Chapter 2
High School Student Experiences of Teacher Research Thinking

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Abstract This chapter reports a Participant Observation study of a teacher's explicit facilitation of student research skills in a combined Year 9/10 subject that was designed to prepare students for a subsequent year-long *Research Project*. The Research Skill Development framework was used by the teacher to inform his planning for students' learning when they conducted their research. The setting is a geographically remote Kindergarten to Year 12 school in Australia, with very limited resources. The data, collected by a Preservice Teacher, is presented as research vignettes, stories of student engagement in the classroom. The focus of the vignettes and subsequent discussion is the teacher's research thinking and students' experiences of the development of their research skills in the classroom.

2.1 Introduction

This chapter reports on a participant observation study of a geographically remote Year 9/10 classroom in which the teacher used the Research Skill Development framework (RSD: Willison & O'Regan, 2007: see Chap. 1 for details) to plan and to facilitate student thinking. Representing the educators who are the subject of this book, the three authors of the chapter are Home, an In-Service Teacher (I-ST), Snelling, a Preservice Teacher (PST) at the time he collected the data and Willison, a University Educator whose role was specifically as a Teacher Educator (TE).

First the rationale of developing student research thinking is presented, and then the reasons the teacher, Home, chose to use the RSD to facilitate this thinking. Next,

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the participant observation methodology of the study used by Snelling is followed by research vignettes of the classroom observations across two lessons. The chapter then discusses the evidence for Home's research thinking, and his facilitation of student research skills and their consequent classroom experiences. Implications for research and teaching conclude the chapter.

2.2 Rationale for Secondary School Student Research Skills

In order to make an explicit, national shift from a school-system focused on content and recall (Renzulli, 2000) the Australian Curriculum from 2012 foregrounded the development of student thinking (Australian Curriculum, Assessment and Reporting Authority, no date). This thinking is now characterised in the 8th iteration of the curriculum as '…productive, purposeful and intentional [and] is at the centre of effective learning. By applying a sequence of thinking skills, students develop an increasingly sophisticated understanding of the processes they can use whenever they encounter problems, unfamiliar information and new ideas.' (Australian Curriculum, Assessment and Reporting Authority, n.d.). Such a characterisation was at the heart of the RSD when it was developed 15 years ago.

The Australian Curriculum includes *inquiring* as an approach to a core capability of *critical and creative thinking*, where students '… pose questions and identify and clarify information and ideas, and then organise and process information. They use questioning to investigate and analyse ideas and issues, make sense of and assess information and ideas, and collect, compare and evaluate information from a range of sources.' (Australian Curriculum, Assessment and Reporting Authority, n.d.). These skills were particularly important in the state in which this research took place, because the senior secondary curriculum required a senior high school *Research Project* of five months or more duration. However, critiques suggest a deficiency in the development of high school student research skills (Lazonder & Harmsen, 2016).

This research is set in a geographically remote town, and while Australia is viewed to be a highly urbanised nation, four million people (31% of the Australian workforce) are located outside of urban centres (Department of Jobs and Small Business, 2019). The lack of thinking skill development is felt across the nation, but rural communities are further disadvantaged in this area, as they are more likely to cater to low socioeconomic families that are disadvantaged in terms of educational resources and outcomes (McCourt & Ikutegbe, 2019). Rural and geographically remote students must be taught, in ways that are relevant to them, the skills they need to thrive in school and later in life, including the thinking used in research processes.

Learning through research can be taught implicitly or explicitly in Inquiry-based learning (IBL). Research skills can be implicitly developed in the classroom by "embracing a question-centred pedagogy" where the responsibility for asking questions is shifted from the teacher to the students (Sciacca, 2016, p. 6). However, unguided IBL environments have been reported to cause "a much larger cognitive load and led to poorer learning" while explicit and guided instruction produce better

results in regard to problem solving skills (Kirschner et al., 2006, p. 80). Hmelo-Silver et al. (2007) argue a third option, that guided instruction should be the foundation on which unguided inquiry learning occurs, and that students are better able to develop lifelong skills if both methods of instructions are used in concert (de Jong, et al., 2023). This view implies a shift over time from explicit to implicit instruction of IBL.

While the development of research skills is deemed valuable for learning by the Australian Curriculum, the difficulty for educators lies in knowing how to teach these skills and making them seem relevant to students and other teachers, principals and parents. The development of thinking skills is difficult and requires students to be active and persistent learners; student attitudes towards learning presents the greatest enablers and barriers to engagement in sophisticated thinking development (Malik et al., 2018; Willingham, 2019). One of the numerous challenges is shown by one study where the majority of students did not see the relevance of the thinking skills learned because they saw their educational goal was '…achieving a high score for Year 12 studies and thus entry to university' (Grainger et al., 2019: 441).

2.2.1   Context and Why RSD in the Year 9/10 Class

This study was undertaken at a Government K-12 area school in a remote mining town in Australia. The school's full-time teaching staff numbered 25 at the time of data gathering (2019), and there were 215 enrolled students (ACARA, 2018). The Index of Community Socio-Educational Advantage (ICSEA) of the school was below average (ACARA, 2018) and 60% had a language background other than English (ACARA, 2018). Observations took place in a class comprising Year 9 and 10 students that was focussing on the development of research skills.

In order to complete the State's Year 11 and 12 Curriculum, all students must, as noted above, pass a major, half year-long *Research Project*, typically conducted in Year 11. However, Home and a colleague in the school who taught the *Research Project* found that students often struggled to put together a complete and coherent project. These individual projects were tedious for students and staff involved, with the focus often becoming 'how do we get them over the line?', rather than developing and showcasing students' effective research skills.

Home was interested in exploring the use of the RSD, introduced three years earlier in his PST program by the TE Willison, and saw the framework may assist with the identified difficulties of student engagement with the Research Project. School leadership gave approval for Jason to co-develop a new subject, *Impact*, which was designed to introduce and develop student research skills in keeping with the RSD. The pedagogical premise was that students had the capacity for sophisticated thinking, however, systemic failures of the education system in part due to the 'tyranny of distance' (Rossi & Sirna, 2008) left students with little tangible and relatable experience in engaging in research and inquiry learning. Epistemic justice is needed to overcome the structural inequity for the students, by providing practices

that can empower and give due credit to student ability and agency (Fricker, 2003). Through the explicit teaching and usage of the RSD framework, the intention was that students would explore the six facets of research in different contexts, building these skills through years 9 and 10, to meet the academic rigours of *Research Project* in their final years of schooling. The research questions of this study are:

(1) What is the nature of Home's research thinking in the classroom?
(2) What are student experiences of explicit research skill development in Home's *Impact* class?

2.3   Methodology

In order to capture the richness of student experience of Home's research thinking and facilitation of their research skills, participant observation methodology was used by Snelling as both PST and researcher in the classroom, to learn about the activities of a whole class in their natural setting (Kawulich, 2005). As participant observer he established a rapport with the class in order to obtain rich and detailed data (Bernard, 1994). Participant observation is a valuable method of data collection when the researcher maintains a non-judgemental attitude, is a good listener, and is interested in learning more about others (DeWalt & DeWalt, 1998). Furthermore, Snelling's positioning as a participant observer in a research scenario made it possible for him to observe and interact with members of the studied group without disrupting the typical interactions of the group in question (Adler & Adler, 1994). In the classroom, the researcher (Snelling) was introduced to the students, who were given an overview of the scope of the study, and the types of questions which they may be asked. Snelling as researcher made notes throughout the lesson in a notebook about events that occurred in the classroom that suggested student interaction with the RSD, and informal conversations in the classroom about their experiences while engaged in learning tasks were also recorded in a notebook. Willison, as TE and research supervisor, was present in the first classroom observation to provide Snelling extra guidance about his field notes after the lesson, then left the town. From Snelling's observation data, two vignettes were written in first-person and independent of Home, but were shared with him on the writing of this chapter. Home chose to use his own first name and made no changes to the vignettes presented as he felt they captured the classroom as he remembered it, in keeping with the quality standard of member checking (Birt et al., 2016). Student names and the company acronym used in the vignettes are pseudonyms.

Ethics approval for this research project was granted by the Human Research Ethics Committee prior to the commencement of the four-day observation period. Prior to the researcher's arrival to the area in which the school was located, the school distributed parent/guardian consent forms detailing the purpose of the project, the reasons for which they were involved in the project and alerting the participants that they were free at any time to withdraw from the project. Informal conversations in

the classroom were only held with students that returned a completed consent form prior to the first observation period.

2.3.1   Data Analysis Methodology

The two vignettes were analysed with reference to:

(1) The Research Thinking characterised in Table 1.1 of Chap. 1, to determine the nature of Home's research thinking in the classroom, addressing Question 1.
(2) The six facets of the RSD, introduced in Chap. 1, to determine the student classroom experience of Home's research thinking, addressing Question 2.

The Vignettes were subject to deep reading, using these two analytical tools (Research Thinking and the RSD facets) to identify text that directly related to the research questions. Next, exemplifying statements were chosen from the vignettes to insightfully represent the teacher research thinking and the student research experiences respectively. As exemplifying statements, they are not representative of the classroom experience, but rather shed light on possibilities for teaching and learning. An example of a 'Lotus Diagram', referred to in Vignette 2 may be found here https://www.edrawmax.com/article/what-is-lotus-diagram.html.

2.4   Results

2.4.1   Vignette 1: Climate Change Source Analysis

Jason announces the start of *Impact*, with students moving in ones and twos to collect their materials for class. Several students wait for Jason to provide them with writing utensils. There's an easy rapport between the teacher and the students, and there is a general din of conversation. The class settles into the task at hand, copying down a fictional quotation from the board.

Jason states that the focus of *Impact* today is source analysis on the causes of global warming. The paragraph the students are copying was authored by Jason but credited to author 'Croaky McToadface', the Vice President of a fabricated mining company BJK. Croaky refutes the evidence of climate change in the text. There are a pair of spelling mistakes two thirds of the way through the paragraph.

Jason announces that the students' task for the moment is to analyse the paragraph on the board. They are given a few minutes to copy the text in their own books and circle statements that support or detract from the overall argument. While the majority of the class settles into relative quiet, two students have pulled out their phones.

After five minutes have passed, Jason asks the class what they have come up with. One student, Alex, immediately throws up his hand to assert that the statement

"trees need carbon dioxide to live" is the only factual statement. Riley states that the argument that "we need to pump out more carbon" is 'sooo wrong'. One student Jordan states that the same phrase is "twisting the facts". Jason waits for several seconds for more answers, but the class remains quiet. Jason asks if the students know what 'BJK' is. Several joke answers are provided including "Big Jumping Kangaroo", but it is Jason who provides the correct answer. Jason then asks the students to reflect on what effect the authorship has on the trustworthiness of the source. One student calls out "bias".

Finally, Jason points out the two misspellings in the paragraph he has written on the board. Most students claim that they believed these were genuine mistakes on his part, and not placed there to bring in to question the credibility of the source. The students then assert that the source that has been presented to them is not useful. Jason asks them to reflect on why they believe this, before calling a short break.

After stretching their legs for ten minutes, the students return. Jason explains that the students need to take what they have learnt in the initial sources analysis and do the same work again with additional sources that are provided to them. Varying levels of analysis of the sources occur around the classroom, ranging from scrutinising the quality of the handwriting on one page, to the website URL on another, and a handful of students questioning whether an individual's qualifications make that person a reliable source. Jason asks a small group of students which facets of the RSD are being used in the work they are tasked with. The group pauses for a moment to think, and they eventually respond with "find and generate", and "analyse and synthesise".

After Jason asks Riley how she is going with the task, she responds, "I hate analysing!". She has only circled two statements on the page at this time. However, Riley is so far the only student who has questioned whether a Ph.D. in Physics is relevant to question the science behind climate change. As the lesson draws to a close, only two or three students are still actively engaging with the content of the lesson.

2.4.2   Vignette 2: Australia Day Date Questions

Students rise from their seats and collect books, laptops and printed notes from around the room. Those towards the front of the class make a start to their work, while those at the back were either absent or inattentive during yesterday's lesson. Jason steps outside to deal with a pair of students' behaviours, and one student from the back row asks another if the work for today is to be done on the task sheet or on their laptops. While this is taking place, a student at the front of the classroom attempts to draw me into a spirited conversation with other students about his sandwich filling.

Jason returns inside and introduces the topic of determining and refining a question. Students are to fill out a Lotus Diagram to work out the complexities of the 'Change the Date' debate on the national holiday Australia Day, which falls on 26th January. A variety of opinions are spontaneously called out around the classroom.

Riley and her table partner are discussing the date of Australia Day and are both in favour of keeping it as it is. 'If you don't want it to be on that day, then don't celebrate it', she says.

At a nearby table, Peyton, Alex and Jordan are discussing the origin of Australia Day, and when it could be moved to. Peyton states that 'Australia Day is the day that First Nations people got rights from the government'. Neither of his table neighbours nor he verify this information.

Alex asks 'Is it possible to move *Australia Day* to *National Sorry Day*?'.

Jordan responds: 'They could change the name to *Revolution Day*'.

'If we call it *Invasion Day*, doesn't that mean that we did something bad?' asks Alex.

These students appear to have already come to the conclusion that the date for *Australia Day* needs to be changed or it should be renamed, rather than choosing and refining a question about the topic.

Taylor, Alex, Jordan and Peyton begin to fill out their Lotus Diagrams. One box is labelled 'Date', with examples such as the 25th of January, the 27th of January, and May 8th filled in by the students. I enquire about the latter; it is a reference to Australians being mates.

Taylor asks Alex 'Would *Colonisation Day* be a suitable replacement for *Australia Day*? He searches for the definition of 'colonisation' and believes that he is on to something when he discovers that the definition for the word fits the actions of the Europeans that migrated to Australia.

There are ten minutes left now until the end of class. Jason calls the students attention to the front and asks them to refine the research they have been doing into a research question. The attention of the students begins to wane, some pulling out their phones, and others engaging in conversation. Peyton and Alex are the only students that participate in this final task for the lesson. They have refined their research into one question, 'Why should we celebrate Australia Day?'.

The following analysis of the two research vignettes makes the evidence for each facet of Jason's research thinking explicit. The following section shows the experiences of students when he is facilitating the development of their research skills. The names used in the vignette are used throughout the discussion, to be consistent with the vignette data e.g. Jason rather than Home.

2.5   Discussion

2.5.1   The Classroom Teacher's Research Thinking

Two-and-a-half years after completing his teaching degree, what is the nature of Jason's research thinking in the Year 9/10 classroom as analysed with the facets presented in Chap. 1?

2.5.1.1   Purposive Thinking

With reference to the RSD facets, Jason's prime and explicit teaching purpose in the two vignettes is to facilitate student engagement in 'source analysis' and 'choosing and refining a question', a specific aspect of embark and clarify. He states each at the beginning of a lesson as a learning intention for students. With clarity of direction, Jason is equipped to know if, when and how a lesson may need to be modified to better achieve the learning intended, or even if other, better opportunities for students could be pursued in a responsive manner.

Jason's purpose to guide the students' explicit development of research skills is shown in the vignette when he 'asks a small group of students which facets of the RSD are being used in the work they are tasked with. The group pauses for a moment to think, though they eventually respond with "find and generate", and "analyse and synthesise".' While research skill development can be left to occur implicitly in inquiry-based learning, Jason seeks for students to know and articulate explicitly which facets they are focussing on.

2.5.1.2   Informed Thinking

Informed thinking makes opportunities to not only be informed by frameworks, sources, conferences and colleagues, but treats as prime data students' classroom experiences. Walking around and chatting to students is arguably the most insightful data of all, especially given Jason has clear purposive thinking that helps him know how to respond to student needs. His information and data for informed thinking includes getting to know the students and staff at the school and the deficits in the curriculum.

In the classroom, Jason talks with students individually, in small groups and the large group. After some questions and a few student answers 'Jason waits for several seconds for more answers, but his class remains quiet.' This is a cue to Jason that some students may need more guidance and prompting with evaluation of the source. He then moves to check if students even know what BJK stands for, and gains some humorous student ideation, such as *Big Jumping Kangaroo*. Since the students didn't know that BJK was a mining company, his subsequent guiding question about authorship would make little sense. Student silence and unfilled answer spaces are forms of data that impacts on and guides responsive teaching.

2.5.1.3   Astute Thinking

Jason evaluates classroom information on a minute-by-minute basis. This includes evaluating a student yawn, to determine if this is an indication of wider-scale flagging or a one-off. Jason is especially evaluating students' work to determine where different groups of individuals are up to and this evaluation helps him determine what to do next. His evaluation of the comic names, mentioned above, prompted

Jason to spell out what BJK stands for. Astute thinking does not believe by default but weighs-up and checks. Astute thinking also reflects afterwards to determine lessons learned, including what could have been done better and what went better than expected. This is in keeping with Schön's (1987) focus of teachers reflecting back to times of uncertainty in a classroom when, in the midst of action, they decided responsively what to do. This is where the teacher teaches themselves about their own enacted responsiveness, and learns lessons from their responses, whether effective or ineffective. Jason's practice is also in keeping with the very different notion of Brookfield's (2017) reflection, which emphasises breaking down one's own prejudices and bringing in others' perspective, exampled by Jason's use of the RSD as well as other literature.

2.5.1.4   Harmonising Thinking

There are clear challenges with managing the classroom, including students chatting, off-task phone use and eventual tedium. Early in Vignette 1 'there's an easy rapport between the teacher and the students, and there is a general din of conversation.' A large part of Jason's management is maintaining rapport with students, and he uses humour devices such as the persona *Croaky McToadface*, perhaps prompting students to be comfortable with providing joke answers of their own. Students even give leeway to Jason, when they noted spelling mistakes in the board text but did not point them out or blame him because 'they believed these were genuine mistakes on his part'.

Part of rapport is to maintain a positive learning environment even when the conceptual demands are high. Students '…are given a few minutes to copy the text in their own books…'. While board copying as an instructional strategy is frowned on, Jason's purpose for student copying off the board is thoughtful. Here, student copying is an enabling feature, giving students who are easily disrupted a focussed activity that they can be successful at, before moving to the hard conceptual work, in which many may struggle. That Jason eases students into a task through copying is a teaching choice is demonstrated by contrasting it with Vignette 2, where students have access to laptops and printouts; the copying activity is a considered responsiveness after getting to know the students. In this geographically remote context with limited resourcing, including difficulties with effective diagnosis of learning disorders, starting simple may have had profound positive influence on gaining students engagement in the chief and sophisticated purpose that is built on this copying activity: analysis.

Jason also manages the energy levels in the room, sensing times that students need a break and then responding appropriately by providing '10 min spent outside'. After a refreshing break, Jason introduces the next topic and there is an energised discussion about 'Australia Day', requiring all facets of student research thinking as shown in the next section.

2.5.1.5   Insightful Thinking

Jason's capacity to analyse needs and synthesise answers, fuelled by his creativity, gave him insights into what to craft. In the resources in the vignettes, he did not start from scratch, but synthesised new solutions from component parts, drawing on the facets of the RSD, and moulding and fitting them to the purpose. Jason uses the self-authored, semi-humorous source in part because he discerned that students in his *Impact* class would resonate with and be motivated by that style, rather than drier articles that they ultimately review later in the class. He may be wrong, and his insightful thinking will be on the lookout for his own misreading of the students.

2.5.1.6   Externalised Thinking

Jason's *pushed out* thinking is shown by his clear statement to the class about learning intentions for each lesson and, perhaps even more profoundly, the shared use of RSD facets to provide students with a big picture for their learning. This is Jason's decision to use explicit strategies as a preference over facilitating tacit learning. Moreover, class and group conversations stimulate Jason's thinking, for example causing him to realising for the first time in three years at the school that the students are not aware of what BJK is. This conversation-based realisation *pushes in* to Jason's teaching and causes him to, uncharacteristically, tell the students the answer.

2.5.2   Students' Experiences of Explicit Research Skill Development

The following analysis shows excerpts from the vignettes that epitomise student use of each of the six RSD facets to engage with source analysis in Vignette 1 and develop a researchable question in Vignette 2. There are multiple instances where only one or two students are so engaging with a specific facet, and there is no sense that this engagement extends to the whole class.

2.5.2.1   Students Embark and Clarify

In Vignette 2 the lesson is structured to facilitate student research question formation through a process that first unpacked a complex range of opinions about *Australia Day*. During the lesson, one student asks 'Is it possible to move Australia Day to National Sorry Day?' Another questions 'If we call it Invasion Day, doesn't that mean that we did something bad?' These are examples that reflect a synthesis of individual student thinking to determine a question, but one that is not 'refined'. They are both yes/no questions, even though the intent behind the questions is far richer than that.

When 'Jason calls the students attention to the front and asks them to refine the research they have been doing into a research question', he is striving to use their passion for the topic and new-found perspective to engage in the central purpose of the lesson. However, 'Peyton and Alex are the only students that participate in this final task for the lesson. They have refined the research into one question, "Why should we celebrate Australia Day?"' This is a clearly articulated and insightful question, and gets at underlying reasons for a celebration, which seems very sensible to ask before discussing 'whether to' and 'which date?' The vignette showcases Jason's process for facilitating student question posing but also shows the difficulties faced for most students to do so.

2.5.2.2   Students Find and Generate

Much that comes under 'finding' is considered to be unearthing sources and selecting appropriate ones. In the vignette, most sources are provided but student capacity to find is tested when they must '… circle statements that support or detract from the overall argument.' Here, finding information within a provided text is a complex skill in itself, involving a close reading of text for relevant information within a source. Strategies for finding information include identifying key terms, skimming, scanning and close reading. In Vignette 2, students do engage in finding sources, such as Peyton finding 'colonisation' is a term that perfectly fit their idea. One group, when asked, recognises that they are developing skills pertaining to "find and generate".

2.5.2.3   Students Evaluate and Reflect

Jason starts the lesson with a highly structured activity based on a source he wrote with intentional cues that cast doubt about its credibility, and several students called out answers that are effectively evaluative. Alex asserts that 'trees need carbon dioxide to live' is the only factual statement. Riley states that the argument that 'we need to pump out more carbon' is 'sooo wrong'. Jordan states that the same phrase is "twisting the facts". Overall, the class asserts 'that the source that has been presented to them is not useful' and indicate a 'bias' in the source.

The 'Croaky' source may have assisted student willingness to be discerning. The humour and glaring mistakes may have helped students get over 'source reverence' and be willing to find fault. As the class moves from this highly structured activity to subsequent ones with more choice, some students apply the evaluative criteria to website URLs and author qualifications.

2.5.2.4   Students Organise and Manage

'In Vignette 2 Taylor, Alex, Jordan and Peyton begin to fill out their Lotus Diagrams. One box is labelled "Date", with the 25th of January, the 27th of January, and May 8th filled in.'

The organisational structure of Lotus Diagrams provides a format that facilitates broader thinking than students' current perspectives. From evaluate and reflect (above) the strategy to get students to pose and refine a question did not guarantee students moving out of their own self-referential perspectives. The spaces for different dates in the diagram show that different possibilities can be considered. This organisational structure enabled a shift from a 'yes–no' approach e.g., Celebrate on 26th January yes/no, to broadened possibilities. Teacher determined or student-determined organisational structures can provoke new conceptualisations of topics.

2.5.2.5   Students Analyse and Synthesise

In an interaction between two students, 'Taylor asks Alex "Would *Colonisation Day* be a suitable replacement for the title *Australia Day*?" He searches for the definition of 'colonisation' and believes that he is on to something when he discovers that the definition for the word fits the actions of the Europeans that migrated here.' Instead of engaging with the main direction of the class concerning date change, Taylor and Alex consider what happened on 26th January, 1788. Their excitement of renaming that date as *Colonisation Day* is because the word characterises, to them, the British actions of the time. Their example of question posing emerges from an explorative process requiring analysis of ideas and synthesis of discussion. While we tend to say that questions launch inquiry processes, if students are the posers, questions often may emerge over time and from much research thinking that draws on all the facets of the RSD. One student, Riley, states 'I hate analysing!' Analysis is conceptually difficult and perhaps required more modelling by Jason and practise with sources somewhat like the *Croaky McToadface* one. Nevertheless, one group perceives that the skills they are using include those needed to 'analyse and synthesise'.

2.5.2.6   Students Communicate and Apply

Communication is not explicitly stated by Jason as a learning intention, but the lesson demands and prompts high-level and frequent communication skills. Students are talking and listening in their small groups, with the conversation between Alex, Jordon and Peyton showing the students bouncing ideas off each other and growing in clarity and understanding. Moreover, they are writing and reading each other's work, such as the Lotus Diagram.

An indication of students applying what they learned previously is shown by the students' metacognition that recognised which facets of the RSD they were developing in particular during that lesson 'The group pauses for a moment to think, though they eventually respond with "find and generate", and "analyse and synthesise".

The above descriptions show how the teacher learning intention around analysing and synthesising and embarking and clarifying required other facets to be involved. Time and again, studies have shown that any sophisticated thinking, even if focussed on a specific facet such as analysis, is multifaceted (Ain et al., 2019; Willison, 2012; Willison et al., 2017, 2020; Wilmore & Willison, 2016) and this multifaceted thinking is evident for students and teacher in both vignettes. However, any approach to developing thinking skills must take the long view and may require 'at least three to five years of practice' (Willingham, 2019: 12). Thinking routines, which are learning heuristics, strategies and mental algorithms that teachers provide to students, have been recognised as a major value add by teachers over time (Ritchhart & Perkins, 2008). Students can draw on these thinking routines and apply them to areas outside of the context in which they were learned, and the RSD facets may be used by students in this way (Willison, 2020).

In addition, this case study shows the RSD may be a 'thinking routine' for teaching that provides guidance for thinking through deeply and planning for issues of concern. At the same time, the RSD may act as an heuristic to help teachers to respond quickly and appropriately to the immediate demands of a classroom, such as uncertainly around 'BJK', or a student yawn. The exposure to the RSD for planning lessons was a factor in Jason being tuned to research thinking for considered, longer term planning. For the immediate needs of the classroom, further research is needed to see if a research-thinking heuristic does enable teachers to respond more effectively in the moment-by moment decision making that is reflection-in-action (Schon, 1988). If so, this would bring together two major thinkers on reflective practice, with Brookfield (2017) primarily focused on gaining perspective outside the one who is reflecting and Schön (1987) focused on the existing internal resources of the practitioner (Newman, 2020). Taken together these models of reflection imply the need for teachers to be tuned to finding out through externalised thinking and so professionally able to make internal decisions when the ways to proceed are unclear. Responsive teaching is engaged in by practitioners who use research approaches to find and generate optimum solutions and, when such research thinking is increasingly part of their mental repertoire, it improves the absolutely vital, quick decisions that all teachers make.

2.6 Conclusion

In-service teacher Home's use of the RSD provides a triple value-add. First, it guided Home's research thinking in response to students' needs in the lesson and unit design. Second, Home used it explicitly to guide students in the development of their research skills, in advance of a major research project in a subsequent year. And third,

Home modelled and demonstrated explicitly to Preservice Teacher Snelling research thinking for responsive teaching with the power of a shared articulation for students and teachers in the form of the RSD facets. Some students in Home's classes engaged with the RSD to interpret which facets they were currently focussing on, requiring and developing their metacognitive capacities. Willison as Teacher Educator introduced Home, when still a Preservice Teacher, to the RSD and now Home was introducing the framework to Snelling in a lived classroom experience. Snelling, as Preservice Teacher, experienced the RSD primarily in a classroom setting allowed him to see the strengths and weaknesses of its use. Taken together, the compounding effect of the RSD framework on high school students, Preservice Teacher, In-Service Teacher and Teacher Educator demonstrate its potential to empower educators with the kind of research thinking that enables their responsive teaching for engaged and sophisticated student learning.

References

Adler, P., & Adler, P. (1994). Observation techniques. in N. Denzin, & Y. Lincoln. *Handbook of qualitative research* (pp. 377–392). Sage.

Ain, C. T., Sabir, F., & Willison, J. (2019). Research skills that men and women developed at university and then used in workplaces. *Studies in Higher Education, 44*(12), 2346–2358.

Australian Curriculum, Assessment and Reporting Authority. (n.d.). *Australian curriculum: General capabilities; critical and creative thinking*. Retrieved from https://www.australiancu rriculum.edu.au/f-10-curriculum/general-capabilities/critical-and-creative-thinking/

Australian Curriculum, Assessment and Reporting Authority. (2018). *My school.* https://www.mys chool.edu.au [school's URL withheld].

Australian Jobs. (2019). Australian Government Department of Jobs and Small Business, viewed 12 November 2019. https://docs.employment.gov.au/documents/australian-jobs-publication

Bernard, R. (1994). *Research methods in anthropology: Qualitative and quantitative approaches* (2nd ed.). AltaMira Press.

Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2016). Member checking: A tool to enhance trustworthiness or merely a nod to validation? *Qualitative Health Research, 26*(13), 1802–1811.

Brookfield, S. D. (2017). *Becoming a critically reflective teacher*. John Wiley & Sons.

de Jong, T., Lazonder, A. W., Chinn, C. A., Fischer, F., Gobert, J., Hmelo-Silver, C. E., Koedinger, K. R., Krajcik, J. S., Kyza, E. A., & Linn, M. C. (2023). Let's talk evidence—The case for combining inquiry-based and direct instruction. *Educational Research Review*, 100536.

DeWalt, K., & DeWalt, B. (1998). Participant observation. In R. Bernard (Ed.), *Handbook of methods in cultural anthropology* (pp. 259–300). AltaMira Press.

Fricker, M. (2003). Epistemic justice and a role for virtue in the politics of knowing. *Metaphilosophy, 34*(1–2), 154–173.

Grainger, P., Steffler, R., de Villiers Scheepers, M., Thiele, C., & Dole, S. (2019). Student negotiated learning, student agency and general capabilities in the 21st century: The DeLorean project. *The Australian Educational Researcher, 46*, 425–447.

Hmelo-Silver, C., Golan Duncan, R., & Chinn, C. (2007). Scaffolding and achievement in problem-based and inquiry learning: A response to Kirschner, Sweller and Clark. *Educational Psychologist, 42*(2), 99–107.

Kawulich, B. (2005). Participant observation as a data collection method. *Forum: Qualitative Social Research, 6*(2) (art. 43).

Kirschner, P., Sweller, J., & Clark, R. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist, 41*(2), 75–86.

Lazonder, A. W., & Harmsen, R. (2016). Meta-analysis of inquiry-based learning: Effects of guidance. *Review of Educational Research, 86*(3), 681–718.

Malik, Z., Khan, S., & Maqsood, M. (2018). Exploring the relationship between student engagement and new pedagogical approaches. *Journal of Educational Technology Systems, 47*(2), 170–192.

McCourt, B., & Ikutegbe, V. (2019). Supporting school completion: The importance of engagement and effective teaching. In *Learning curve issue* (Vol. 21, pp. 1–12). Centre for Education Statistics and Evaluation.

Newman, S. (2020). Teacher learning: Schön and the language of reflective practice. In *Research-informed teacher learning: Critical perspectives on theory, research and practice* (pp. 98–111). Routledge.

Renzulli, J. S. (2000). Raising the ceiling for all students: School improvement from a high-end perspective. In A. L. Costa (Ed.), *Teaching for intelligence: A collection of 11 articles* (pp. 151–77). Skylight-Hawker Brownlow.

Ritchhart, R., & Perkins, D. (2008). Making thinking visible. *Educational Leadership*, 65(5), 57.

Rossi, T., & Sirna, K. (2008). Creating physical education in remote Australian schools: Overcoming the tyranny of distance through communities of practice. *Journal of Research in Rural Education (Online), 23*(6), 1.

Schön, D. A. (1987). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions.* Jossey-Bass.

Sciacca, R. (2016). Fostering critical thinking through a critical inquiry approach in home economics. *Journal of the HEIA, 23*(2), 2–12.

Willingham, D. (2019). How to teach critical thinking. In *Education: Future frontiers.* Department of Education.

Willison, J. W. (2012). When academics integrate research skill development in the curriculum. *Higher Education Research & Development, 31*(6), 905–919.

Willison, J. (2020). *The models of engaged learning and teaching*: *Connecting sophisticated learning from early childhood to Ph.D.* Springer.

Willison, J., & O'Regan, K. (2007). Commonly known, commonly not known, totally unknown: A framework for students becoming researchers. *Higher Education Research and Development, 26*(4), 393–409.

Willison, J., Sabir, F., & Thomas, J. (2017). Shifting dimensions of autonomy in students' research and employment. *Higher Education Research and Development, 36*(2), 430–443.

Willison, J., Zhu, X., Xie, B., Yu, X., Chen, J., Zhang, D., Shashoug, I., & Sabir, F. (2020). Graduates' affective transfer of research skills and evidence-based practice from university to employment in clinics. *BMC Medical Education*, *20*(1), 1–18.

Wilmore, M., & Willison, J. (2016). Graduates' attitudes to research skill development in undergraduate media education. *Asia Pacific Media Educator, 26*(1), 113–128.

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