry and appeared more comfortable in sharing *possible* things to investigate. By changing that one word the question was loosened up and this shifted the children's thinking from one, to many possible responses:

> *I'm more reflective and more aware of the pedagogy. I'm [now] consciously asking 'what might' and 'what if' questions.* (TVI2)

Other teachers acknowledged that, while they were excited by the possibilities, they were also aware that more practice and opportunity was required for intellectually challenging questioning to be part of their everyday practice. This was particularly so for the non-classroom-based teacher who commented that the focus group meetings had really demonstrated the benefits of sharing ideas and practices with peers. She reflected that she would welcome having someone to work with in the future to further develop her practice:

> *Children's questions can be ambiguous and need refining. I did see some lights go on for some children. I need to become more adept at scaffolding the children who need this. For example, the quiet children*. (TTI2)

4. Embedding change

Exploring teacher practice that fostered student engagement in generating engaging and intellectually challenging questions, was central to the study and so it was important to determine if the notable changes in practice were likely to be sustainable. Changing, or even developing a questions focused practice isn't easy, even for those who might seek challenges and embrace new approaches. Would the teachers continue to apply their new knowledge about their own questioning practices, post project? While the pedagogical shift was clear, and implies embedded practice, answering this question would require a longitudinal study. However, data collected during focus group meetings, and the

teachers' open and thoughtful reflections in their final interview, suggest embedded change was likely for the majority.

As an example of embedded change, one of the teachers (TL) commented that she had now changed her whole approach to the planning and the design of tasks. She noted that she would now be making sure tasks were open ended, and was endeavouring to ask 'big questions' that challenged students' thinking rather than filling in the spaces for them. She commented:

> *Doing the quality assessment project at the same time [as this study] has helped. They go hand-in-hand and I have been able to make it work by doing them together. Otherwise I would not have managed both if independent*. (TLI2)

In the final interview the teachers were asked what had been the most significant change (Davies & Dart, 2005) for them in this project. The following comments provide a sense of the teachers' progress, and of their future oriented thinking about questioning:

A cross-curriculum focus on questioning:

> *(Teaching) Junior Primary means questioning all the time, not only in one subject. It's throughout the day and across curriculum*. (TJI2)
>
> and
>
> *(I) used question stems last term in science, and would now like to develop stem questions for maths and for question time* (TDI2)

A range of question types being used, adapting DECD's BiTL tool and/or Bloom's taxonomy:

> *K.E.'s help with BiTL (tool), and using the inquiry based questions has helped my learning. For example, for small homework tasks such as climate change and its influence on Indigenous people.* (TLI2)
>
> and
>
> *I (then) began using questions such as: What do we think the book is about? What do the pictures show us? What do we need to find out? Where is the setting? Where is the*

book based? Then I introduced them (students) to Bloom's taxonomy. For example, for analysis: What do you think are the traits of this character? … Oh, why do you think that he is an optimistic person? …and, Why do you think that that he's courageous? (TAI2)

A focus on the linguistics of questioning:

Rather than giving them an 'out', I (now) ask children who don't know an answer "if you DID know the answer, what might it be?" Allowing the thinking time often gives them time to come up with an answer. (TJI2)

5. Collecting evidence: the what, and the how

In an era of learning analytics, teachers are well versed in collecting numerically based evidence of student learning. However, for the teachers in this project, collecting evidence of their own developing practice, and of increased student engagement and capability in generating engaging and intellectually challenging questions, was in itself a challenge. The evidence provided during the three focus group meetings, and most particularly in the third, together with each teacher's reflections during the post project interview, provided a living picture of the journey and growth that had occurred.

While each of the teachers talked with increasing confidence about their use of their own or students' questions in the classroom, some were initially uncertain about how they might collect and demonstrate evidence of student engagement and growth in asking intellectually challenging questions. In response to this concern, a list of strategies was co-devised by the researchers. Interestingly, the teachers came to the third and final focus group meeting armed with evidence of student learning, including video and audio recordings, work samples, examples of students' questions and student led Q. and A. sessions. For example, one teacher provided an explicit example to demonstrate how she initiated then encouraged student questioning that led to a demonstration of student learning:

…. And one boy said that 'I know that frogs (sic) metamorphosis [sic] into frogs' and the other kids in the group go, 'What does that mean?' And I said, 'Well Michael, would you like to explain?', and he goes 'Change'. And then another group this morning went, 'I know that salamanders are amphibians like frogs and tadpoles.' I think, well, if you don't pose those questions you wouldn't know that those children have got this knowledge. (TDI1)

Another teacher commented,

> *Students are creating speeches now, by using their own questions they've needed to research for their speech and connect their questions to the topic. It was a big task and I wasn't sure they could do it. The questions made them think, and they've risen to the challenge. The majority have enjoyed the challenge.* (TLI2)

However, collecting measureable outcomes of teacher and student engagement and capability in generating engaging and intellectually challenging questions remains a challenge for the future, for researchers as well as for teachers. As one of the teachers lamented in the final interview,

> *I'm not good at recording and collecting evidence about this, though I could find evidence in their books … I'm disappointed I didn't collect [more] evidence along the way.* (TDI2)

Conclusions and implications

Teacher and student questioning is not an under represented area of research, and some might query the need for yet another study. However, the findings of this study, with its focus on the pedagogy of questioning, have demonstrated that there continues to be a need to keep this integral, but sometimes invisible and often underrated, part of planning for learning in focus. The model used in this questions focused action research study, both supported and motivated teachers to cultivate more effective questioning practices in the classroom, leading to enhanced student engagement and learning.

As Mansour, Deghaidy, Alshamrani and Aldahmash (2014) found in their study on continuing professional development in science:

> *Providing a mechanism for individuals to reflect on and assess their professional needs, and giving them a voice that empowers them and provides a roadmap for development, are some of the issues that need to be taken into consideration to enable implementing the concept of lifelong learning in science teacher education.* (p. 970)

This study focused on how teachers supported their students to generate engaging and intellectually challenging questions. As Sedova, Sedlacek and Svaricek's study (2016) found, "it makes sense to teach teachers the specific skills of dialogic teaching" and, as Toshalis and Nakkula (2012, p. 2) commented, "research has shown that the more educators give their students choice, control, challenge, and opportunities for collaboration, the more their motivation and engagement are likely to rise." As Kurimay (2014, p. 2) also found, rather than only focusing on the questions they thought the class must answer, these teachers started paying attention to what questions the topic, or book, or conversations raised for the students. One teacher's simple example of moving from "What will" or "What are" question stems to "What might.." has noticeably changed her practice and significantly increased the engagement of her children.

As the previous example demonstrates, the findings show there has been a definite pedagogical shift in the majority of these teachers' practices. Their discussions about the highly engaging learning experiences that were built around questioning involved high cognitive, high responsive and high operating characteristics (Sawyer, Callow, Munn & Zammit, 2013; Callow & Orlando, 2015). For two teachers, who recognised that they hadn't moved as far as some of their colleagues, the seeds had been sown and the school's culture of collegiality continues to support their development. Additionally the Principal encouraged the teachers to share their work within and beyond the school, and two teachers have now presented their findings at a national conference.

The pilot project was introduced at the end of the year preceding its initiation. Responses from the first teacher interviews helped us recognise that its formative nature meant that the teachers needed time to develop and trial strategies, and to reflect on the concept of generating and using questions to be able to embed this change into their practice. Thus, the first six months of the project were regarded as exploratory in nature, whereby teachers planned and trialled learning experiences that focused on questions, and emphasised student engagement.

A significant and direction-changing aspect of this early period was the teachers' unanimous decision to choose the learning area (subject) they would use as the foundation for their exploration of deeper questioning. They reasoned that being confident in the content enabled them to focus on the pedagogy. As it eventuated, it was not until well into the middle of the year that the teachers felt ready for the formalised collection of data.

A critical phase in this was the focus group approach to sharing practices that both challenged and enhanced the collection of evidence that demonstrated student engagement and learning. Evidence, that included video clips, audio recordings and collections of students' work, demonstrated that these teachers had developed nurturing environments where students were not only encouraged to generate questions but to also investigate them and share their findings. They were moving themselves towards being "co-enquirers" with the students (Fielding 2012, p. 51), and had created environments that were, as Fraser and Gestwicki (2012, p. 7) described in their work, "responsive to student interests, provide (ing) opportunities for children to make their thinking visible and then foster learning and engagement."

The concept of working towards becoming co-enquirers with their students supports another significant finding of the study. Each of the teachers found that attempting to separate their own questioning from those of their students was futile. One impacted on the other and both benefitted from their growth in skills. It inevitably became a symbiotic relationship. As Mitra (2004, p654) describes, "we learn and become who we are through interaction with others…. learning is inherently a social activity that occurs between people rather than just as an individual process."

There are three implications that arise from this study, and which warrant further research. First, developing a pedagogical approach that emphasised questioning as a fundamental part of planning for learning was a challenging and new experience for these teachers. Thus, there appears to be a need to use a pedagogical framework that explicitly incorporates a questions-based focus in teacher professional learning events, regardless of the learning area. As this study found, and, as Chen, Hand, and Norton-Meier (2017) identified, overtime, as a better understanding of how teachers develop their roles as questioners is gained, structures to support them can be designed more effectively and practically.

Second, as Reason and Reason (2007) reported, and as Mansour, Deghaidy, Alshamrani and Aldahmash (2014) also found, providing these teachers with a team-based in-school opportunity to think, share and plan, helped shift their pedagogical approaches and set in train the embedding of practices. This suggests that a team-orientated, school-based focus for professional learning is a powerful approach.

Third, it took some time for the teachers to feel confident about collecting evidence of student learning that emanated from student questioning, despite it being a common practice for all teachers to collect evidence. In a climate of greater accountability and an increased emphasis on collecting data about student learning, this clearly needs further attention and exploration. In consideration of this, we recommend that for future projects it may also be useful to work collaboratively with teachers to further address the rigours of classroom based research.

In reflecting on the limitations of this study, it is important to acknowledge that there are pitfalls in reliance on teachers' self-reporting about practice, as it may be unreliable or inaccurate (Koziol & Burns, 2015). We were aware of that in this study, and attempted to address this by having all teachers present their progress and show evidence of outcomes at each focus group presentation. In addition, the Principal of this school assigned her Assistant Principal to the project. The AP regularly visited the teachers' classrooms, held meetings with them, and attended each of the focus group meetings, thus verifying reported outcomes. This was an important aspect of addressing data reliability and is to be highly to be recommended for future projects.

In summary, there are three key findings from this study: providing teachers with choice, freedom, time and support to develop their practice around questioning encourages teacher buy-in; who does the questioning is not an either-or dichotomy, and, pedagogical shifting takes time – changes can be seemingly small, but highly significant.

The range and quality of the evidence eventually provided by these teachers highlighted student engagement and progression towards deeper learning. It also undeniably demonstrated enhanced teacher practice in the generation and use of intellectually challenging questions, be it their own or their students. Thus, the challenge now is to investigate how, and if, the pedagogical shifting of these teachers really is embedded and, if so, how they might be involved as mentors in the extension of the pilot into other schools, as was intended.

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