Understanding teachers' professional knowledge

A considerable literature exists that describes a diversity of views on the nature of teachers’ professional knowledge of practice. However, despite the proliferation of these views, understanding what teachers’ professional knowledge really is, what it looks like and, how it might be interpreted and implemented through classroom actions is exceptionally difficult. As teachers, we often struggle to define our knowledge because it is largely tacit. That is not really surprising because we are so busy doing teaching that there is little time, opportunity or expectation to talk about why we do things the way we do. Because our knowledge of our practice is tacit, it is often misunderstood - despite the fact that it is fundamental to quality classroom teaching and learning.

Teachers’ professional knowledge of practice matters because:
- it is important to be able to recognize and articulate the expertise that is encompassed in quality practice for ourselves and for the wider community;
- there is a continual need to communicate and share our knowledge of practice in ways that extends beyond tips and tricks as the sole measure (or expectation) of classroom expertise;
- we need to be reminded that the skills we develop in managing the dilemmas and tensions inherent in working with 25 or so different students each lesson is a basis for specialist knowledge; 
- expertise needs to be able to be shared in ways that does not always call on each individual to reinvent the wheel; and, 
- teachers’ professional knowledge encapsulates the very essence of being an accomplished practitioner.

In the actions we take to facilitate student learning, we are continually developing our professional knowledge of practice. By valuing what we do, in accepting that good teaching requires skills, knowledge and abilities, it stands to reason that such knowledge needs to be recognized, developed and cultivated. Articulating our professional knowledge requires a shared language from which genuine meaning, application and value to our daily work as teachers might be derived. This paper offers one way of conceptualizing teachers’ professional knowledge of practice.

A framework for understanding expertise

The development of teaching expertise can be viewed as a learning process that helps to build knowledge. Teaching is not just a matter of doing, it is also about that which informs what is done. Expertise in teaching then comes to the fore when this developing knowledge is sorted, filtered and analysed to be understood in relation to how it influences students’ learning. Teaching is a process embedded in relationships - relationships between: thinking and doing; theory and practice; students and teachers; students and content; students and students; and so on. With so many factors influencing the nature of teaching, it is not difficult to see why teaching itself is problematic.

The nature of teaching is embedded in uncertainty and yet, to learn more about teaching requires us to choose to increase that level of uncertainty through risk taking in order to experiment with our practice. Learning to be comfortable with uncertainty is part of what it means to become a learner of teaching and is at the heart of that which supports the development of expertise and the growth of professional knowledge of practice. One way of thinking about how that knowledge is able to be developed, recognized and shared is through the use of a framework.

In teaching there are many ways of thinking about a framework to direct practice. There is not one correct, true and right framework. Rather, there are many possibilities for constructing ways of shaping teaching beyond classroom activities. The framework described in the rest of this paper is one way of thinking about the nature of teachers’ knowledge and how it can ‘frame’ thinking about teaching. The framework includes: prior knowledge; processing; linking; translation; synthesizing; and, metacognition. When grouped together they form a framework for conceptualizing teaching and of articulating aspects of teachers’ professional knowledge of practice (a full explanation is available in, Loughran, 2010, which also includes a range of teaching procedures that turns these ideas into practical examples of classroom practice).

Prior Knowledge

The ideas, information, beliefs and attitudes that learners bring with them to the classroom are some of the elements that comprise that which could be termed prior knowledge (i.e., prior to formal teaching). We are all familiar with the notion of prior knowledge and how it can influence our learning because, whether we are introduced to new things or are in a situation...
in which we are building on existing ideas, what we already know impacts that learning.

Typically, when we are involved in, observe, or hear about, an experience or event, we link that event to the things that spring to mind that we already know, think or believe, and/or similar, situations. In so doing, we bring to bear those ideas that we previously held in ways that we may (or may not) be conscious of - depending on how ‘attached’ we are to the existing ideas. For example, there are times when ideas that are firmly held prove difficult to shift or change. This is partly due to our prior knowledge having a bearing on how we view alternative perceptions of the same (or similar) situation. In some cases, no matter how often we are told, or how carefully something is explained to us, it is simply not sufficient to cause us to alter our existing worldview; we cling tightly to that which we already know, feel or believe.

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Prior knowledge can come in many forms. There are things that we learn, things that we are told, have heard about or seen and, situations that we have experienced. All of these shape our understanding. As a consequence, there is a continual building up of ideas that can be called upon in different ways.

Learning often involves some form of generalizing so that the essence of the learning in one situation might be applied in another. Therefore, our prior knowledge may well comprise personal explanations of events that make sense to us, but although they might make sense, that does not necessarily mean they will accord with the explanations of others. This stands out most strikingly for science teachers when they explore students’ explanations of many everyday phenomena. Although their explanations appear to make sense and fit their observations, they do not accord with scientists’ explanation of the same event.

There is a vast literature on students’ alternative conceptions (see for example, Pfundt & Duit, 2000) and this work illustrates well how important it can be to not only be aware of, but be skilled at, working with students’ prior knowledge - especially if quality learning is to be encouraged. But it is not just in science that prior knowledge can lead to difficulties with learning. The same applies across the curriculum from reading, through to history, mathematics and studies of culture. Prior knowledge involves learner feelings and attitudes which can have a big bearing on how students learn – or feel about learning – so prior knowledge is not only limited to information per se.

Clearly then, prior knowledge is an important component of learning that we need to not only be aware of, but be prepared to work with in order to help develop our students’ understanding. Students learn much more effectively when they are placed in positions where they are building on what they already know because they can link the new information to their existing information. In so doing, it is more likely that their curiosity will be aroused and that they will be encouraged to create and build their knowledge in ways that might help them to better understand the topic being studied.

**Processing**

Teaching for understanding requires propositional knowledge (facts, definitions, information, etc.) to be developed and used by learners in ways that go beyond simply absorbing the information and regurgitating it when asked to do so (most commonly through low level assessment tasks). Absorption and recitation of information is typically associated with surface learning and such an approach to learning can create problems when it becomes the major script for students’ approach to school learning. Therefore, changing the script is important if learning is to be enhanced so that the particular knowledge under consideration might be more meaningful, relevant and useful for learners. For this to happen, the information must be processed. Processing means that the information is deconstructed, looked at from different perspectives and linked to existing knowledge and ideas so that it might be able to be used in different ways and appropriately applied in different situations.

Studies in psychology offer very strong evidence that, “people’s active mental processing operations form a powerful and important cause of learning and remembering. Of the many factors that influence what a person learns, none has a larger influence than the kinds of mental processing activities that are carried out by the learner, deliberately or otherwise, at the time the person is attending to the material or information that is to be learned” (Howe, 99, p. 33).

Processing matters because it is one way in which a learner can begin to impose a structure on the material. Processing can help a learner begin to organise information in ways that make sense so that it can be recalled and used appropriately when needed. Clearly, when information is stored in a meaningful way, it is able to be more easily retrieved and used in the future. By thinking about processing in this way, the difference between remembering and learning becomes immediately apparent and the value of processing as an activity emerges as an integral component of teaching and learning.

Processing, as an active element of learning, can be catalysed through teaching. When we think about what needs to be processed, how and why, there is a greater possibility that the script for learning can change so that a meaning making focus might displace a recitation and recall focus. Thinking carefully about the ways in which processing can be encouraged through teaching approaches can assist students in shifting information from their short term to their long term memory because they develop a deeper purpose in that learning. Therefore the level of
processing (surface or deep) becomes important in embedding the learning in long term memory in ways that allow it not only to be remembered but also to be useable in meaningful ways.

Surface processing is characterised by a lack of attention to detail, analysis is largely superficial; skimming is a good example of surface processing. Deep processing, as the term suggests, is when full attention is paid to detail so that analysis leads to the creation of strong links with existing knowledge. Deep processing means that ideas and information are sorted and organised in ways that contribute to understanding. Teaching for understanding therefore is all about encouraging processing to move beyond the surface so that it becomes deeply embedded in a learner’s long term memory.

Learning is also influenced by the way we feel (affective domain) and how we share and interact in our learning with others (social). Teaching for understanding draws on the cognitive, affective and social to transform learning into a meaningful act that is expertly designed and organised. Teachers’ professional knowledge is clearly evident in how they carefully plan and implement teaching approaches that encourage deep processing. Quality in teaching is not about using a teaching procedure just to break up the normal classroom routine, it is about using a particular teaching approach for a particular reason; there is a pedagogic intent and that intent is closely tied to the professional knowledge of practice and how that can be used to enhance students’ learning.

**Linking**

Linking is making connections across ideas so that prior knowledge and new knowledge can interact in ways that will further develop a student’s understanding of the topic being studied. Jo Osler and Jill Flack (authors of the quote below) paid careful attention to the notion of linking in their teaching as they sought to help their students be more effective learners:

“*In order for us to develop linking with our students we had to first identify the important components that we felt would enhance the learning for our students. ... Although over the years our approach to teaching linking has continued to develop, our list of understandings stayed fairly constant. We want our students to: - realise that school is more than a series of unrelated episodes; - see learning as ‘building on’; and, - make personal connections by accessing their prior knowledge and linking it with new learning.*”

*(Osler & Flack, 2008, p. 19)*

Although the idea of making links may seem simple and obvious, there is a big difference between thinking about links (to related ideas, events, etc.) and actually articulating meaningful links in ways that can inform learning of the particular topic under consideration. For example, we often experience the situation in class in which questions we pose are responded to in ways that seem to bear little relevance to that which was asked. These ‘red herrings’ are usually linked in some way to the ideas being discussed, but unfortunately, the thinking underpinning those links may appear less than transparent to us as the teacher and/or to the rest of the class. Developing students’ abilities to link in meaningful ways then is important in expanding the ways in which they understand a concept and ultimately, how they can work with a concept in different situations and demonstrate that publicly to others.

**Encouraging students to be effective linkers can be difficult because the routine of schooling can lead some students to develop a default learning approach based on minimizing effort and only maximizing output when they feel they have to.**

Linking is a process that, in some instances, happens almost subconsciously. Something that happens in one context can be a reminder of a similar thing in another, or there are times when ideas spring to mind as a result of a series of links such that, in isolation, the beginning and end points themselves do not appear to be related (as per the notion of red herrings). Yet, when working through the links that have led from one point to another, the cascading of ideas and suggestions demonstrates well how complex linking can be and how in some circumstances, unrelated events can be brought together to make sense of a situation.

Encouraging students to be effective linkers, and therefore more effective learners at school, can be a challenging task. It can be difficult because the routine of schooling can lead some students to develop a default learning approach based on minimizing effort and only maximizing output when they feel they have to, i.e., they become conditioned to operate in ways that allow them to cope with the demands of schooling. Unfortunately, this means that they can become very good at paying attention only to the immediate task or activity and inadvertently shun links to other knowledge, ideas, experiences and events that could enhance their learning. Therefore, a student’s ability to link may not be a problem; rather, it might be the ability or motivation to do so under the normal conditions of schooling. This point has been demonstrated time and again throughout the research literature which reinforces the importance of continually paying attention to the need to make linking explicit.

The need to help students realise that school is more than a series of unrelated episodes is clearly important. Linking not only matters from lesson to lesson within a subject but also across subjects. With the wide range of content covered in classes it stands to reason that the more active a student is in making links, the easier it is to remember that content and therefore the more likely it is that richer understandings will eventuate.
Linking learning to episodes and events from students’ own lives clearly helps to make learning more relevant and so the teacher is important as a catalyst for linking rather than directing the form that linking should take. Linking then benefits from being student initiated as the particular experiences, ideas, knowledge, episodes and events able to be linked to that content will vary enormously from student to student - thus being student directed is more likely to create greater personal meaning.

As briefly noted above, challenging a student’s default school learning script requires them to recognize the need to make a change to the way they approach their learning and one way of doing that is through ensuring they experience a sense of making progress. In so doing, it is then more likely that the value of linking will be reinforced – and therefore become part of their learning routine.

Making progress means that students need to see advantages in making the effort to search for links. A good beginning point is through linking with personal experiences. We commonly remember the details of events in which we have been personally involved and it is through this personal connection that linking can become a powerful aid to learning. Making personal connections increases relevance for students and also gives them permission to think in different ways about the work they are doing. For example, students who study history but do not make links to their own experiences (related to the topic, place, events of the time, etc.) may come to see history as a long list of facts and information to be remembered. However, students who do link the topic to their own experiences develop many more points of connection between that which is being learnt and that which they already know and so their learning is enhanced (so too is the likelihood that they will have a more positive attitude toward the topic being studied).

An important aspect of making links (and therefore progress in learning) is in the extent to which linking can be made public in order to facilitate the thinking of others – as opposed to linking remaining an individual and private process. When students are able to talk aloud about the connections they are making, not only is it helpful for them, but it can also be helpful for others. Interestingly, the very process of making links in a public way can create a memorable episode for a class and, as a shared experience can be another way of supporting students’ learning through the personal links they make as a result of that learning experience. For example, in a class discussion a link that one student makes to the topic may well trigger similar thinking about such links by another. If students relate the given situation to others that they have experienced it can create new links for other students and help to open up new ways of thinking about the topic that might not otherwise have been possible. Through these sorts of personal connections, meaning making is fostered and learning processes beyond simply remembering information into ways of knowing that are much more intertwined and evocative.

**Translation**

Translation occurs when ideas and information presented in one way are processed and then used in another form. Translation requires cognitive manipulation as the ideas and information being worked with need to be well understood in order for them to be applied in a different way in a different setting. Being able to translate information is one way for students to demonstrate a deeper understanding of a subject because the work of translation depends on much more than just restating facts and information. Translation is about manipulating information in ways that demonstrate the essence of being able to use that idea in a different context.

Working with ideas in one context then using them in another can mean that students need to be adept at shifting their thinking between the concrete and abstract. Being able to manipulate concepts in an abstract form encourages students to think more deeply about what they know and how to apply it. In terms of teaching for understanding such cognitive manipulation is indicative of the learning process that matters and is something that can be initiated, but not necessarily controlled by the teacher. The process of translation occurs in different ways in different individuals depending on such things as their prior knowledge, the ways in which they process the information, and the particular links they are able to make to ensure that the process is meaningful as opposed to being a routine task.

One obvious value in implementing teaching procedures that are based around translation activities is that although the beginning and end points can be established by the teacher, the paths between are rightly able to be controlled and directed by the learner. Therefore, meaning making becomes a much more personally significant process and so is more likely to have a lasting influence on what the learner learns.

Creating pedagogic situations in which students operate as active learners is crucial to challenging their default school learning routines. Translation activities are one way of unsettling these routines and ‘forcing’ students to think differently about what they are doing so that learning is not just encouraged but purposefully developed by students.

**Synthesizing**

Synthesizing is putting all the parts together to make up a coherent whole. Although there are a number of elements that influence learning, no one element of learning alone is sufficient for understanding. Rather there is a need for learners to continually build and refine their knowledge, skills, feelings, attitudes etc., in ways that might help to broaden what it is they know about a topic and how to use that knowledge in different situations. Synthesizing is therefore a process of creating a coherent whole at a particular point in time.

Synthesizing is an important way of bringing the pieces together and joining them in learning so that
In order to bring different elements together to create a big picture view of the particular content, there is a need for the learner to apply thinking skills such as reasoning, analysing and summarizing in order to make sense of the individual elements of the content and to consider how they might fit together in a meaningful way. Therefore, reconsidering the nature of the elements can encourage learners to begin to search for and recognize patterns, and to create new perspectives on what once may have been unknowingly taken for granted.

Another important point about synthesizing is that in bringing different parts together, the learner is creating something new. Synthesizing is not about regurgitating information and ideas in an unthinking and unconnected way; it is about creating something new and extending knowledge - although the implication is that the knowledge is new to the individual not necessarily new knowledge per se (i.e., the new knowledge is such as to further develop the learner’s understanding beyond what it was before). Thus synthesizing is clearly a very active process.

Understanding synthesizing in the way briefly described above is important because the process itself can sometimes be inadvertently confused with summarizing or paraphrasing – which are different processes with different purposes. A major point of difference between summarizing, paraphrasing and synthesizing is about the need to be working toward creating something new, not simply recasting the information in a more concise form. That is not to suggest that summarizing and paraphrasing are not important tools for learning, rather, they should be seen as helpful ways of identifying and refining some of the elements to be assembled; which can then help to make the creative process of synthesizing more meaningful.

Benjamin Bloom (1956) described synthesis as a higher order thinking skill requiring the learner to be able to do such things as: make informed predictions; hypothesize; invent; design; develop; and, construct in ways that might lead to new and creative outcomes. Again, the notion of synthesizing as an active intellectual process stands out as important for building learning in ways that moves beyond the constituent parts alone and comprises a number of thinking skills that, when developed and refined, make a difference for quality in learning.

Recognition of the value of developing teaching and learning episodes that encourage students to synthesize information, ideas, knowledge, feelings and concerns is important and can be initiated through activities that draw on some of the thinking skills that form the basis of synthesizing (e.g., categorizing, combining, compiling, devising, designing, predicting, hypothesizing, revising, organising, etc.).

**Metacognition**

The aspects of the framework outlined above have largely focused attention on cognition, i.e., the mental processes used to code, store, transform and retrieve information, ideas, knowledge, etc. Metacognition is a process that operates at a different level and has been described as thinking about thinking (Flavell, 1976). Metacognition helps us to know/decide which mental process(es) to use in a given situation, at a given time for a particular reason - hence the notion of thinking about thinking. We are all metacognitive. However, the level of metacognition employed, or put another way, the range of metacognitive skills we have and use varies from individual to individual and from context to context.

Encouraging learners to enhance their metacognitive skills offers real possibilities for changing the rhetoric of developing active, responsible learners into reality in classrooms because metacognition involves self-monitoring and self-regulation. When self regulated learners are faced with a task, they typically tend to:

- analyse the task and interpret task requirements
- set task-specific goals that aid successful task completion
- self monitor progress and provide ‘self-feedback’
- adjust strategies and goals throughout the process
- use self motivational strategies to ensure task completion.

Metacognition thus involves planning, monitoring, regulating, questioning, reflecting on and reviewing our cognitive processes. (Krause, Bochner, & Duchesne, 2003, p. 145).

It is not difficult to see then how metacognition can make a difference in learning and the possibilities it offers as a key to unlocking new avenues to teaching for quality learning.
There are many types of metacognitive skills and strategies but at the broadest level three main strategies are most commonly noted in the literature: planning; monitoring; and, evaluating. A typically successful school learner would most likely employ strategies from each of these categories in order to successfully complete a task. For example, in planning for the task at hand, metacognitive students are likely to ask themselves questions such as: what is the purpose of the task; what do I need to do to complete the task; what do I want to achieve from the task; how much time and energy should I devote to the task? Similarly, once involved in the task, a degree of monitoring matters in order to best align what is happening with what was planned. Monitoring questions might include such things as: how do I feel this task is going; am I making sufficient progress; are there any changes I need to make to what I am doing; am I meeting my goals? At the completion of the task evaluation questions might include such things as: how well did I complete the task; what did I do well; what could I have done better; what would I do differently if I was doing it again?

One way of interpreting the actions of students who think about their thinking in the way described above is that they are asking of themselves the types of questions that we (as teachers) often ask our students to help them successfully complete their set work. Thinking about metacognition in that way then raises an interesting point about what it means to learn to be more metacognitive; it requires a conscious effort. Therefore, to develop and enhance students’ metacognition there is a need to explicitly link that skill development to the way we teach which means that the teaching procedures we use challenge students’ thinking – and their thinking about thinking. PEEL (Project for Enhancing Effective Learning, Baird & Mitchell, 1986; Baird & Northfield, 1992) grew out of teachers’ desire to do just that and is an excellent example of how teachers, when focused on the notion of metacognition, can dramatically change their teaching and their students’ learning.

Over the years the notion of teaching for enhanced metacognition has been taken up in many ways. However, at the heart of this work is a paradox that can sometimes be misleading to even the most informed and thoughtful teacher. It has been demonstrated time and time again that despite our best intentions and efforts to teach in ways that encourage active student learning, research suggests that for many of us, our purpose and our practice are not always so perfectly aligned. The difficulty is that in the rush bustle world of teaching it is not always easy to really see our own practice; much less see it from a student’s perspective. Therefore, sometimes we need to be challenged and confronted by our own teaching - just like students need to be challenged and confronted by their learning.

As we have all experienced, the dailiness of schooling (Loughran & Northfield, 1996) can work on us (just as it works on students) to inadvertently transform practice into routines and scripts that, sadly, can diminish our good intentions and unknowingly trigger passive learning responses in our students. This is an issue that those outside of teaching think can be easily resolved – usually by some top-down policy mandate - but those whose work is based in classrooms (the crucible of teaching and learning) recognize this situation as the ongoing challenge of teaching; something that the expert pedagogue manages in idiosyncratic and professional ways. The situation is not something easily able to be fixed by applying a recipe or formula; rather the manner of the response is in fact a demonstration of the wisdom of practice which forms the foundations of teachers’ professional knowledge.

Teaching for enhanced metacognition has been developed and refined over the years because teachers have moved beyond teaching as activities to seriously explore teaching and learning as a relationship. Just as it matters that students develop their metacognitive skills, so too it is important for teachers to do the same. In so doing, it leads to a fundamental change in the way classrooms operate. By paying attention to learning through metacognition, teachers can become expert at articulating what they are doing, how and why in ways that make their professional knowledge of practice clear, meaningful, accessible and useable by others. It is in this articulation and subsequent sharing of knowledge that real pedagogical development is able to be realized. In that way, knowledge of practice moves beyond the individual, becomes public, and leads to professional growth that moves well beyond ‘teaching as doing’; it becomes the hallmark of specialist knowledge production and that is what it means to be a professional.

**Conclusion**

The idea of a framework on which teachers’ professional knowledge might be conceptualized is one way of thinking about teaching as being much more than an array of teaching tips, tricks and activities. It is a way of understanding the specialist knowledge, skills and abilities inherent in quality teaching. Quality teaching is clearly crucial to improving student learning and helps to focus attention on teachers’ professional judgements which are a window into how to better recognize and value expertise. If improved student learning is a goal of education, then expertise in teaching is fundamental. Capturing, articulating and sharing teachers’ professional knowledge of practice is one way of better valuing that expertise.
REFERENCES


