
Title	Field-based enquiry in geography: The influence of Singapore teachers' subject identities on their practice
Author(s)	Tricia Seow, Kim Irvine, Ismath Beevi and Tharuka Premathillake

Copyright © 2020 Taylor & Francis

This is an Accepted Manuscript of an article published by Taylor & Francis in *International Research in Geographical and Environmental Education*, 29(4), 347-361 on 23/10/2019, available online: <https://doi.org/10.1080/10382046.2019.1680001>

FIELD-BASED ENQUIRY IN GEOGRAPHY: THE INFLUENCE OF SINGAPORE TEACHERS' SUBJECT IDENTITIES ON THEIR PRACTICE

Tricia Seow
Humanities and Social Studies Education Academic Group,
National Institute of Education
Nanyang Technological University
1 Nanyang Walk, Singapore 637616.
tricia.seow@nie.edu.sg
Tel no. +65 6790 3556

Kim Irvine
Humanities and Social Studies Education Academic Group,
National Institute of Education
Nanyang Technological University
1 Nanyang Walk, Singapore 637616.
kim.irvine@nie.edu.sg
Tel no. +65 6790 3401

Ismath Beevi
Humanities and Social Studies Education Academic Group,
National Institute of Education
Nanyang Technological University
1 Nanyang Walk, Singapore 637616.
ismath.hasan@nie.edu.sg
Tel no. +65 6790 3419

Tharuka Premathillake
Humanities and Social Studies Education Academic Group,
National Institute of Education
Nanyang Technological University
1 Nanyang Walk, Singapore 637616.
tharuka.p@nie.edu.sg
Tel no. +65 6790 3410

Abstract

This qualitative study examines the influence of teachers' subject identities on how four secondary school teachers in Singapore conduct *field-based enquiry* about water quality in geography. Given the complex interactions noted in the literature among teachers' academic and school training, their academic subject specialisms and their practice, it also interrogated the influence of teachers' subject specialisations on their practice. In general, it was found that the teachers shared concerns about water conservation and environmental sustainability in their practice of enquiry with their students. However, divergence in teachers' emphases when conducting GI was also noted, which could be partly attributed to the influence of their other subject specialisations. This underscores the importance of attention to teachers' subject identities in geography education research, as well as in pre-service and professional development courses for teachers.

Keywords: subject identities, field-based enquiry, teaching practice, teacher agency

Manuscript length: 6726 words (excl. appendices)

Field-Based Enquiry in Geography: The Influence of Singapore Teachers' Subject Identities on their Practice

Introduction

Since Shulman first drew attention to the importance of the subject matter knowledge of teachers in 1986, research into teachers' subject knowledge and its relationship to teachers' practice took off in United States (e.g. Grossman et al., 1989; Shulman, 1987; Wilson et al., 1987;), and in the United Kingdom (see Calderhead, 1996 for an overview). Within geography education a number of authors have studied this relationship, arguing that insight into teachers' knowledge and how it develops over time can shed light on the support that teachers need in the initial teacher preparation phases and beyond (Barratt-Hacking, 1996; Brooks, 2010; Corney, 2000; Jewitt, 1998; Martin, 2005; Seow 2016).

Brooks (2016) however cautioned that focusing on just subject matter knowledge is inadequate to understanding the work that teachers do. She argued that teachers enter the profession "largely driven by a love of, and desire to continue working with, their subject specialism" (pg. 8). Ball and Goodson (1985) also suggested that for secondary school teachers, subject specialisms form part of the values and norms that teachers share as a component of their professional identities. However, research also suggests that subject-oriented professional identities are not necessarily important to the practice of all teachers. For instance, Ball and Goodson observed that some teachers are more "vocationally committed", caring for the pupils in a holistic manner (1985, pg. 21). This is particularly true at the primary school level. Nias (1989) argued that primary school teachers focus more on building relationships with the child in order to support the individual's growth, and are less concerned with inducting students into the disciplines.

Indeed, Seow (2016) found that even pre-service secondary school teachers' articulation of their subject matter knowledge and practice are affected by the professional identities they had adopted within a spectrum from the subject specialist to the generalist. She suggested that geography teacher educators need to pay more attention to developing pre-service teachers' geographical identities if a goal of initial teacher preparation is to encourage more engagement with disciplinary perspectives (2016, pg. 11).

Brooks (2016) argued that teachers' subject identities were linked to both school and academic geography cultures, which also interacted with broader structures like the school and education cultures, and teachers' own personal cultures. Teachers' perspectives or understanding of each culture might differ, and the potential influence of each culture on teachers' practice (and agency) would vary. The complex interactions among structure, identity and practice were also noted by Seow (2016) and Alexandre (2016). Brooks (2016) further suggested that within this multi-scalar interactions of cultures, teachers' subject identities are an important source of motivation, and that teachers who are not able to draw on them in their practice experience dissatisfaction in their work. Similarly, Lambert (2017) observed that the professional identity of geography teachers helps them to meet the challenges in their practice, positing that this identity was rooted in part by a 'framework of organising concepts that offer an enduring vision of what lies at the conceptual "heart" of the subject' (pg. 21).

In this paper, we look at the influence of teachers' subject identities on how four secondary school teachers in Singapore conduct *field-based enquiry* in geography. Fieldwork has been defined as "any arena or zone within a subject where, outside the constraints of the four walls classroom setting, supervised learning can take place via first-hand experience" (Lonergan &

Anderson, 1988, p. 64). Researchers have found that fieldwork brings students into real world settings which contextualise and make visible the abstract, theoretical material taught in the classroom (Dummer et al., 2008; Mcguinness & Simm, 2005). The literature on the benefits of fieldwork in higher education suggests that students' learning is enhanced by any type of fieldwork, but within geography education, project-based field research provides more educational benefit (Fuller, et al., 2000). Unsurprisingly, fieldwork and pedagogies that encourage active learning and engagement with the real world have been encouraged as viable forms of pedagogy in school geography. For instance in its manifesto, *A Different View* (2009), the Geographical Association promoted the use of geographical enquiry as a means of actively engaging learners with the subject and the real world.

However, most of the research on teacher's subject identity focuses on classroom-based teaching. Little is known about how teachers' identities influence the ways in which they plan and conduct field-based enquiry with their students. We argue that this is a gap that geography education researchers should address, given geography's traditional link with the exploratory tradition (Driver, 2001; Sauer, 1956; Stoddart, 1986), and fieldwork's importance to the ways in which geographers construct knowledge in the discipline.

The Research Context

Since the 1990s, the education mantra in Singapore has been *Thinking Schools Learning Nation* (TSLN), which emphasizes critical thinking skills and creativity, and represents the government's educational response to the challenges of globalisation (Deng & Gopinathan, 2016). Deng and Gopinathan summarised the major education initiatives that occurred in response to this

– including curricular and examination reforms across subjects, the infusion of technology into education, project work to encourage students to integrate their learning across different subjects, and a pedagogy characterised by “more opportunities for constructing knowledge, problem-solving, higher order thinking and innovation” (pg. 458).

From 2012, enquiry has been adopted as the recommended pedagogy for teaching and learning geography in secondary schools, and field-based enquiry (known as Geographical Investigations or GIs) have become compulsory components of the curriculum at all levels. Field-based enquiry is seen as a means through which to give students opportunities to appreciate real world applications of geographical knowledge and skills (Ministry of Education, 2014). All GIs are project-based and modelled after Robert’s (2003) Geographical Enquiry framework (Figure 1). Robert’s (2003) model draws upon Kolb’s (1984) experiential learning theory. Kolb outlines how students use experience, observation, and reflection to help them understand concepts and in turn generate new ideas and concepts.

Each GI was also designed to provide students with deeper understandings of particular issues in the secondary school syllabuses. For instance, in lower secondary school geography, students learn about water shortage issues on the international scale as well as about Singapore’s approach towards providing this basic need for society. Within this topic, students may then conduct GIs into the water quality of a selected water body, as well as how human activities affect water quality (Ministry of Education, 2014, p. 12). These changes in curriculum and pedagogy have great potential to affect teachers’ practice, if one assumes a simple cause-effect relationship between education policy and what goes on in the classroom. This paper therefore examines how

geography teachers have responded to the curricular changes outlined above in their practice, as well as to understand how teachers' subject identities influence the ways in which they interpret and enact field-based enquiry with their students.

Research Methodology

This study aimed to gain an in-depth understanding of teachers' subject identities and their influence on teachers' practice of field-based enquiry. This required an interpretive approach that would allow insight into the personal and professional contexts in which teachers were situated. We therefore used a qualitative instrumental case study approach, as outlined by Miles and Huberman (1994) and Creswell (1998).

The teachers were all teaching in different publicly funded secondary schools in Singapore, though the schools were purposefully selected for variations in the academic ability of their student intake based on the national Primary School Leaving Examinations. The participants also varied in their teaching experience. Of particular note to this study is the fact that secondary school teachers in Singapore are trained to teach two subjects as their specialisms when they enter pre-service teacher education, though not all of them end up teaching both subjects. These teaching subjects are usually assigned by the Ministry of Education (MOE), based on teachers' past academic qualifications and/or school experiences. Given the complex interactions noted in the literature among teachers' academic and school training, their academic subject specialisms and their practice, it is particularly important to pay close attention to the influence of teachers' subject specialisms in this research. Table 1 below provides the pertinent information on each of the teachers in the study.

Name	Teaching Experience	Academic Specialisation	First Teaching Subject	Second Teaching Subject	Description of School
Jill	7	Geography	Geography		Government school for students of above average academic ability. The school offers an integrated programme where the majority of students skip the GCE “O”-level exam (offered at the end of Year 10, 16 years of age), and go on to sit for the GCE “A” levels (Year 12, 18 years of age).
Jason	1.5	Biology	Biology	Geography	Mainstream government secondary school with students of average academic ability; Students sit for the GCE “O”- level exam at the end of their course of study (Year 10, 16 years of age), before applying to schools offering the GCE “A”- level curriculum or to vocational schools.
Mark	5	Sociology	English	Geography	
Dana	10	Sociology	Geography	Social Studies	

Table 1. Participant Data

A range of data collection methods was used in this study. These included concept mapping (after Hopwood, 2006; Martin, 2005; Seow, 2014), photograph elicitation exercises (after Hopwood, 2006; Seow, 2014), and the ranking of different cultures of influence (as outlined by Brooks, 2016) on their practice. These elicitation exercises were used together with in-depth interviews based on observations of practice, and examined alongside the curriculum resources which teachers used to guide their students’ field-based enquiry. Collectively, the data allowed us to get the thick descriptions we needed to understand our participants’ practice (see Table 2 for more details).

Data Collected	Timing/ Frequency of Data Collection	Purpose of Data Collected
Indepth interviews + concept mapping + photo elicitation & ranking exercises	4 interviews per teacher: <ul style="list-style-type: none"> • start of study • after each round of lesson observations 	To understand teachers: <ul style="list-style-type: none"> • knowledge of the GI topic and its links to the water supply theme • content knowledge of the water quality GI topic • their beliefs about the importance and value of GI to their students' education • the relative influence of the different cultures of influence (after Brooks, 2016) on their practice
Lesson observations	3 lesson observations per class: <ul style="list-style-type: none"> • pre-fieldwork (Stage 1 of inquiry process) • during fieldwork (Stage 2 of inquiry process) • post-fieldwork (Stage 3 or 4 of inquiry process) <i>Each lesson observation lasted approximately 80 minutes, except for the field-based lesson, which lasted approximately 2.5 hours.</i>	To observe and analyse: <ul style="list-style-type: none"> • teachers' focus areas in the ways they planned and conducted GI • the opportunities and constraints they faced in enacting GI
Lesson plans and teaching resources	All lesson plans and teaching resources related to the water quality GI	

Table 2: Data Collection Methods and Objectives

The data analysis was guided by Miles and Huberman's (1994) stages of qualitative data analysis, and drew on the literature and data for the initial broad coding categories. These included within-case coding for the different types of influences on each teacher's practice (reported and observed), and the teachers' actual (observed) practice. Each researcher used the codes to individually analyse the data sets, before collaboratively triangulating and refining the codes, and eliminating redundancies. Cross-case analyses and discussions of the larger themes that emerged

from the data allowed us to look for generalities that could fit across all cases within the study, while providing insight into the specificities of contexts that led to differences in practice.

Findings

Subject Identities and Varying Emphases of GI

One of the key findings is the importance of teachers' subject identities on their practice of field-based enquiry with their students. This is unsurprising considering arguments in the literature that what teachers value about the subjects they teach affects the ways in which they design their curriculum (Brooks, 2010). This is because values are fundamental convictions which influence behavior and are used as reference points to evaluate particular issues (Halstead & Taylor, 1996). The geography teachers in this study were unanimous in articulating that a key value in the water quality GI was to develop consciousness in students about the need to conserve and value water as a resource.

I will say that water issues is important not just in Geography. But perhaps I think it's a national issue. It is an issue for a lot of countries as well. I mean, water is important source for plants. If we don't have it, it's going to be a problem. In Singapore, we are fortunate. So we don't really have problems with our water supply but I don't know whether that will be the case in future. Yeah so it's good that students understand... it's still essentially Geography. We learn about the water cycle. You will learn about if you connect it to like, drainage basin, the river, you know, when you teach a bit on that then they see as Geography as well. (Jill, 7 years of experience, Geography specialist and teacher, Interview 1)

Because I want to bring in the context ... because I understand that Singapore is going to face water stress in 40 years. (Jason, 1.5 years of experience, Biology specialist, teaches Biology and Geography, Interview 1)

I think it is all about understanding and appreciating your lived environment, and how you actually play, you actually shoulder a huge responsibility in making sure you live in quality environment... And it is not about doing away with modern conveniences, it is about striking a good balance. So that we can sustain Earth.

(Mark, 5 years of experience, Sociology specialist, teaches English and Geography, Interview 1)

What is noteworthy in this study, however, is the diversity in teachers' responses about what else they chose to emphasise to their students through the GI. For instance, Jill discussed how the GI she was doing with her students was grounded in geographical concepts, and her main goal was to get students to learn more about these disciplinary concepts through the field-based enquiry.

So for example when you do fieldwork, your analysis and findings is based on one place, one field site. So you can only conclude or say whatever you want about that one place. But is understanding this place or whatever is happening here help you to understand what is going on in other places in Singapore? So you start to see perhaps, when you tell them to think about what's observed in other waterways, in other water bodies, then they start to think about the concept of Space... And Environment. So when you talk about what's happening in an area, you tend to talk about what's happening there, but you also talk about the human, Man's relationship with his environment. So that's when you think about the concept of Environment. So hopefully, with this practice, they, okay it's ambitious, *but we hope they understand Geography better and the concepts to them are what makes Geography, Geography.* (Jill, 7 years of experience, Geography specialist and teacher, Interview 4)

In fact, Jill suggested that the issue of water conservation was not as important as inducting students into the discipline.

So, it's not just about like whether they can answer the GI question. Whether they eventually understand water conservation. Rather there are certain skill sets that they pick up along the way. And it helps them to understand Geography. It helps them perhaps to transfer these skills to the other levels as they go higher up. (Jill, 7 years of experience, Geography specialist and teacher, Interview 2)

Jill's position could be due to her *geographical training*, as well as her unique position (relative to the other participants) as a teacher with a single subject specialisation in her school. In contrast,

Jason drew on his academic training as a *science* major in his practice, and focused on the scientific method in his practice.

I will consider myself more towards a Science teacher. When I teach the students, *I will always relate back to Science...* I do see relevance, the relationship between Science and Geography, they are actually quite similar. GI and Science enquiry, they are actually similar. In the process, for instance, the way they post questions and form hypothesis; they need to conduct experiments to collect evidence, data collection and they need to analyze the data. (Jason, 1.5 years of experience, Biology specialist, teaches Biology and Geography, Interview 1)

As a result of this belief, Jason was largely concerned with ensuring that the students collected accurate data. To this end, Jason gave students an opportunity to try out the water testing kits using the school's pond water, prior to going out to the field site located in a park. This was because he wanted students to 'have a first-hand experience first, so that when they go there, they are able to do the proper thing' (Interview 2). Jason was also mindful of warning students of the limitations of the relatively rudimentary water testing kits they were using.

I bring in the concept of accuracy. Accuracy in recording data. So I actually shared with them the limitations of the water testing kit, like it cannot really give you a very accurate result. (Jason, 1.5 years of experience, Biology specialist, teaches Biology and Geography, Interview 2)

In contrast, Jill suggested that focusing on the accuracy of the data collected was of less importance.

...if you are collecting water from the surface, of course it might not be that accurate and it also depends on the water level for the day... I recognize it to be an inaccuracy in itself. But because this is more of like an experience, and to collect the data and then make sense out of it, not so much of like, does it need to be the same, does it need to be accurate. (Jill, 7 years of experience, Geography specialist and teacher, Interview 4)

This difference in emphases between the two teachers can also be seen in their evaluations of the importance of scientific content knowledge about water quality. Jason prioritised understanding the indicators of water quality well.

If I don't know what is the content knowledge of water quality. What should I do? So I will go and read up in the Internet and read up on my own. And then luckily, it's actually quite easy to understand because probably of my Science background. Actually, I was doing the same thing. Just that I'm doing on plants, not water quality. (Jason, 1.5 years of experience, Biology specialist, teaches Biology and Geography, Interview 3)

Jill explained that the water quality indicators were difficult for her, but as a geography teacher she was able to focus more on catchment characteristics and how these might affect the quality of water.

I wouldn't really able to explain to students that well. Why we want to test these things. Why these chemicals matter. Or what it really means, except to be able to explain it based on like, what's the source? How it affects the water quality, the environment etcetera. So that's what I can do, but if you ask me to go dwell further in, why it matters, what's this indicator mean, I actually don't know. (Jill, 7 years of experience, Geography specialist and teacher, Interview 1)

The other two teachers, Mark and Dana, were similar to Jill in that they were also less concerned with the chemical aspects of the water quality GI. Dana suggested that since she was not a science teacher, there was no need to belabour the scientific aspects. It was good enough to simply use a credible source's definition of good water quality and to know examine the findings against that.

I mean, of course, not to go into too much of scientific aspect, because I'm not a Science teacher myself, but at least basic, you know, like there is a chart the World Health Organisation has, and you have to match up to it, and how do you go about that. You know those kind of things? Basic things, just to let them know. (Dana, 10 years of experience, Sociology specialist, teaches Geography and Social Studies, Interview 1)

Unlike Jason who made his students practice collecting and testing water to ensure the accuracy of results from the field-based enquiry, Mark explained that he did not let students practice using the water testing kits prior to going to the field site. He also felt it did not matter if the students failed to collect the full set of data recommended for analysis since they were unlikely to collate all of the data from the students. Like Dana, he argued that just understanding that Singapore's water was of a high quality was sufficient.

We didn't explicitly or literally extract the data to use it because... only half of the groups actually managed to collect such data. Also, it will be quite tedious to extract from individual students... But then, they all have a common understanding that water in Singapore is clean enough... but I wouldn't say that we went in-depth into really analysing facts and figures because we didn't. (Mark, 5 years of experience, Sociology specialist, teaches English and Geography, Interview 4)

Like Jill, Mark and Dana stressed that they were *not science teachers* and did not emphasize the chemical aspects of the water quality GI which they associated with science. The three teachers also did not focus on ensuring rigour in the data collection process. However, while Jill was concerned with getting the students to apply geographical concepts and think geographically through field-based enquiry, Mark and Dana had different foci in the GIs they designed. They both felt that the purpose of field-based enquiry was to get students to appreciate their access to clean water in Singapore.

And I guess that whole idea of, if they have a hands-on approach of investigating and realising that there can be differentiation in the water that is consumed and what cannot be consumed. I think *it will make them responsible citizens* in the sense that they know that, they will understand that, it is not something that they get it easy. (Dana, 10 years of experience, Sociology specialist, teaches Geography and Social Studies, Interview 1)

Dana's rationalization of her practice suggested that she believed the main aim of the GI was to educate good and responsible environmental citizens, and that this was partly influenced by her role as a Social Studies teacher.

My aim is that, maybe it is from a very Social Studies point of view. Because we always want them to appreciate Singapore. So I feel like it's like a two-in-one thing whereby they learn to understand that the quality of water given in Singapore is really of a high quality. And then of course, appreciate what they have. (Dana, 10 years of experience, Sociology specialist, teaches Geography and Social Studies, Interview 2).

Mark espoused an appreciation for GI as an appropriate pedagogy to learn geography because it enabled students to construct knowledge about the world experientially.

*I very much welcome [doing field-based enquiry], in fact if I have a choice, I wouldn't have taught Geography in the classroom. Because as mentioned, I believe that Geography is a living subject. *It needs to be lived, to be experienced, to be learnt.* And it is all around us. So a lot of these things are actually better taught through experience, outside the classroom. (Mark, 5 years of experience, Sociology specialist, teaches English and Geography, Interview 1)*

In fact to Mark, boundaries among content topics in geography were artificial, and he designed his GI tasks to transverse across the different themes the students were learning that year to mirror more closely the world around them.

...they must see that Geography is not, the boundaries between the topics are more, more fluid. There is no clear boundary between topics, because as we move from let's say tropical rainforest and then into water, water cycle, they must make the very basic linkage that rainforests are also sources of water. Because it helps filter water, underground aquifers, you know, large aquifers are found under rainforests anyway. So they must see the linkages and the flow between topics and they must live it out in the everyday lives. (Mark, 5 years of experience, Sociology specialist, teaches English and Geography, Interview 1)

Mark further saw the boundaries between disciplines as limiting, and argued for an integration of learning *across school subjects*.

...because water resource is also very early situated in the Science syllabus, when they talk about Chemistry. When they talk about biodiversity, they have already talked about the water... there's still a lot of room for improvement in terms of bringing the syllabus together. Because at the end of the day, *it is ideal if we can teach Science in Geography, as well as Geography in Science* (Mark, 5 years of experience, Sociology specialist, teaches English and Geography, Interview 2)

Mark alluded to his practice as an English teacher in influencing the way he came to understand GI when it was first introduced in the geography curriculum.

...actually my first fieldwork experience came from English, because I had the opportunity to bring the students out for Learning Journeys. And they did conduct surveys and interviews for English Language, and then that kind of rubbed off into Geography. (Mark, 5 years of experience, Sociology specialist, teaches English and Geography, Interview 1)

The data in this section alludes to the importance of understanding the ways in which a geography teacher's academic specialisation and teaching subjects may influence the ways in which they interpret the role of the GI in the syllabus. These also influence how they plan for and execute the GI with their students.

Perception of Student Readiness and Teacher Choices

The data also suggested that a second factor influencing teachers' practice was their perception of their students' readiness for GI. All of the teachers believed that their students were not yet ready to undertake enquiry independently, and designed GIs that were mainly teacher-directed in that the teachers developed the enquiry and guiding questions and selected the sampling sites for their students.

I have students who need to be guided a lot. So if I need students to be guided a lot, to be spoon-fed, to be like hand-held, then I need more time... So I have to make it very simple, just give them a guiding question. "How clean is our water". That's why. (Dana, 10 years of experience, Sociology specialist, teaches Geography and Social Studies, Interview 2)

Because I thought that the students they were unable to come up with the guiding questions at this level. So I just come up with all the guiding questions for them. I want them to just have a sense of what the guiding questions look like. (Jason, 1.5 years of experience, Biology specialist, teaches Biology and Geography, Interview 2)

None of the teachers planned to follow the detailed guidelines provided in the curriculum on how to assess GI processes and products, but instead adapted their practice to take into account student readiness levels. Dana, for instance, had decided not to grade the students at all, while Jason had not yet made any decision about assessment, even after the GI had begun.

There's no grading... there will be no grading per se, they are just exposed to GI, they are just exposed to the skills, they are exposed to doing analysis, doing this package, but eventually for exams they are not graded. They are not going to be tested as well... Because the thing is again, I think they are being overly stretched. Because they've got so much things to handle, the students themselves it's a big jump from primary school to secondary school. And I know even in my own class, I know students who are struggling. (Dana, 10 years of experience, Sociology specialist, teaches Geography and Social Studies, Interview 4)

I haven't really decided on how I'm going to assess them. I haven't really told the students that they are assessed on which component. I don't want to stress them out, I just want them to go out there and do the things and learn from there. (Jason, 1.5 years of experience, Biology specialist, teaches Biology and Geography, Interview 2)

In contrast, Jill had decided that her academically able students would participate in two GIs that year (and not just the recommended one per year), and that she would ignore the process marks in favour of marking the product (written report) only.

What was more interesting, however, was that teachers' perception of student readiness appeared secondary to their own subject identities as an influence on their practice. While student characteristics affected the extent to which the enquiry was teacher-directed, the larger goals and emphases of the GIs were still guided by teachers' beliefs and values. For instance, Mark, Dana and Jill were supportive of field-based enquiry despite the logistical difficulties involved because they felt that enquiry supported their goals.

I was very happy that they brought in fieldwork, because trying to explain certain Geographical things like conservation to students locked up in a classroom is quite difficult. As in, it gets a bit boring, it gets a bit dry. (Dana, 10 years of experience, Sociology specialist, teaches Geography and Social Studies, Interview 1)

I would say that for us, for lower secondary Geography right, because the students don't know what Geography is. They come with very vague concepts based on perhaps what their parents tell them. And I think it is important for them to experience Geography, with more hands-on. (Jill, 7 years of experience, Geography specialist and teacher, Interview 1)

In fact Mark went on to state that he did 'not really bother about student characteristics when designing and carrying out the GI because this can be mitigated in the lead-up to the GI' (Interview 4). Instead what mattered more was to build on students' lived experiences to help them become aware of their role in environmental conservation.

They have seen this, and most of them live around this area, they know that there is a difference between just clear water running from the *longkang* (drain) into the lake, and basically *teh tarik*. (local term for milky, frothy tea) So we always use, they know that there is a difference. When it's *teh tarik* that means there's a lot of soil, there's a lot of suspension in the water. And then they are encouraged to think, "Where do you think all this come from? What are the areas that you usually see exposed soil?" And they know it is construction sites, so on and so forth. So with a lot more development, they can actually predict and forecast, okay, the water is, the water quality is definitely going to be affected... that means what are the things you can do to make sure that our waterways remain

clean, despite development? (Mark, 5 years of experience, Sociology specialist, teaches English and Geography, Interview 1)

Field-based Enquiry and Knowledge Construction

The participants generally appeared to believe that field-based enquiry facilitated knowledge construction in positive ways. For instance, Dana observed for her students, the ‘majority of them seem to learn better when they’re out [in the field]’ (Interview 1).

Because sometimes, we are dealing with nature, so what we have as content is based on many, many years of research. And it’s just trends and patterns we’re working with. But at that point when they’re stepping out at the field, they might get contradicting data. So the contradicting data should be a learning point for them that links back to the content that yes, I’ve got a contradicting data, but at the end of the day, yes, this is the prediction or this is the theory behind it. But there are possible exceptions. (Dana, 10 years of experience, Sociology specialist, teaches Geography and Social Studies, Interview 1)

If you are talking about efficiency, then it will be classroom learning. Because you are situated in a very controlled environment...but in terms of greater and deeper understanding, deeper interest, then it will definitely be outdoor learning. Because then students are able to see real world connections to textbook knowledge (Mark, 5 years of experience, Sociology specialist, teaches English and Geography, Interview 3)

Jill alluded to the affective nature of field-based enquiry as defining feature of a geographical education for herself as a student, as well as from the perspective of a teacher.

Ok so, it's exciting. And I think it brings back wonderful memories for me, for I think my friends as well... when we did Geography. So, I think it's instances like this that we should, we should make it a part of school experience. (Jill, 7 years of experience, Geography specialist and teacher, Interview 1)

I would say that [field-based enquiry is] intrinsic to learning Geography. Yes, I would say that it does perhaps enhance their knowledge... It's tiring for both teachers and students. But after you get through that, the part where you have

something that you must write, must submit, you will reflect, hopefully, they reflect in, and they think about it as, as enjoyable part of learning Geography. (Jill, 7 years of experience, Geography specialist and teacher, Interview 1)

Although Jason agreed that learning experientially was an effective way to learn about the world, he was the only participant who felt that field-based enquiry outside the school was unnecessary to students' learning. This may be due to his belief that that geographical enquiry was 'similar to conducting any science experiments, but experiment outdoors' (Interview 1), and his focus on testing water quality accurately.

So I were to do it my way, right... maybe I will ask the students to do the data collection at home or outside their home or even in school. Actually, they still experience how they collect data, how they record data and I think that is sufficient already. And they come back to class and show the class the data then no need for us to bring the students out somewhere else to do the water quality. (Jason, 1.5 years of experience, Biology specialist, teaches Biology and Geography, Interview 1)

Unlike the other participants, Jason did not see the GI as a way to connect geography, the subject, to the world outside of the classroom, nor did he think that the learning points offered in confronting the inherent complexities in field-based enquiry as worth the effort to be expended in logistical arrangements.

Discussion

In this study, all of the teachers articulated shared concerns about water conservation and environmental sustainability in their practice of enquiry with their students. This is aligned with the national curriculum for geography which aims to 'imbibe in students an awareness of appropriate attitudes and values that promote a positive geographical future; one that ensures the sustainability of our resources, people, country, and planet' (Ministry of Education, 2014, pg. 2).

It can also be argued that the research participants had shared understandings of the goals of a geographical education with geography teachers in other contexts. For instance, a recent study of geography teachers in four different European countries reported a common focus on the development of informed and responsible citizens (Uhlenwinkel, Bénéker, Bladh, Tani, & Lambert, 2017). In addition, the participants drew on their knowledge of students, as well as on their own beliefs and values about what was important to guide their decisions about how to design and carry out GIs. This study supports the idea of teachers as active agents who interpreted the national curriculum and adapted it in their own practice. This is aligned to the findings of an earlier study on climate change education by Seow and Ho (2016), where geography teachers in Singapore rationalised their practice based on their own values and beliefs.

Beyond this broad commonality, we found a divergence in teachers' emphases when conducting GI. For example, Jill and Jason clearly took distinct disciplined-based approaches, with the former focusing on developing geographical thinking using disciplinary concepts, and the latter emphasising scientific method. The participants also differed in their evaluation of field-based enquiry as a route to knowledge construction. Jill, Dana and Mark firmly believed that field-based enquiry helped their students to learn better partly because it was directly connected to students' experiences, but also because learning no longer occurred in silos but connected with the complexity of the real world. In contrast, Jason did not think it was necessary to go out to the field to learn how to test water accurately, because his focus was on the accuracy of the water testing process.

Uhlenwinkel et al. (2017) noted a propensity for their respondents to cluster between their understandings of geography as a natural science or as a social studies subject in their cross-national study. The authors attributed this to a structural difference in the organization of school

subjects across national contexts. While this may be true, this study suggests that the Singapore geography teachers understood school geography differently, partly because they were drawing beyond geography as a school subject in the articulations of their practice. The syllabus document for lower secondary geography in Singapore points explicitly to key concepts (such as Space, Place Scale, and Environment) as ‘a particular set of perspectives to make sense of Singapore and the complex and dynamically changing world’ (Ministry of Education , 2014, pg. 5). However, out of the four participants, only Jill she emphasized the understanding of these disciplinary concepts as a goal, based on how she framed and discussed her practice of field-based enquiry. It is also noteworthy that Jill had only one teaching subject. The other three respondents appeared to draw on their other teaching subjects as well, or even across the different subjects in the Singapore school system, in their practice of field-based enquiry. This supports Seow’s (2016) findings that pre-service geography teachers in Singapore sometimes had subject and professional identities that were not always centered on geography.

The implication of this is that understandings within the international geography fraternity about geographical thinking and powerful knowledge (Maude, 2017; Young, Lambert, Roberts & Roberts, 2014) do not always translate neatly into geography teachers’ classroom and field-based practice. Lambert’s (2017) argument that the professional identity of geography teachers can be usefully rooted in the conceptual understandings of the discipline and can guide teachers in their curriculum making, may also not be relevant to some teachers. This underscores the importance of attention to teachers’ subject identities in geography education research, as well as in pre-service and professional development courses for teachers. Additionally, in contexts where teachers do not specialise solely in teaching geography even at secondary levels and higher, research on the

ways in which the identities of practising geography teachers are affected by teachers' other subject specialties might provide useful insights on teachers' practice.

Conclusion

Lambert (2011, pg. 135) has argued that geography education has the potential to develop students to become 'self-fulfilled and competent individuals, informed and aware citizens and critical and creative "knowledge workers"'. Geography teachers have an important role to play in this process regardless of the place of geography within national school curricula, or the stated purposes of geography in national curricula frameworks. Research has supported teachers' agency in enacting geography curricula, and the centrality of teachers' subject identities (and concomitant beliefs and values) to their practice. However, subject identities are complex and multi-faceted, due to the complex relationships among teachers' past academic and school experiences and the educational and schools contexts in which teachers are situated. This study provides evidence that teachers' identities are sometimes linked to dual or multiple subject specialisations, which affect the ways in which secondary geography teachers framed their practice in field-based enquiry.

Funding

This study was funded by Singapore Ministry of Education under the Education Research Funding Programme (OER 19/15 TS) and administered by the National Institute of Education, Nanyang Technological University, Singapore.

References

- Alexandre, F. (2016). The standardization of geography teachers' practices: A journey to self-sustainability and professional identity development. *International Research in Geographical and Environmental Education*, 25(2), 166-188, doi: 10.1080/10382046.2016.1149339
- Ball, S., & Goodson, I. (1985). *Teachers' lives and careers* (Ed.). London: Falmer Press.

- Barratt-Hacking, E. (1996). Novice teachers and their geographical persuasions. *International Research in Geographical and Environmental Education*, 5(1), 77-86.
- Brooks, C. (2010). Why geography teachers' subject expertise matter. *Geography*, 95(3), 143-148.
- Brooks, C. (2016). *Teacher subject identity in professional practice: Teaching with a professional compass*. London: Routledge.
- Calderhead, J. (1996). Teachers: beliefs and knowledge. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of Educational Psychology* (pp. 709-727). London: Prentice Hall International.
- Corney, G. (2000). Student teachers' pre-conceptions about teaching environmental education and their implications for pre-service teacher training. *Environmental Education Research*, 6(4), 313-329.
- Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five tradition*. Thousand Oaks: Sage.
- Deng, Z., & Gopinathan, S. (2016). PISA and high-performing education systems: Explaining Singapore's education success. *Comparative Education*, 52(4), 449-472. doi: 10.1080/03050068.2016.1219535
- Driver, F. (2001). *Geography militant: Cultures of exploration and empire*. Oxford: Blackwell.
- Dummer, T. J., Cook, I. G., Parker, S. L., Barrett, G. A., & Hull, A. P. (2008). Promoting and assessing 'deep learning' in geography fieldwork: An evaluation of reflective field diaries. *Journal of Geography in Higher Education*, 32(3), 459-479.
- Fuller, I., Rawlinson, S., & Bevan, R. (2000). Evaluation of student learning experiences in physical geography fieldwork: Paddling or pedagogy?. *Journal of Geography in Higher Education*, 24(2), 199-215.
- Geographical Association. (2009). *A different view: A manifesto from the Geographical Association*. Sheffield: GA.
- Grossman, P. L., Wilson, S. M., & Shulman, L. (1989). Teachers of substance: Subject matter knowledge for teaching. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 23-36). Oxford: Pergamon.
- Halstead, J. M., & Taylor, M. (1996). *Values in education and education in values*. London: Falmer Press.

- Hopwood, N. (2006). *Pupils' Conceptions of School Geography: A Classroom Based Investigation*, Unpublished PhD Thesis, University of Oxford.
- Jewitt, L. (1998). *Personal Experiences, Values and the Teaching of Geography*. Unpublished MA Dissertation, Institute of Education, London.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development* (Vol. 1). Englewood Cliffs, NJ: Prentice-Hall.
- Lambert, D. (2011). Reframing school geography: A capability approach. In G. Butt (Ed.), *Geography, education and the future* (pp. 127–140). London: Continuum.
- Lambert, D. (2017). Thinking geographically. In M. Jones, M (Ed.), *The handbook of secondary geography* (pp. 20 – 29). Sheffield: Geographical Association.
- Lonergan, N., & Andresen, L. W. (1988). Field-based education: Some theoretical considerations. *Higher Education Research and Development*, 7(1), 63-77.
- Martin, F. (2005). *An Analysis of PGCE Primary Students' Conceptions of Geography, Education and Knowledge and the Relationship between these and their Development as Teachers of Primary Geography*, Unpublished PhD Thesis, University of Coventry.
- Maude, A. (2017). Geography and powerful knowledge: A contribution to the debate, *International Research in Geographical and Environmental Education*, 27(2), 179-190.
- McGuinness, M., & Simm, D. (2005). Going global? Long-haul fieldwork in undergraduate geography. *Journal of Geography in Higher Education*, 29(2), 241-253.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). Thousand Oaks: Sage.
- Ministry of Education. (2014). *2014 lower secondary geography syllabus*. Singapore: Ministry of Education.
- Nias, J. (1989). *Primary teachers talking: A study of teaching as work*. London: Routledge.
- Roberts, M. (2003). *Learning through enquiry*. Sheffield: Geographical Association.
- Sauer, C. O. (1956). The education of a geographer. *Annals of the Association of American Geographers*, 46, 287-289.
- Seow, T. (2014). *The Subject Conceptions and Practice of Pre-Service Geography Teachers in Singapore*. Unpublished PhD Thesis, Institute of Education, London.

- Seow, T. (2016). Reconciling discourse about geography and teaching geography: The case of Singapore pre-service teachers. *International Research in Geographical and Environmental Education*, 25(2), 151-165.
- Seow, T., & Ho, L.-C. (2016). Singapore teachers' beliefs about the purpose of climate change education and student readiness to handle controversy. *International Research in Geographical and Environmental Education*, 25(4), 358-371.
- Shulman, L. (1987). Knowledge and teaching: foundation of the new reform. *Harvard Educational Review*, 57(1), 1-22.
- Stoddart, D. R. (1986). *On Geography and its History*. Oxford: Blackwell.
- Uhlenwinkel, A., Béneker, T., Bladh, G., Tani, S., & Lambert, D. (2017). GeoCapabilities and curriculum leadership: Balancing the priorities of aim-based and knowledge-led curriculum thinking in schools. *International Research in Geographical and Environmental Education*, 26(4), 327-341. doi: 10.1080/10382046.2016.1262603
- Wilson, S. M., Shulman, L., & Richert, A. E. (1987). 150 different ways of knowing: Representations of knowledge in teaching. In J. Calderhead (Ed.), *Exploring teachers' thinking* (pp. 104-124). London: Cassell Educational Ltd.
- Young, M., Lambert, D., Roberts, C., & Roberts, M. (2014). *Knowledge and the future school: Curriculum and social justice*. London: Bloomsbury Academic.

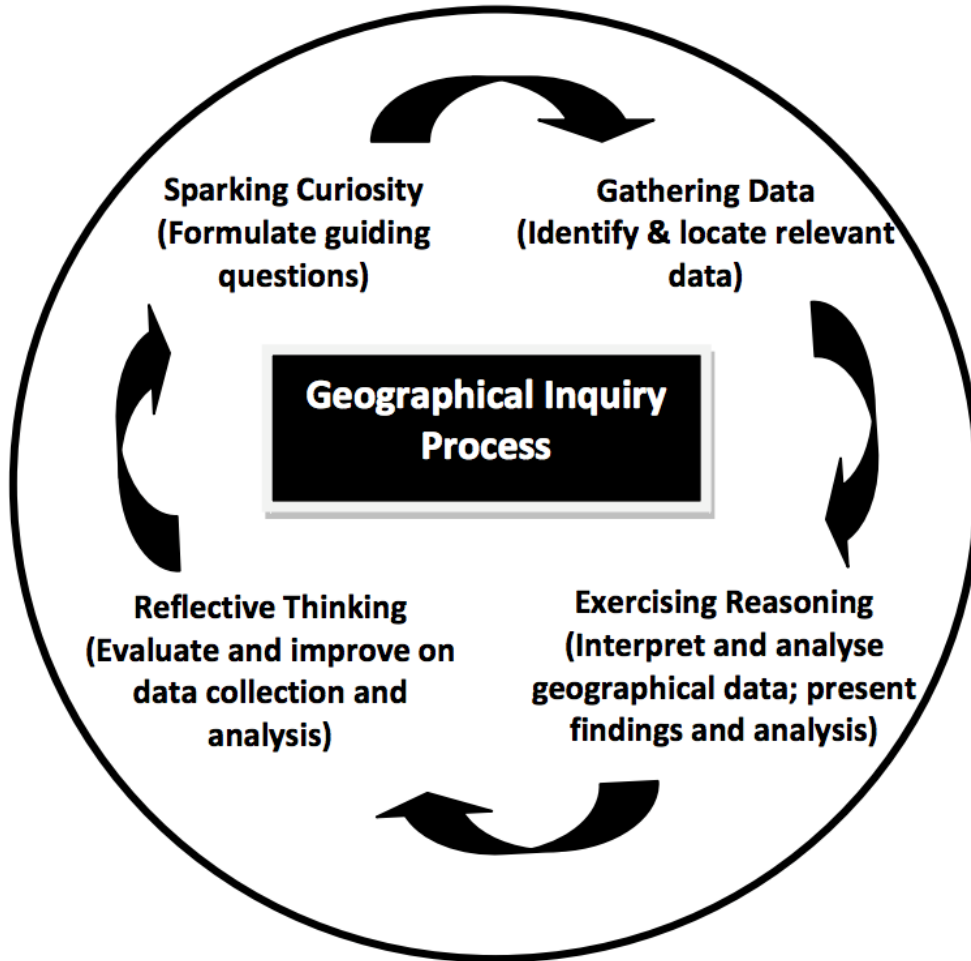


Figure 1. Geographical Enquiry Framework
(MOE, 2014, p.26; Adapted from Roberts, 2003)