

International Research in Geographical and Environmental Education

ISSN: (Print) (Online) Journal homepage: www.informahhealthcare.com/journals/rgee20

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To cite this article: Shu Jun Lee & Jeana Kriewaldt (03 May 2024): Where powerful knowledge and pedagogical content knowledge intersect: the case of knowledge and beliefs for teaching school geography through inquiry, International Research in Geographical and Environmental Education, DOI: [10.1080/10382046.2024.2348274](https://doi.org/10.1080/10382046.2024.2348274)

To link to this article: <https://doi.org/10.1080/10382046.2024.2348274>



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Published online: 03 May 2024.



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Where powerful knowledge and pedagogical content knowledge intersect: the case of knowledge and beliefs for teaching school geography through inquiry

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ABSTRACT

Despite global interest in inquiry as a teaching and learning approach for school geography, little is known about teachers' knowledge and beliefs for teaching geography through inquiry. This paper reports on findings from a survey of 44 Victorian secondary teachers' knowledge, beliefs and practice of teaching geography through inquiry. Our findings reveal that geography teachers believe in the power of geographical knowledge to influence young people's attitudes, values, emotions and ethical action and the power of incorporating geography inquiry to deliver these ambitious educational goals. This paper concludes that knowledge for teaching geography through inquiry is a dynamic collection of rich and situated knowledge constructed in and with practice, and teachers' beliefs are deeply intertwined. These conclusions augment Shulman's concept of pedagogical content knowledge by incorporating concepts of powerful knowledge and curriculum-making, signalling a way forward on knowledge for teaching powerful subject knowledge through inquiry. We argue that geography inquiry is key to experiencing and developing powerful knowledge in geography. Disciplinary inquiry supports, even gives flesh to, Young's vision of a Future 3 curriculum.

KEYWORDS

Future 3 curriculum; GeoCapabilities; geography inquiry; pedagogical content knowledge; powerful knowledge; teacher beliefs

Introduction

Inquiry frequently features as the recommended teaching and learning approach for school geography in professional texts for geography educators (Biddulph et al., 2015; Catling & Willy, 2018; McInerney et al., 2021) and in curriculum directives around the world (Lee et al., 2022). Inquiry is described by scholars as geography's signature pedagogy (Seow et al., 2019) and a powerful pedagogy/pedagogical practice (Roberts, 2017; Windsor & Kriewaldt, 2023). Despite such global interest, little is known about teachers' knowledge for teaching geography through inquiry. Few studies on geography teachers' knowledge for teaching use Lee Shulman's concept

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of pedagogical content knowledge (PCK). Smit et al. (2023) systematic literature review of empirical studies on knowledge for teaching geography found that only nine studies used PCK as a framework and three¹ focused on inquiry-based teaching. The knowledge debates in geography education research have centered on Michael Young's concept of powerful knowledge; the GeoCapabilities approach positions geography teachers as knowledge workers making curriculum that empowers learners with powerful disciplinary knowledge (Lambert & Biddulph, 2015; Lambert & Solem, 2017; Solem et al., 2013). PCK and powerful knowledge represent two distinct research frameworks and traditions that have different antecedents and have developed different positions. We posit that knowledge for teaching geography through inquiry presents an important and fertile opportunity to interrogate the intersections between PCK and powerful knowledge and between subject knowledge and pedagogy in geography education. It is through this lens that we present survey findings from a novel study on teacher knowledge and beliefs for teaching secondary school geography through inquiry in Victoria, the most populous state in Australia whose national curriculum strongly advocates geography inquiry (Lee et al., 2022). Our key research question was: what do secondary school geography teachers in Victoria know and believe about teaching geography through inquiry?

Framing literature

Geography inquiry to develop disciplinary ways of thinking

Inquiry in school geography uses a constructivist approach to learning geography; students learn to ask geographical questions and exercise geographical thinking and reasoning to evaluate these questions, with the support of geographical evidence and data (Bednarz et al., 2013; Roberts, 2013, 2023a). Inquiry in school geography is not a new phenomenon. Efforts to encode a discipline-specific approach for geography inquiry can be traced back to Slater's (1982) seminal work, Hill's (1990) issues-based inquiry model (cited in Klein et al., 2019) and Naish et al. (1987) route for inquiry. These models provided the foundation for the Geographic Inquiry into Global Issues project in the US in the 1990s (Hill, 1994; Klein, 1995) and the UK Schools Council Geography Projects in the 1980s-1990s; both projects promoted the development of inquiry-based instructional materials for geography and professional development of geography teachers for inquiry-based instruction. School geography in Australia saw similar interests in inquiry from the 1970s.

In the limited number of studies investigating teachers' understanding and enactment of geography inquiry, teachers often associate geography inquiry with fieldwork (Kwan & So, 2008; Seow et al., 2019). As well inquiry is associated with learner-centred activities that provide a high degree of choice (Greenwood et al., 2020) and with classrooms that promote dialogic talk and processes (Lin, 2020; Roberts, 2013). Differences in inquiry practices amongst geography teachers can be influenced by their specialisations in other subjects (Seow et al., 2020). Scholars recommend that professional development focuses on building teachers' content and place-based knowledge to foster teacher competence in geography inquiry (Almquist et al., 2011; Pickering et al., 2012; Seow et al., 2019).

Inquiry in Australia's geography curriculum

Tracing the history of inquiry in school geography in Australia, Kidman and Casinader (2017) reported that in the mid-1970s the Secondary Geography Education Project (SGEP) funded by the Victorian State Curriculum Branch began producing units of study employing inquiry learning and field investigations for all levels of school geography. The SGEP was supported by both state-based geographers passionate about field-based inquiry and geography teachers influenced by the emphasis on fieldwork in their academic training. The 1990s saw a move to integrate the humanities subjects into Studies of Society and the Environment; interest in fieldwork inquiry registered a simultaneous decline. At the federal level, preparations for a national curriculum began in 2008. The professional bodies for geography education issued a joint recommendation advocating for inquiry methods which they noted were “widely and successfully used in geography teaching in Australia and supported by many teachers” (McInerney et al., 2009, p. 17). When the Australian Curriculum: Geography (AC:G) curriculum (version 8.4) was implemented in 2013, it was the only subject amongst the secondary humanities subjects that included inquiry as a key strand in the curriculum, making it one of the most inquiry-rich geography curriculums internationally (Lee et al., 2022)².

States and territories however variously adopt and adapt the AC to suit local contexts and preferences (Savage, 2018). The 2017 Victorian Curriculum: Geography (VC:G) significantly deviates from the AC:G. While it mandates that fieldwork is formally assessed in the senior secondary years, the AC:G is otherwise silent on inquiry. Victoria's state curriculum deliberately dissociates pedagogy from curriculum (Green, 2018); the VC:G does not recommend any teaching approach for geography and chooses to use the terms *fieldwork* and *investigate* (specific practices) instead of *inquiry* (an approach).

Teacher knowledge and beliefs for inquiry instruction

This study affirms the significant role teachers play in all phases of inquiry. Teacher scaffolding during students' collaborative inquiry, for instance, amplify intellectual collaboration and co-construction of knowledge (Kraatz et al., 2020). Teachers constantly judge when and how to shift from being an advisor to being a co-inquirer as students grow in their expertise in inquiry (Golding, 2013). The complex tasks involved in planning and enacting inquiry lessons necessitate multifaceted and multidimensional knowledge and judgement in teachers (Kriewaldt et al., 2021; OECD, 2012; Roberts, 2013, 2023a).

Following Shulman's (1987) seminal work, this study understands teacher knowledge to encompass knowledge of subject matter, students, pedagogies and educational contexts that enable teachers to fulfil their role of teaching subject matter using appropriate pedagogies within their contexts. PCK thus refers to teachers' professional knowledge for transforming subject matter and integrating this with expertly selected pedagogy for effective student learning. One of few PCK studies on inquiry teaching is Suh and Park (2017) model on primary science inquiry teaching which concluded that teacher orientations, specifically their beliefs about how students learn, are a

crucial driver of the use of sustained inquiry in teaching practice. If teacher knowledge are the “more factual propositions”, teacher beliefs then represent their “personal values, attitudes and ideologies” (Meijer et al., 2001, p.172) which are more “affective” and “episodic” (Nespor, 1987, p.318). Beliefs act as filters “through which new phenomena are interpreted” thus redefining and reshaping teachers’ thinking (Pajares, 1992, p.325) and influencing the “content and nature of a teacher’s PCK” (Chan & Hume, 2019). In a recent study on Dutch geography teachers’ PCK, Smit et al. (2023) related geography teachers’ orientations to geography perspectives like globalist, earthist and interactionist, noting that these influenced teachers’ choice of teaching content and strategies.

PCK and non-PCK research highlights the significance of teacher beliefs in influencing practice. Examining history teachers’ beliefs and adoption of inquiry-based learning, Voet and De Wever (2019) found that teachers who were more knowledgeable about disciplinary ways of thinking valued developing such thinking in students and were more motivated to master instructional approaches like inquiry. This in turn increased their self-efficacy for using inquiry. Evidently teacher knowledge, beliefs and practice are interrelated in complex ways which can be amplified by variations in teaching contexts (Thacker et al., 2018).

Powerful knowledge and knowledge for teaching subject knowledge through inquiry

Young’s (2008) concept of powerful knowledge emphasises the role of disciplinary knowledge in providing learners with “intellectual power” and power to engage in “political, moral and other kinds of debates” (Young, 2008, p.14). Young and Muller (2010) argue for an emancipatory Future 3 curriculum whereby subject-based concepts are key for taking students beyond their everyday experiential knowledge. Maude (2015, 2018) proposed a typology of powerful geographical knowledge (Table 1) which has been taken up and applied by scholars including Béneker and Palings (2017) and Bouwmans and Béneker (2018).

Powerful knowledge draws attention to the importance of disciplinary knowledge for learners. However teaching demands sophisticated curriculum thinking and making—critical ‘boundary work’ that bridges knowledge and pedagogy, and students’ lived geographies and disciplinary knowledge (Lambert and Morgan, 2010; Lambert

Table 1. Maude’s (2015) Five-part typology of powerful geographical knowledge (PGK).

PGK Type	Characteristics
Type 1 PGK provides students with “new ways of thinking about the world” (p. 18)	Refers to geography’s <i>key concepts</i> of place, space, environment and interconnection.
Type 2 PGK provides students with “powerful ways of analysing, explaining and understanding” (p. 20)	Enables students to <i>analyse, explain and generalise</i> i.e. understand various phenomena and apply to different contexts and/or futures.
Type 3 PGK gives students “power over their own knowledge” (p. 22)	Provides skills to find and make sense of information and evaluate knowledge claims.
Type 4 PGK “enables young people to follow and participate in... local, national and global issues” (p. 23)	Enables students to examine issues significant to society and the world.
Type 5 PGK is “Knowledge of the World” (p.23)	Refers to learning about places beyond the local or beyond students’ own experiences.

& Biddulph, 2015). This sophisticated work, or ‘curriculum-making’, sees teachers as influential knowledge workers (Mitchell & Lambert, 2015) who provide students with epistemic access to powerful disciplinary knowledge, to help them build on their everyday geographies. Using dialogic conversations and inquiry-based approaches empower students with epistemic agency for advancing their own knowledge (Lambert & Biddulph, 2015). Curriculum-making aligns with the European didactic tradition that teachers, informed by their understanding of students, transform specialist knowledge for educational purposes (Gericke et al., 2022; Hudson, 2022).

Analytical framework

The powerful knowledge construct and F3 thinking are powerful when there is productive engagement with different epistemological traditions (Béneker et al., 2023; Muller, 2023). This paper seeks to advance dialogue between different traditions by using both the constructs of powerful knowledge and PCK to investigate teaching specialist knowledge through the powerful pedagogical practice of inquiry. The following analytical framework for this study is an amalgamation of key components on teacher knowledge and beliefs from research on PCK and powerful knowledge:

- A. teacher knowledge of (i) geography, (ii) inquiry as a pedagogical approach to teaching geography, (iii) inquiry in the geography curriculum, and (iv) students;
- B. teacher beliefs about (i) the purpose of geography education, (ii) the nature of knowledge in geography, (iii) how students learn, and (iv) self-efficacy for teaching through inquiry; and
- C. teachers’ practice of geography inquiry.

Materials and methods

This paper reports findings from a novel study investigating teachers’ knowledge and beliefs about geography inquiry. Despite the AC recommending inquiry as an approach for secondary geography, no such survey has ever been conducted in Australia. A thoroughly piloted 19-item survey was emailed to secondary geography teachers across Victoria between April and September 2020³. An example of a question on teacher beliefs is “In your opinion, how important is inquiry in students’ learning of geography?” Following the Likert scale response, participants could elaborate on their choice with an optional open-text response. A total of 44 valid responses⁴ comprising teachers from public, private and Catholic schools were included in the analysis (Table 2).

Descriptive statistics and correlational analyses were generated for the quantitative data. The qualitative data was analysed using content analysis (Cohen et al., 2017). Coding was based on theoretically derived categories e.g. using Maude’s (2015) PGK typology (Table 1) as well as emergent codes. All the data were then scanned for patterns and connections to establish relationships and linkages. Finally, the analyses were combined to make analytical generalisations about teacher knowledge, beliefs

Table 2. Profile of teacher respondents (N=44).

Profile of teachers		Number of teachers, n (%)
School Type	Government	15 (34%)
	Catholic	10 (23%)
	Independent	19 (43%)
Experience Teaching Geography	Less than 2 years	5 (11%)
	3 to 5 years	11 (25%)
	6 to 8 years	2 (5%)
	More than 8 years	26 (59%)
Highest level of study in geography (participants could select more than one option)	Undergraduate, as an academic subject	12 (27%)
	Undergraduate, as part of teacher education	4 (9%)
	Graduate, as an academic subject	15 (34%)
	Graduate, as part of teacher education	31 (71%)
	Total who studied geography as part of teacher education	35 (80%)
	Total who studied geography as an academic subject at university	27 (61%)

and practice about geography inquiry. The combined quantitative and qualitative analyses, including verbatim from the open-text responses, will be presented and discussed together in the next section.

Results and discussion

This section uses the analytical framework described to discuss the results and analyses of the survey findings. Table 3 shows the results from the quantitative survey questions, which will be referred to throughout this section.

Teacher knowledge of geography and of inquiry

Teachers surveyed recognised the disciplinarity of geographical knowledge. 84% of respondents described geography as a distinct field of study with its own concepts, skills, knowledge, distinctive ways of thinking and constructing understanding, and even its own “*lens*” (#02, #04, #44). This is perhaps unsurprising given that all respondents have specialist knowledge about geography having studied it as an academic subject at university and/or as part of teacher education (Table 2).

Teachers however did not attribute their main source of knowledge for teaching geography through inquiry to their pre-service education studies. Instead on-the-job experience (practice) was the most commonly cited source. Learning to teach geography through inquiry was described by many as an ongoing process informed by experimentation and student feedback. Knowledge was gained through “*trial and error*” (#02, #07, #12), “*stuffing up, learning, trying again*” (#19), and “*doing, reflection and modification*” (#31). Resources from external organisations, collaboration with peers and professional development were also identified as important sources. Significantly, none of the teachers mentioned the curriculum as a source of knowledge on inquiry.

Teachers demonstrated their knowledge of inquiry as a pedagogical approach that employs a variety of instructional strategies, notably those which enable students to navigate learning independently and in groups. Learning might appear “*messy*”

Table 3. Results from quantitative survey questions.

Teacher knowledge						
Question	N	Yes	Maybe	No		
Do you think of geography as a distinct field of study?	44	37 (84%)	4 (9%)	3 (7%)		
How familiar are you with teaching geography through inquiry?	N 44	Extremely 21 (48%)	Moderately 14 (32%)	Slightly 8 (18%)	Not at all 1 (2%)	
Teacher beliefs						
Question	N	Extremely	Moderately	Slightly	Not at all	
How important are inquiry processes in the study of geography?	44	29 (66%)	13 (30%)	1 (2%)	1 (2%)	
How important is inquiry in students' learning of geography in school?	44	24 (55%)	16 (36%)	3 (7%)	1 (2%)	
How far has the use of inquiry helped your students in their learning of geography?*	44	14 (32%)	26 (59%)	2 (5%)	2 (5%)	
Teacher practice						
Question	N	Always	Often	Sometimes and regularly	Sometimes but infrequently	Rarely
In a typical school year, how often do you teach geography through inquiry?	44	3 (7%)	21 (48%)	8 (18%)	10 (23%)	2 (5%)

This table reports n (% rounded to nearest whole) for each response.

*The percentages in this row do not add up to 100% because of rounding.

(#04, #12) but is the result of deliberate teacher decision to relinquish some control of the learning to students putting them “*in the driving seat*” while teachers “*redirect, encourage, support and incite curiosity*” (#04). Teachers in inquiry lessons thus act as guides (#20, #26, #41), facilitators (#09, #41), coaches (#04) and encouragers (#20). Therefore, contrary to flawed ideas of inquiry learning as unstructured and unguided, these survey results reveal that teachers understood that they play significant roles in the inquiry classroom. The teacher’s inquiry stance creates a classroom climate that simultaneously values the knowledge students bring and provides opportunities for students to make sense of specialist knowledge and build disciplinary understanding (Roberts, 2023b). This is, in Lambert and Biddulph (2015) words, the teacher as knowledge worker setting up opportunities for students to make epistemic access and ascent and develop epistemic agency.

Teacher knowledge about inquiry in the curriculum

Teachers’ interpretations of inquiry’s place in the state and/or national geography curriculum fell into two diametrical positions: some teachers described the curriculum as antithetical to inquiry whereas others described it as prescribing inquiry. The first view is common amongst teachers who believe an inquiry approach requires significant time and effort to plan and implement, and is often unsupported by the

educational goals of the prescribed curriculum e.g. *“The pressures of moving through the curriculum compete with one’s ability to embrace inquiry”* (#02). The second view sees inquiry as part of the prescribed curriculum because of its perceived synonymy with fieldwork. The VC:G’s mandating of fieldwork in the formal assessment for senior secondary geography significantly influenced these views: *“Fieldwork inquiry is a main aspect of Year(s) 11 and 12 geography”* (#40). The VC:G’s lack of direction on inquiry despite a commitment to fieldwork investigation has contributed to diverse teacher understanding which, for some, represents a limited view of inquiry as simply *fieldwork* or *fieldwork inquiry*.

Teacher knowledge of students

Teachers reported being knowledgeable about their students’ preconceptions and motivations and expressed desires to incorporate this knowledge of students in enacting their practice. Engaging with students’ everyday knowledge was seen as critical in ensuring that inquiry learning was relevant and motivating. However, some teachers also suggested that students could have naïve or insufficient pre-instructional knowledge which then posed challenges to inquiry learning. These findings align with research that suggests perceived student ability for engaging in inquiry could strengthen or hinder teachers’ beliefs about inquiry learning (Voet & De Wever, 2019). Significantly too, contrary to criticisms that inquiry learning is skills-focused at the expense of knowledge, our findings reveal that teachers are committed to geographical knowledge and understanding as the building blocks for deep inquiry.

Teacher beliefs about the purpose of geography education

Maude’s typology of PGK (Table 1) provided the framework for analysing the responses on teacher beliefs about the purpose/power of geography education. Developing students’ conceptual understanding (Type 1 PGK) was most frequently articulated, followed by developing students’ ability to inquire and think critically about information (Type 3 PGK). Inquiry skills are seen as important for life beyond school: *“Identifying problems, constructing hypothesis, evaluating multiple sources and perspectives, providing solutions but also understanding limitations... are useful skills that transcend education in schools”* (#44). More than a list of skills, inquiry is also described as a stance whereby students are orientated towards evaluating knowledge claims and thinking critically about diverse opinions: students learn through inquiry to *“question and check facts”* (#42) and to *“reflect on their knowledge and challenge their perspectives”* (#08).

Significantly, teachers also displayed strong beliefs in affective outcomes such as developing students’ sense of wonderment and curiosity about the world, and appreciation and respect for other people and cultures. Deep geographical understanding gives rise to these affective attributes which enable students to appreciate and develop empathy for the world beyond their own experience (Type 5 PGK). Related to understanding the world and empathising with others is to act on the knowledge

(Type 4 PGK). Geography prepares students to become “*global citizens*” (#11, #30, #31, #32, #40) and “*citizens of action and responsibility*” (#26) who “*engage in a global society*” (#30), carry out “*informed decision-making*” (#20), feel empowered “*to make changes*” (#22) and even take up “*political activism*” (#39). These findings affirm Uhlenwinkel et al. (2017) argument that teachers and teacher-educators’ curriculum thinking in relation to geography’s contribution to the future of their students are similar across national contexts. Like their European counterparts, Victoria’s secondary geography teachers hold strong beliefs in the power of geography’s disciplinary knowledge for civic understanding and action. Respondents also believe that geography education gives students the ability to analyse and explain phenomena and make generalisations for application to new settings (Type 2 PGK). Students learn to “*view experiences, situations, issues from a variety of perspectives*” (#13) and “*make sense of patterns in the world and relate to current and past events*” (#22).

Finally, respondents articulated their belief about conveying an intrinsic love for the subject to their students: “*It’s a beautiful subject. Full of the wonderment of life and our planet. Imparting this and sharing it with students is a great mission*” (#36). The powerful knowledge debate is often focused on the power of knowledge for externalising understanding and action; that teachers still believe in the intrinsic value of knowledge is a salient reminder that knowledge in itself holds power for individuals’ personal growth and satisfaction. In sum, this section on teachers’ beliefs demonstrates that teachers’ goals for geography education extend beyond the cognitive and epistemic: as concerned as teachers are for knowledge, they are equally committed to the power for geography education to influence young people’s attitudes, values, emotions and ethical action.

Teacher beliefs about nature of knowledge in geography and how students learn

Almost every respondent (96%) believed that inquiry processes are important for the study of geography: geographers use an “*action-oriented model of inquiry/way of exploring, problematising and responding to phenomena we study*” (#04). They also held constructivist beliefs about how students learn: 91% believed that inquiry is important and helpful for students’ geography learning. The constructivist nature of inquiry provides the affordance of choice which teachers believe empowers students and increases their engagement. Inquiry also produces significant cognitive benefits, helping students acquire “*deeper learning and understanding*” (#40) and “*higher-order thinking skills*” including “*metacognition... (as they) critically navigate the topic and reflect on their learning-adjusting their inquiry when appropriate, reflecting and evaluating*” (#08). There is a sense that students produce higher quality of work from inquiry (#20) demonstrating “*greater understanding of concepts*” (#01). At least one teacher believes this ultimately improves students’ achievement in external examinations (#27). Others also value the dispositions and transferable skills that students gain from inquiry such as developing the “*academic courage*” (#04) to ask questions.

However, teachers also cautioned that there could be varying results with inquiry. Nine per cent of respondents believe that inquiry processes are *slightly* or *not at all*

important in the study of geography, and has only *slightly* or *not at all* helped their students in learning geography. Inquiry is perceived to be of low value particularly for students who “*don’t know a topic in a detailed way... (and have) little background information*” (#07) and those who prefer or are accustomed to traditional learning modes (#36). This again demonstrates that teachers recognise the importance of specialist knowledge as building blocks for deep inquiry but it also brings to fore an important observation: in order for inquiry to develop powerful geography thinking, students need repeated exposure to this powerful pedagogical practice for mindsets and learning attitudes to shift (Windsor & Kriewaldt, 2023).

Teachers’ self-efficacy beliefs and practice of geography inquiry

Teachers mostly reported high self-efficacy beliefs about teaching geography through inquiry: 80% reported being *extremely* and *moderately* familiar with the approach. In terms of practice, most respondents used inquiry at least sometimes during the school year. About half the teachers (53%) reported that they *often* or *always* teach through inquiry, 18% *sometimes and regularly*, 23% *sometimes but infrequently*.

Relationships between knowledge, beliefs and practice

This section will examine possible relationships between teacher knowledge, beliefs and practice. Spearman correlation analysis was conducted to investigate any tendency for two variables to vary consistently (Table 4).

Several inferences can be made from the above results. Firstly, increased self-efficacy and familiarity with inquiry is more likely related to increased practice rather than to years of teaching experience. Although teachers who taught geography for more years reported being more familiar with inquiry ($r=0.62$), the effect size ($r=0.35$) between years of teaching experience and frequency of inquiry use is weak. Teachers who taught geography for more years, though more familiar with inquiry, may not necessarily use inquiry more often than teachers with fewer years of experience. Instead there is a strong and statistically-significant correlation between familiarity

Table 4. Correlation between teacher knowledge, beliefs and practice (N=44).

	Years of teaching experience	Familiarity with inquiry	Inquiry has helped students’ learning	Frequency of inquiry use
Familiarity with inquiry	0.62 ($p < 0.001$)			
Inquiry has helped students’ learning	0.04 ($p = 0.777$)	0.47 ($p = 0.001$)		
Frequency of inquiry use	0.35 ($p = 0.021$)	0.65 ($p < 0.001$)	0.45 ($p = 0.002$)	
Inquiry processes are important for geography	0.10 ($p = 0.515$)	0.20 ($p = 0.187$)	0.47 ($p = 0.001$)	0.30 ($p = 0.048$)
Inquiry is important for students’ learning	0.27 ($p = 0.080$)	0.22 ($p = 0.148$)	0.70 ($p < 0.001$)	0.36 ($p = 0.017$)

*Reporting Spearman correlation coefficient (p -value in brackets); coefficients in bold are statistically significant ($p \leq 0.001$).

with inquiry and the frequency of inquiry use ($r=0.65$): frequent users of inquiry are teachers who report higher self-efficacy or familiarity with the approach.

Secondly, teachers who have experienced success in using geography inquiry to improve student learning hold strong beliefs in constructivism and the disciplinary value of inquiry; these teachers are also likely to be familiar with inquiry and use the approach frequently. There is a strong and statistically significant correlation ($r=0.70$) between teachers' observations that inquiry has helped students' learning and their beliefs that inquiry is important for learning. There is a moderate but statistically significant effect size for the correlations between observations that inquiry has helped students' learning and teachers' belief that inquiry processes are important for geography as a discipline ($r=0.47$), their familiarity with the inquiry approach ($r=0.47$) and frequency of use of inquiry ($r=0.45$). Positive experiences of conducting inquiry are related to teachers' beliefs in the value of inquiry for student learning and for knowledge construction in the discipline as well as their self-efficacy beliefs and frequency of using the approach.

Thirdly, more experienced teachers do not necessarily hold stronger beliefs in the value of inquiry for students' learning and for knowledge construction in the discipline. Teachers who believe that inquiry is beneficial for student learning and/or that inquiry processes are important for the discipline of geography are weakly correlated with frequency of inquiry use ($r=0.30$ and 0.36 respectively) and very weakly correlated with years of teaching experience ($r=0.10$ to 0.27) and familiarity with inquiry ($r=0.20$ to 0.22) with even higher likelihood of chance.

Finally, non-parametric tests were conducted to determine if the same knowledge, beliefs and practice statements have any tendency to vary consistently with the teachers' demographic data. These confirmed that teachers with more years of teaching experience report greater familiarity with inquiry. However there is insufficient evidence to conclude that the teachers' knowledge, beliefs and practice of inquiry vary across school types or years of teaching experience.

The correlation analyses signal some complex relations between teacher knowledge, beliefs and practice. Our findings support Voet and De Wever (2019) conclusions that teachers' self-efficacy beliefs are related to their epistemological beliefs about how knowledge is constructed in the discipline. We further argue that these beliefs are augmented by teachers' practice of using inquiry and observing its power in supporting students in building up their subject knowledge.

Conclusion

Analysis of the survey findings has provided significant insights into teachers' knowledge, beliefs and practice of geography inquiry. Teachers believe in the power of geography education and knowledge and they also hold constructivist beliefs about how students learn. Inquiry in geography is regarded as an important tool for students to acquire powerful disciplinary knowledge and understanding. Although teachers value how inquiry empowers students to make decisions, it is evident they do not view inquiry learning as fully student-led with minimal teacher guidance, as critics like Sweller (2021) characterise it to be. Teachers in this study see themselves as actively involved and "highly intentional" (Murdoch, 2015, p. 14) in the inquiry classroom;

they recognise that while students generally value having the freedom to choose and make decisions, teacher support and scaffolding remain important for deep learning. Active support and differentiated scaffolding are especially important to enable students to learn more effectively through inquiry because, like Hmelo-Silver et al. (2007) argued, well-scaffolded inquiry lessons reduce the cognitive load of students to enable them to focus on developing more complex domains. Teachers make use of sophisticated combinations of pedagogies which include inquiry-oriented strategies and explicit instruction (Kriewaldt et al., 2021; OECD, 2012). Teaching through inquiry demands multifaceted knowledge and skills. Recognition of the complexities of inquiry learning has led many teachers to experiment to improve their knowledge and skills. Some also acknowledge they require more professional development.

Importantly too, it is through practice that teachers observe students' geography learning and the difference inquiry makes, which in turn reinforces their beliefs. The good news from this study is the strong support for geography inquiry amongst teachers who have seen success in using it. It may be that the turn to inquiry in Australia in the 1980s through the Secondary Geographical Education Project impacted a generation of geography teachers who continue to influence current generations. This is reinforced by international interest in inquiry which influences the content of initial teacher education and professional development. Regardless, our findings confirm that even as national and state policies and frameworks define the overall aims and content of secondary school geography education, teachers are daily exercising curriculum making with their knowledge of geography and pedagogy, and incorporating student experiences to help students gain access to powerful geographical knowledge (Lambert & Biddulph, 2015). Our key conclusion from these findings is that knowledge for teaching geography through inquiry is generated in and with practice and is fostered through the dialogue between geography teachers.

In conceptualising the professional knowledge base for teaching powerful subject knowledge through inquiry, this study has considered the concepts of PCK and powerful knowledge. The nature of knowledge construction in geography is such that everyday knowledge necessarily contributes to the construction of new geographical understandings. Geographical knowledge is dynamic, and what remains 'stable'—Young's criteria for powerful knowledge—are geographical ways of thinking and inquiring. Geography inquiry (knowing) is key to experiencing and developing powerful knowledge in geography. Geographical ways of thinking and inquiring give geographical knowledge its power. It is power to think anew about the world, to analyse, to construct knowledge and to participate in matters that influence the planet and all its inhabitants. We further argue that the epistemic focus of the powerful knowledge concept can eclipse the more affective goals of education. This study demonstrates that geography teachers believe in the power of geographical knowledge to develop young people who are not only informed, but are also compassionate, ethical and hopeful, and they believe in the power of incorporating geography inquiry to deliver these ambitious educational goals. Inquiry approaches that value the importance of disciplinary knowledge and conventions are not in tension with Young's ideas on powerful knowledge. Disciplinary inquiry support—even gives flesh to—Young's vision of a Future 3 curriculum; it opens up the discussion of educational goals so education can be truly emancipatory.

Notes

1. The three studies are Almquist et al. (2011), Pickering et al. (2012) and Seow et al. (2019).
2. It is noteworthy that the latest (2022) iteration of the AC:G (version 9.0) no longer recommends an overarching teaching and learning approach. At the time of writing in early 2024, some states and territories including Victoria are in the process of revising their curriculum, and the extent to which they will adopt and adapt from the revised national curriculum remains to be seen.
3. The survey was conducted amidst Melbourne's lockdowns in the Covid-19 pandemic during which Australian teachers faced numerous challenges in remote online teaching that impacted their physical and mental well-being (Ziebell et al., 2020). This likely influenced the survey returns.
4. Here are some indicative statistics on geography teachers in Victoria for context. A 2013 national census (McKenzie et al., 2014) estimated a total population of 11,200 secondary geography teachers across Australia. 27.1% of the secondary teachers in the census were from Victoria, so it can be estimated that Victoria has around 3,024 secondary geography teachers. A significant proportion of this population is teaching out-of-field: about 43% of geography teachers in Victoria do not have specialist qualifications in geography (Kriewaldt, 2006). This figure has since increased: Kriewaldt and Lee (2022) found that almost half (45.9%) of Australian secondary geography teachers do not have a specialist study of geography.

Acknowledgements

We wish to thank Dr Amy McKernan for her comments on an earlier draft. We also acknowledge the helpful and critical insights of two anonymous reviewers of an earlier draft of this article.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by an Australian Government Research Training Scholarship.

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