

**Case Study: Technology-Enhanced Learning in High
Possibility Classrooms in Australian Schools**

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Abstract

Research conducted in the classrooms of exemplary teachers in Australian schools is published as a collection of case studies in a new book on technology-enhanced learning. Understanding what makes an effective case study for practitioners to reflect upon to change classroom teaching is important. In doctoral research that inspired the assemblage of case studies in the book, an additional process of cross-case analysis was used to bring participants together for deeper understanding of the study phenomena. An all-day workshop held at the conclusion of the data-gathering period allowed participants to not only meet each other for the first time, they also had opportunities to discuss, interpret, and analyze case summaries prepared by the researcher prior to writing the final case narratives. Carefully prepared case summaries add another layer of understanding to research findings, and it is necessary in organizing published exemplar case studies of teachers' pedagogical practices in schools. In this moment, participants in a study who often worked in isolation within their own contexts, reflected and drew comfort from understanding how other “tech-savvy teachers” worked in both similar and different ways when they finally came together in the workshop. This case study pays attention to the usual processes in case study methods but also demonstrates how validity and reliability in analysis using member-checks, software for staged coding, and a “collective member check” in the format of a day-long workshop supports building a rich picture of the phenomenon studied.

Learning Outcomes

By the end of this case, students should be able to

- Prepare an effective case study from fieldwork
- Understand how to validate collected data through member-checking to build an interesting narrative
- Generate first-level codes in initial data analysis using qualitative software and recognize its drawbacks
- Knit together a story for a case summary using categories generated from data analysis
- Appreciate how preparing case summaries for participants in a “collective member-check” workshop can be successful as a precursor to writing publishable case studies

Project Overview and Context

When I commenced this research project in 2011, I knew I wanted to prepare a series of case studies for my doctoral thesis. Education literature at the time was replete with calls for effective written exemplars of teachers' technology integration practices in schools (Mishra & Koehler,

2006; Schrum & Levin, 2012). Teachers still find technology integration in student learning problematic. Access to the Internet is difficult in many locations and the time needed to play with its possibilities in classrooms is in short supply in daily school routines (Organisation for Economic Co-operation and Development [OECD], 2015).

For some years, this reality focused my attention on wanting to examine how a purposive sample of “tech-savvy” exemplary teachers, who fitted a set of rigorous criteria, conceptualized their knowledge of technology integration. The study design was approved by university and education jurisdiction ethics committees and was conducted across a 2-year period at four Australian schools in the classrooms of students aged 6-16 years (Hunter, 2013).

Data from the study found that this group of exemplary teachers enhanced their students’ learning with technology in five clear ways; the framework that explicates the practices and processes from the study findings is known as *High Possibility Classrooms* (Hunter, 2015b). The framework has five conceptions (Figure 1) and 22 pedagogical strategies and student learning processes (Figure 2) and is being used by an increasing number of Australian schools to re-imagine how classrooms might operate now and into the future.

Figure 1. High Possibility Classrooms framework showing the five conceptions.

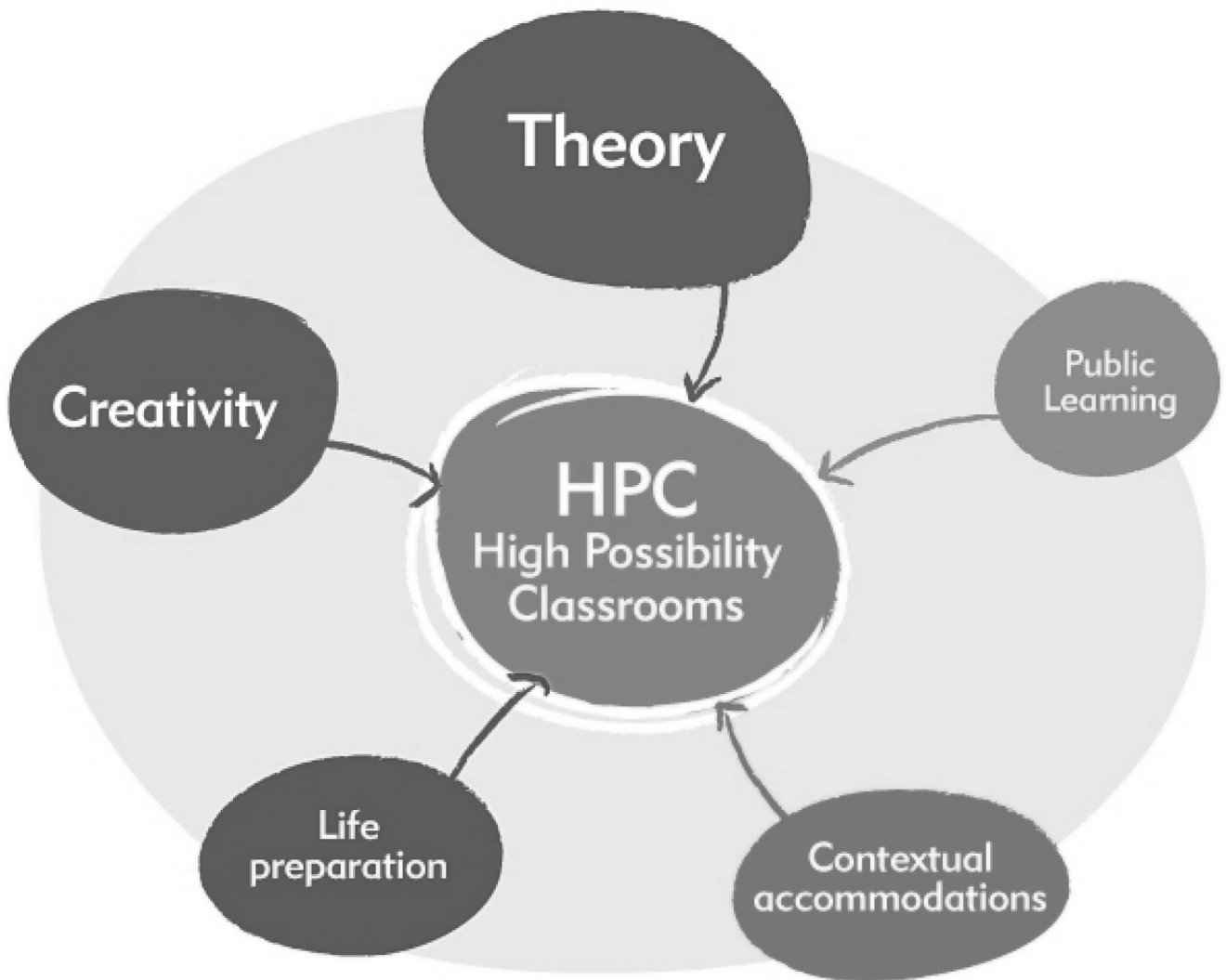


Figure 2. Themes underpinning the five conceptions in the High Possibility Classrooms framework.

Theory-driven technology practice	Creativity for learning through technology	Public learning through technology	Life preparation using technology	Contextual accommodations using technology
Technology drives construction of learning	Technology boosts creativity	Technology scaffolds performance	Technology operationalises the real world	Technology remains personal and professional
Technology enhances purposeful teaching	Technology creates opportunities for production	Technology enhances outcomes	Technology gives voice	Technology changes time
Technology focuses planning	Technology unleashes playful moments		Technology means ownership and possibility	Technology nurtures community
Technology enriches subject matter	Technology supports values		Technology reveals effectiveness	Technology defines the game
Technology promotes reflective learning	Technology differentiates learning			
Technology shifts conversation and thinking				
Technology engages students in authentic ways				

Central to the context of re-shaping pedagogy in school classrooms is the collection of case studies from the research project. Each case study forms a chapter in the book: *Technology Integration and High Possibility Classrooms: Building from TPACK* (Hunter, 2015b). The book does not contain a methods chapter. One purpose of the case study example described here is to share the processes and practices that made the collection publishable.

Several professional development workshops for teachers held in schools since publication of the book indicate that the collection of case studies is acting as a set of reflective prototypes (Hunter, 2015a) for how other teachers might navigate the pedagogical challenges of teaching at this time in education history.

The research project took me inside the classrooms of four teachers: Gabby, Gina, Nina, and Kitty. These teachers taught diverse groups of students, for example, some came from middle class backgrounds in inner city schools, and others were located on the edge of a large city in

a disadvantaged community in one of the poorest regions in Australia.

To explain, the first teacher, Gabby, was an early-years specialist whose teaching experience of more than 20 years provided a rich context of technology-infused learning for her class of 6- to 7-year-olds. The second teacher, Gina, taught elementary stage students and used creativity in science and engineering to engage her learners. In the middle years, Nina, the third teacher, used a set of laptops and individual assignments to excite metacognitive processes in her students. The fourth teacher, Kitty, was a filmmaker in her own right prior to commencing her teaching career. She used the subject matter in visual arts and specialized digital media projects to inspire and engage the high school students she taught.

Briefly, the research design for the project adhered to case method traditions (Stake, 1995) and involved interviewing each teacher three times (12 interviews in total); the first one featured discussion of the teacher's background and teaching experience, the second interview was shaped around technology and its meanings, and the third teased out the teacher's knowledge and approaches to technology integration. Observations took place in each teacher's classroom for a week at a time across a 2-year period. An observation instrument allowed systematic checking and crosschecking alongside what the teachers did in the classroom and what they described in interview. Focus groups, with a random sample of students from each teacher's class, served to triangulate findings with what was observed and what was stated in teacher interviews. The final brick in the method involved collecting fieldwork artifacts in the form of notes and memos, lesson plans, photographs, and school technology policies.

Validity, reliability, and member-checking of the case study data collected from the sources mentioned were attended to in the practicalities of research at each step in the conduct of the study.

Research Practicalities

Questions of validity and reliability were critical to my quest to write effectively about education research. Validity is a relative term in this project, as what is reported in a published case study is the product of a convergence between my own worldview and those of the teachers. Reliability in education research is achieved through minimizing errors and bias (Yin, 2014). An important question to consider here is as follows: if another researcher was to replicate this study using the same four teachers, would they arrive at the same findings? It is, in reliability terms, more important to think about whether "the results make sense given the data collected and are they consistent and dependable" (Merriam, 2009, p. 206). The main issues in this research could be summarized as follows.

Role of Thorough Member-Checks

In this stage of the project, any misinterpretation and clarification of meanings were made that ensured each teacher was satisfied with their interview accounts and any requested changes to transcripts were carried out. The teachers in the study carefully attended to a thorough reading and made minor improvements to the original record, which is not always what occurs (Merriam, 2009). Such processes allow “the actor to review the material for accuracy and palatability” (Stake, 1995, p. 114). One student from each focus group read over the group’s transcript and indicated whether it was accurate. In some ways, what happened was more of a *member-reflection* that provided space for additional data, deliberation, and complexity—not strictly seeking only the realistic “one truth” of what was observed by me (Tracy, 2010). After each data collection phase, in addition to the interview/focus group transcripts, partially formed within case summaries (as described and prepared using the model from Miles & Huberman, 1994, p. 77) were returned to each teacher for further “member-checking.” It was critical to honor each participant’s desire to support the validity and reliability of the project.

Having Regular Conversations With Supervisors During the Analysis Process

Throughout the project, conversations with my doctoral supervisors ensured that the data analysis reduction process was congruent with emerging findings. An abbreviated account is provided below and was essential to preparing robust case summaries for the “collective member check” workshop that took place at the end of the data-gathering period.

Data Analysis to Generate First Codes

The prime purpose of data analysis is to make sense of out of the data. Data analysis in this study involved the conscious method of selection, consolidation, reduction, and interpretation of what was collected and collated in case summaries from the actions of the participants (Coffey & Atkinson, 1996; Silverman, 2010). These simultaneous processes are associated with the main stages in Strauss and Corbin’s (1997) grounded theory method: open coding, axial coding, and selective coding. The rationale behind open coding is similar to Merriam’s (2009) discussion of first and second levels of analysis, where moves are made between “concrete description ... [and] systematically classifying data into some sort of schema consisting of categories, themes, or types ... they interpret the data” (p. 187). For example, the first three interviews from Gabby were initially read without specific coding. The goal was to promote familiarity, jotting notes in margins, and summarizing idea or potential themes at a macro-level. Each step in the process of analysis was designed to “reduce” or break the primary data down into “more manageable chunks” (Miles & Huberman, 1994). This “pilot” data from Gabby generated over 60 codes; the names assigned to the codes were created from the literature

and included the seven components of the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) used as the theoretical lens for the study.

Using Qualitative Software to Support Further Analysis

I reduced the number of codes at this point prior to importation of the first set of data into the qualitative software to commence open coding in earnest (note: I used NVivo—there is not space to go into why I chose this software suffice to say it was best fit and simple to use as time was a constraint in the project). The software has easy text storage for interview, focus group, and observation data; it stores files in single hermeneutic units; and it affixes codes to words or groups of words, establishes queries, creates memos, makes families of codes, and creates network views. Helpfully, it draws on grounded theory in its design (Bazeley, 2007). Although there was some criticism a while ago that Qualitative Solutions and Research, the manufacturer of the software, had jumped on the “grounded theory bandwagon” as the software’s “memoing tools facilitated theory building from the data” (Kellehear, 1997, p. 20), other literature has since pointed out that “the tools do push the researcher to draw theory from the data, however it is not necessary to follow grounded theory guidelines when using this software” (Welsh, 2002, p. 5).

Recognizing That Software Can Sometimes Be a Drawback

Using software in data analysis is thought by some researchers to add rigor and thoroughness to the qualitative research process (Bazeley, 2007; Welsh, 2002). For instance, this was true when data imported from Gabby were initially open-coded into themes (called nodes in NVivo). Moreover, when the data were searched in terms of “attributes,” interrogating the text in more detail was difficult; this drawback of the software is documented (Welsh, 2002). This aspect of the analysis process was possibly added to by a “sense of urgency” with imminent cross-case processes pending, ever mindful of Miles and Huberman’s (1994) plea to “understand the dynamics of each particular case before proceeding to cross case explanations” (p. 207).

Knitting the Narrative Together in Three Stages

The established first-level codes from Gabby were comprehensive, and “manually coding on” continued from the recognized themes for Gina, Nina, and Kitty. It was useful to think of this part of the qualitative process as a type of “rich tapestry, the software was the loom that facilitated the knitting together of the first rows of the tapestry, but the loom cannot determine the final picture on the tapestry” (Welsh, 2002, p. 6).

In other critique of qualitative software, Bandara (2006) and others (Asensio, 2000; Bazeley, 2007) reinforce the view that it is important for researchers to recognize the value of both

manual and electronic tools in qualitative data analysis and management and “not to reify one over the other but instead remain open to, and make use of the advantages of each” (Welsh, 2002, p. 7). Axial coding or the search for regularities within and across the data resulted in narrowing or synthesizing relationships between categories (Corbin & Strauss, 2008; Merriam, 2009). In each case, the causal condition was technology integration, and the phenomenon referred to as the “set of actions.” There were the conceptions drawn on by the teachers. The result of axial coding was the development of categories, based on connections made between existing categories and sub-categories.

In Stage 2, the data were reduced again by further collapsing similar categories together, where distinct categories became sub-categories of others. Axial coding elaborated the relationship of this category to other categories, again uncovering its role by using the paradigm model in light of teachers’ perceptions of technology integration. In this way, theory testing was applied to grounded theory. During this process, observation data were used in an effort to determine evidence of a category and its informing properties. This served to triangulate the claims being made. For example, this was useful when I compared the teacher’s interview remarks with instructional practices observed in specific lessons.

In the third stage, selective coding was established as the main phenomenon of the study, which included several existing codes summarized into one new category. With the central phenomena identified, selective coding required analysis of the remaining categories in order to determine their possible relationship to it. The core category was validated through the creation of a storyline explicating the relationship. This sometimes took a narrative or diagrammatic form, and through testing the fit of each supporting category, I was able to see the “central phenomenon around which all other categories are integrated” (Strauss & Corbin, 1990, p. 116).

This final practicality of the research provided a starting point for the workshop activities to “collective member-check” the study findings.

The Cross-Case Workshop in Action

The final process of data analysis in this project used to build the case studies was distinctive. This act involved the cross-case workshop—I am referring to this step as a “collective member-check” with the four teachers at the conclusion of the data collection period. I hired a comfortable room in an “off-campus” venue central to the location of the schools. An agenda for the day was circulated in advance—it was audio-recorded; the workshop goal was designed to deepen knowledge and explanation of the teachers’ understandings, by examining the similar

and different properties within categories, and the relationships that appeared within each case study (Miles & Huberman, 1994). Participants met each other for the first time; although as it happened some had met one another at previous professional development courses.

Opportunity to gather together like-minded individuals who are the subject of education research cannot be underestimated (Groundwater-Smith, Mitchell, & Mockler, 2007); Gina expressed it this way in the workshop: “there are reasons for what we are doing, coming here today and meeting everyone makes me feel more confident and valid in what I do as a teacher, so often we work in isolation.”

Prior preparation of the case summaries for the cross-case workshop provided an opportunity for me to review and understand multiple data sets more effectively and then for each teacher to see what was common and different across their collective practices (Hamilton & Corbett-Whittier, 2013). For example, I wanted to know: Were the categories emerging from the data correct? In the workshop, the teachers examined the quality of data supporting the research questions and built a storyline for each case from the agreed categories.

Each case summary was discussed prior to moving on to the next one. A conceptual overview of what occurred was mapped, and this understanding was further shaped and altered by the teachers' voices (Groundwater-Smith et al., 2007; Kemmis & McTaggart, 2000).

The audio recording and transcription from the workshop, in addition to more stream-lined within case summaries, were added to the data set to support the final written case studies. It seemed that a smoothed set of generalizations did not apply to any single case. This fitted with the idea of making comparisons while preserving the uniqueness of each case study (Miles & Huberman, 1994). In light of this process in the analysis stage, it is essential to note some of the practical lessons learned.

Practical Lessons Learned

I have focused thus far on the use of the processes leading up to and including the conduct of a workshop as a critical part of data analysis. Now, I would like to offer some extra practical tips. Ideas that, first, could be used on the workshop day and, second, in writing a case study that readers will want to engage with, albeit for examination in a thesis, or publication in a book. Remembering that the audiences for each product are quite different, and that there is good, time-tested advice in the methodological literature (see, for example, Robert E. Stake's *The Art of Case Study Research*, 1995).

It is essential to read what data components are necessary in the method prior to commencing

fieldwork and to signal to the participants that after the data collection period concludes (and this was the following year), they were required to attend a whole-day workshop. Funds from a PhD budget will need to be allocated to this activity, as teacher release time must be paid for in schools. Five additional suggestions to keep front of mind:

1. *Selection of a set number of participants.* This could be a study limitation, and that is the nature of case study research to a large degree and assumptions about purposive samples (Glaser & Strauss, 1967). It is as Stake (1995) comments, “the study of the particularity and complexity of a single case, coming to understand its activity within important circumstances” (p. xi). In addition, there are other misunderstandings about case studies and their generalizability identified by Flyvberg (2011), yet in spite of these drawbacks, “case study can certainly contribute to the cumulative development of knowledge” (p. 312).
2. *How might being a teacher limit objectivity in conducting case study research?* I was a former schoolteacher, and this meant closer attention to issues around subjectivity and what constituted effective integration of pedagogy, content, and technology. Personal reflection is important, but there was recognition that it comprised only one part of case study (Hamilton & Corbett-Whittier, 2013; Kemmis, 2005). Also pertinent is the notion of “gatekeepers” as defined by Hammersley and Atkinson (2007) and the idea that in this project, I had at my disposal “insider knowledge” of where outstanding technology integration practices in schools was located.
3. *Work with a pre-prepared observation instrument and interview schedule.* My supervisors made suggestions around what such an instrument might contain based on prior research projects. I adapted suggestions according to the theoretical lens I used for the study. The interview schedule I prepared was open ended but started with a curiosity for finding out what made these “teachers tick,” and after observations in their classrooms, there was rich material to reference and further question.
4. *When you are a future Principal Investigator (PI) on a project, employ a research assistant to support audio recording and notetaking at the cross case workshop.* This concrete suggestion means as PI, you are freer to listen and focus on what your participants are sharing. I found the cross-case day very intense and having another “set of hands and ears” was helpful—prepare hard copies of case summary materials ahead of the day and providing pens and pencils for clarification and scribbling is also recommended.
5. *Consider painting a picture of the teacher’s classroom using a creative memo prior to commencing the written case study.* For example, in the book *Technology Integration and High Possibility Classrooms: Building from TPACK* (Hunter, 2015b), each case study chapter commences with a short story, a photograph, images from a booklet used in one of the teacher’s lessons, and a poem written by a well-known author being studied by

students observed in one of the classrooms—I changed the words of the poem to reflect a “technology” theme. The format of the case study in each chapter in the thesis and the book flows on from a creative beginning to honor the teacher’s professional background, the school context, the classroom, and representations of their technology integration knowledge and the main conceptions of practice. It concludes with points for further consideration. This pattern is repeated and provides a predictable rhythm for reader ease.

Conclusion

In writing a collection of case studies for my PhD, I wanted to demonstrate to an examiner that I understood a particular qualitative research method. However, I also wanted to triangulate data that were collected individually for each teacher with what other participants in the project understood by what was recorded, observed, and stated—not only by me but also by students. The case summaries took time to prepare but having loosely formed narratives to take into the workshop enabled a somewhat easier case study writing process after the event.

Gathering the study participants together on a designated day proved successful in a way that I had not envisaged. At a personal level, each teacher felt validated in what they were doing in the technology space “as early adopter teachers.” Knowing that other teachers in the same jurisdiction were attempting to do the same things was satisfying. Often, teaching in schools is a solo practice and “secret teacher business” is all about “what I do with my class in my room.” It is a space not often open to “outsiders.” Professionally, the teachers revealed they learned more about research processes at the workshop, and for me, I was grateful for their professionalism and hard work; on reflection and now standing at some distance from completion of the project, it was a joy and a rare opportunity. Now it is time for you to start your writing.

Exercises and Discussion Questions

1. In my PhD, I used a “purposive sample of teachers” to write about in a collection of case studies. What is a purposive sample? Why might it be useful? Does it have drawbacks as a sampling method?
2. What is member-checking? Why is it important? Think of some examples where you have used it or might have used to assist research projects you have undertaken or are planning to undertake?
3. What qualitative software packages are you familiar with in education research? Where can you obtain an understanding of such software? Who might assist you to build capacity in the area of becoming a more efficient tech-savvy researcher?

4. Examine Miles and Huberman's (1994, p. 77) material on writing case summaries—set out a case summary based on a teacher you know and present it to a group of peers. Critique each other summaries—can you imagine the teacher, does it seem authentic, and what silences are there in what has been written down?
 5. Imagine you want to bring together your study participants in a day-long workshop like the one described here—write an inventory of what you might need, think of a suitable venue, and set out an agenda that will ensure the day runs smoothly including catering and hiring costs.
 6. Take one of the case studies from the book *Technology Integration and High Possibility Classrooms: Building from TPACK* (Hunter, 2015b) and discuss its merits and deficiencies as you commence and grow your understanding of writing effective case studies.
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Further Reading

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Web Resources

<http://education.okfn.org/files/2015/11/Book-Open-Data-as-Open-Educational-Resources1.pdf>

<http://www.aitsl.edu.au/research-and-evaluation/evaluation-of-the-standards/activities/case-studies>

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