Model of individual differences in learning

John Munro

University of Melbourne

This paper describes briefly a model of individual differences in learning that integrates various factors involved in knowledge enhancement. The model has been used to examine a range of issues in contemporary educational provision in both Australia and the United Kingdom. The paper describes how the model has been used as a basis for improving pedagogic practice, for catering for literacy and numeracy difficulties, for understanding and catering for gifted and talented learning and for developing a professional learning capacity in schools.

To examine a model of individual differences in learning, it is necessary initially to explicate what is assumed about learning and the factors that influence it. This paper describes a framework for understanding learning and uses the framework to explore sources of individual differences in learning.

In recent years around the world there has been an increased interest and focus on the process of learning and its implications for cultural and social enhancement. Policy makers at the primary and secondary and tertiary education levels identify the need for quality learning. This has been very clearly indicated in leading international organisations such as the National College of School Leadership in the United Kingdom. Several of its recent publications focus directly on learning and leadership. These include *Learning to Lead* (NCSL, 2004), NCSL’s strategy for leadership learning and *Learning-centred leadership* (NCSL, 2003), a set of materials intended to assist schools to improve learning and teaching. *Learning to Lead* identifies six areas of leadership learning.

Nor is this interest in learning restricted to educational policy makers (Senge, 1990). Concepts such as ‘authentic’ learning, ‘prior knowledge’, ‘strategic thinking’ and ‘learning as a lifelong process’, ‘self managed and directed learning’, ‘learning styles’, ‘collaborative learning’, ‘professional learning teams’ has led to international businesses and organisations to see their capacity to learn as critical for their future success (for example, see Smith, 1990).

My presentation examines one possible framework or model for examining the learning process and in particular, how we can understand individual differences in learning. I have developed this model from contemporary research on how people learn. It has been applied to classroom teaching, areas of exceptional learning, professional development, assessment and community learning.

We are all aware that a plethora of learning theories exist. We have developmental theories, cognitive theories, behavioural learning theories, neuropsychological theories, psychometric theories, sociocultural theories, authentic theories, biochemical theories, situated theories and immersion theories. We even have combinations of these, such as social behavioural learning theories and cognitive behavioural learning theories. The theories differ in range of ways. All claim to be effective and all claim to be based on reputable research.

1 A version of this paper was an invited seminar at the Hong Kong Institute of Education in May 2005.
The majority of them, however, are not teaching-friendly and are not easily contextualised in the world of 21st Century classrooms (or even 20th Century classrooms). As a result, they are not used to inform regular teaching.

The focus of the model of learning presented in this paper is on knowledge enhancement. It asks the question: What do learners do in order to change what they know, that is, learn?

To answer this, some of the most popular public domain theories of learning were analysed to identify the aspects or components of learning each had validated. These were synthesised into a framework that identified what learners need to do to learn effectively.

Key questions asked about learning included:

- What actually changes during learning? What parts of knowledge change at any time? How much do they change?
- What catalyses, stimulates or motivates the change?
- What conditions need to be in place for the change?
- How does a person's knowledge change? What actions are needed for the change?
- How permanent is the change?
  - How long does the change last? What factors influence its endurance?
  - In what ways does the stored knowledge change 'by itself' over time?
  - Do capacity factors influence the maximum amount of knowledge that can be 'permanentized' at any time?
- How useful/transferable is the change in knowledge?
  - Does linking it with other knowledge in particular ways increase its usefulness?
  - Does it need to be learnt in particular ways increase its transferability?
- What is the nature of cultural influences on these knowledge change processes?
- What is the nature of developmental factors within each culture on these knowledge change processes?

These questions assume that there are interactions between learners and informational sources that transform their existing knowledge at any time. Informational sources include peers and parents, teachers, on-line learning programs, books and other media sources. In formal education the informational sources are determined by what is valued by the community or culture. These values will also be indicated in the feedback learners receive. In self initiated learning, the information is selected according to personal values and may be in part generated by the learner.

In passing, I need to clarify my definition of knowledge; it refers to what an individual knows. It includes one’s (1) propositional and conceptual knowledge and the associated procedural knowledge; (2) attitudinal beliefs; (3) beliefs about learning and how to learn and how to apply one’s knowledge; and (4) world beliefs.
Learning interactions are what learners do to learn. The analysis of some of the most popular public domain theories of learning led to the following set of learning interactions:

1. **A purpose or reason for learning**  Learners frame up and explicate their purpose or reason for learning the ideas. They are 'challenged' to learn, are in a state of 'cognitive conflict' (Lowenstein, 1994). This can range from a largely emotional drive to satisfy one’s interest of curiosity to an explicit challenge or question to be answered. The reason for learning is to solve a problem or to deal with an issue; learning is problem based and solution focused.

2. **The desired outcomes of the learning**  Learners visualize the intended outcomes of the learning. They form an impression of where they will end up, what they will know, be able to do or what they may believe or feel. They ‘see’ the goals as personal experiences or episodes (Locke & Latham, 1990; Pintrich & Garcia, 1991).

The visualized outcome may be speculative, a possible solution. The learner intuits that a possible state may solve a problem or deal with an issue.

3. **Using what they know**  Learners make links with and use what they know about the topic they are learning. There are several aspects of this; they recall

   - what they know about the topic; their abstract, imagery and experiential and action knowledge of it. This can be described in terms of learning styles (for example, Riding & Cheema, 1991), cognitive styles, (for example, Munro & Howes, 1996), multiple intelligences, (for example, Gardner, 1995, 1999), or dual coding theory, (for example Paivio, 1991).

   - what they know about how to learn it, how to think through the topic, that is, the spectrum of approaches to learning, (for example, Biggs, 1987; Davidson & Sternberg, 1998; Jausovec, 1994),

   - what they believe about themselves as learners of the ideas, how they value the ideas, whether they believe they can learn the topic successfully (their self-efficacy) (Nichols & Utesch, 1998; Pajares, 1996),

   - their metaphors and assumptions about the learning-teaching interaction.

   - what they don’t know about the topic, their unanswered questions about the topic.

4. **A pathway to the outcome**  Learners construct or a possible pathway to their goal. While the pathway may change direction during learning, at any time it assists in orienting the learning. Students who can see a possible pathway are more likely to stay engaged and persevere.

Learners need to learn how to plan and develop their pathways through a topic. Often they can learn it best by identifying the learning pathway they have followed over the previous few weeks.

5. **Learning the new ideas in specific contexts**  Learners learn the new ideas in specific contexts in limited, supported, 'scaffolded' ways, using what they know into new ideas. Their new knowledge may be encoded as experiences. They may learn aspects of the ideas at a time, in particular formats (as actions, as imagery, in language), intuit or speculate about particular components and trial them.
They may ask questions that bridge from existing knowledge to new ideas, for example: *How can we get from...to...?* These question sequences allow them to move gradually from what they know, recode between the different forms of the ideas (for example, change imagery, action knowledge of new ideas into words) and practise the new ideas.

The learning process at this point draws on and integrates contemporary learning research from a range of sources: the role of imagery in learning, multiple ways of learning (for example, Paivio’s Dual Coding theory (Paivio, 1991; Sadoski & Paivio, 1994), learning through internalised actions or operations, learning through specific episodes (Tulving, 2002) and the role of short term working memory in learning (Baddeley, 1990).

This interaction is frequently overlooked or ignored in conventional teaching. Formal teaching frequently expects students to learn new ideas in an abstract, decontextualised way initially and then learn to apply them in particular situations later.

6. **Deepening the new understanding.** Learners deepen or "decontextualize" their new understanding and link it more broadly with what they know. They review the new knowledge, integrate various aspects of it, consolidate it with what they knew, re-prioritize their knowledge and identify a range of contexts in which they can use it. This interaction is consistent with the notion of abstraction proposed by Anderson, Reder & Simon (1996, 1997).

7. **Invest positive emotion in the new knowledge** Learners invest positive emotion in the new knowledge they have learnt. This increases the likelihood they will
   - be self-motivated to think about it and use it on later occasions,
   - have an emotional commitment to or feeling for the ideas they are learning.
   - believe they can learn the ideas successfully and
   - believe that it is OK to take risks.

To make this emotional investment in the knowledge, learners need to see that

- the new ideas as interesting, have a value or use,
- it was their mental activity that learned the ideas (Nichols & Utesch, 1998) and
- they managed and directed aspects of the learning (Zimmerman, Bandura & Martinez-Pons, 1992).

8. **The learning actions that helped them** Learners identify how they learnt and the actions that helped them to learn. They reflect on and review the learning actions they used. This includes both the learning strategies they used and the metacognitive control they exerted over the learning (Schraw & Moshman, 1995).

This helps them build up, in an explicit way, their knowledge of how they learn and the learning strategies they can use. They can compile a list of ‘What I can do to learn’. They also learn the language for talking about what they do when they learn. This interaction is important if students are to learn to be autonomous learners, to learn to manage and direct their own learning (Ablard & Lipschultz, 1998; ) and to be ‘life long learners’(Pintrich, 1995).

9. **Storing what they have learnt in memory** Learners store what they have learnt in memory and practise remembering it. They say briefly what they have learnt, link it with what they know, build memory "icons" for it and practise recalling it.
10. **Seeing themselves make progress**  Learners see they are making progress. They use their own indicators of learning to map and to monitor their progress.

There is a range of ways in which students can learn to do this. They can decide what are reasonable signs or indicators that they are learning more about a topic and are making progress.

11. **Automatising what they have learnt**  Learners automatise aspects of what they have learnt so it can be used more easily to build further learning. They do this by automatizing links between ideas and organizing what they know into larger "chunks".

12. **Transfer and generalise the knowledge**  They transfer and generalise the new knowledge. They explore and analyse the new understanding from a range of perspectives. They

- explore and analyse the new understanding from a range of perspectives, for example, use de Bono's Six Thinking Hats or Taylor's Multiple Talents Model,
- transfer the ideas (near and far transfer),
- use the knowledge in open-ended creative problem solving,
- create new episodes for the ideas,
- categorise problem solving contexts in terms of whether the ideas are useful,
- answer higher-level Bloom-type question sequence and
- suggest questions the new ideas answer

13. **Organise what they have learnt for assessment**  They organise what they have learnt for assessment purposes. They reflect on the context in which they need to display and apply the knowledge, how they can align the knowledge with various assessment context. In summary, students learn how to ‘read’ assessment contexts and how to align their knowledge with them (Munro, 1999b).

This interaction is the ‘flip –side’ of assessment. Rather than focusing on procedures for what students know, it examines how students can learn how to show best what they know. It encourages students to reflect on how they will show what they know and how they can ‘read’ assessment situations’.
The set of learning interactions is shown in Figure 1.

- a challenge or reason for learning something
- an idea of knowing where they will end up, see the goals
- make links with and use what students know re topic
  - stimulate what they know a topic; let them see what they already know
  - how they know, what they know about how to learn, how to think
  - what the feel about themselves as learners of the ideas
  - identify what they don't know about the topic
  - learners’ metaphors and assumptions about the learning-teaching interaction
  - recode what they know to match the teaching
- see a pathway to the goal
- learn new ideas in specific limited, supported, 'scaffolded' ways
  - learn in particular context as actions, imagery, in familiar language scaffold;
  - ask questions How can we get from ... to ... ?
  - recode imagery, action knowledge of new ideas into words
  - see specific aspects of ideas demonstrated, modeled, receive coaching
  - practise new ideas
- deepen what they have learnt; abstract it, link it more broadly with what is known
  - link episodic, semantic and procedural aspects of idea at once; say, write, draw, do.
  - review, consolidate what was learnt  What have you learnt ?
  - decontextualize, summarize, organize, link with what is known, main/subordinate ideas.
  - elaborate and extend ideas through questioning.
  - teach the conventional ways of communicating new ideas
- invest positive emotion in the new knowledge
- store what they have learnt in memory, practise remembering it
- identify how they learnt, what they did that helped them to learn
- see themselves making progress
- automatise what they have learnt so it can be more easily used
- transfer and generalise the new knowledge
- organise what they have learnt for assessment purposes

Figure 1: The set of learning interactions.

Individuals can potentially differ in how they implement each of the interactions during learning. Given the extreme complexity of human learning, it is necessary to make a number of ‘qualifying’ statements about the set of learner interactions.

**The interactions are not a linear one-directional sequence** First, the set of interactions do not operate in a linear one-directional sequence. They can be categorised into three clusters: those to do with

- orienting one’s knowledge (that is, ‘getting it ready’) for learning;
- changing one’s knowledge and
- consolidating and transferring the knowledge change.
Within each cluster, two interactions may share a reciprocal or bi-directional relationship at any time. As well, in line with parallel information processing theories, knowledge from two or more interactions in a cluster can be processed simultaneously. At any time learners can potentially use more than one at once.

During the early phase of learning, learners use interactions 1-4, to orient their existing knowledge to the problem or focus of the learning. They switch between their purpose for learning, what the outcome might be like and what they know. They may revise what they think the outcome will be, re-shape the challenge and modify their proposed learning pathway.

One source of individual difference in learning at this phase of learning is a learner’s existing knowledge. One learner’s knowledge of a topic may be largely experiential or episodic while a second learner may know the topic in a largely abstract way. One learner may have a rich network of meanings for a topic while a second learner may have a much smaller network of meanings.

During the knowledge change phase learners switch mainly between interactions 5-8. They learn new experiential, conceptual, attitudinal and thinking aspects of the ideas. In many situations they learn new ideas in specific contexts in 'scaffolded' ways at first and then generalise these. They may, for example, trial their intuitions or possibilities in particular situations and then explore them more generally.

Even when new ideas are introduced in an abstract way, students often try to make sense of them by thinking them in particular contexts. Once they have begun to abstract an idea, they switch to particular contexts to explore and test their comprehension. In problem based learning they find that a solution works in some situations and then investigate its efficacy more generally.

They link emotion in the new knowledge across this phase. They can also reflect on and review the actions they used to learn across this phase. They may also revisit what they knew earlier as they make links with the new knowledge.

The third phase of knowledge change is when the learners review and consolidate what they have learnt. They identify explicitly the new ideas, link them with what they knew, build memory "icons" for them and practise recalling them. They see their learning progress and may automatise aspects of what they have learnt so it can be used more easily to build further learning.

They can now generalise the new understanding more widely and think more creatively about it. They explore and analyse it from a range of perspectives, see how far they can transfer it (near and far transfer) and use the knowledge in open-ended creative problem solving. As well, they can organise it for assessment purposes. They reflect on the contexts in which they need to display the knowledge and how they can align it with various assessment criteria.

Even though several interactions are potentially available at any time during learning, one or more dominate. One source of individual difference here is how learners balance their use.
Learners direct or manage how they use these actions (their metacognitive knowledge, Schraw & Moshman, 1995).

How learners balance their use of these actions depends on several factors, including their beliefs about what it is they are learning and whether they can learn the topic successfully (Malpass & O’Neil, 1996; Pajares, 1996), how well they have learnt related ideas in the past and about the particular learning context and how it will allow them to learn (Zimmerman, 2000).

The belief that the goal of a particular learning activity is to discover a new way of solving a problem will lead to learners engaging a different set of learning and thinking actions from when they believe the goal is to learn to apply an established solution procedure (Biggs, 1987; Ramsden, 1984). As well, the amount of control learners believe they have over the conditions for learning influences the learning strategies they use (Biggs, 1989; Morgan, Dingsdag and Saenger, 1998; Volet, Renshaw, and Tietzel, 1994). Time constraints, needing to meet external criteria and a need to learn and memorize the ideas in an unquestioning way for later reproduction lead to restricted knowledge enhancement.

Learners can use the interactions spontaneously or be cued to use them. Learners who use them mainly when instructed or cued are more dependent and externally managed learners. Learners who use them autonomously and spontaneously in a strategic, selective way are more self-managing and directing learners (Ablard & Lipschultz, 1998; Boekarets, 1997; Pintrich, 1995). The use of the interactions in a self-managing and directed way depends on the content or subject being learnt. A learner may be more autonomous and self-managing in some areas of knowledge than in others.

**The set of interactions is learnt through meaningful interactions with one’s culture.** Cultures differ in how they construct each interaction and the ways in which they value it. They differ, for example, in the ways in which they frame up goals, their purposes for being challenged and the ways in which a challenge is pursued. The work of Walker and Dimmock (1999) and Drake (2004) assist in elucidating potential sources of variation. The following examples illustrate sources of individual difference from a cultural perspective. While these differences are presented below as dichotomous, it is recognised that each ‘dichotomy’ is an balance or equilibrium, with a difference in degree or extent.

- Cultures differ in their assumptions about what constitutes knowledge and what aspects of the knowledge of the culture are available for change during learning. The extent to which culturally valued knowledge is available for change during learning varies as does the focus of learning as enquiry versus learning as inculcation and transmission. The assumption that a culture’s knowledge of a topic is its best model of the topic at one point in time has different implications for creativity and innovation than the assumption that knowledge of the topic is absolute and ‘fixed’.

- Cultures differ in their goals for the learning activity. A culture may value an increased explicit knowledge of learning outcomes, a knowledge of how to learn and a positive disposition to learning. Some cultures may encourage individual curiosity as the basis for framing up challenges and goals for learning while others may frame up the goals in terms of learning what is known by others in the culture (for example, ‘the elders’).

- Cultures differ in the nature of creative outcomes they value. Some cultures prefer creative activity that is within the existing cultural paradigm and does not question
deep cultural values while other cultures tolerate or even encourage creative activity that includes this level of questioning.

- Cultures differ in the extent of focus on learning as an individual versus group activity. Rather than a focus of self-talk by individuals during learning, the culture may foster group dialogue. Teaching strategies for stimulating existing knowledge may vary from individually focused provocative questions to small group activities to telling students the areas of existing knowledge that will be required or assumed by the teaching.

- Cultures differ in the conditions under which learners display what they know at any time. This has direct implications for the activation and use of knowledge during learning, the assessment of knowledge and even the pedagogy used to encourage students to identify what they don’t know during learning; some may encourage this explicitly while others operate implicitly in this aspect. Some cultures may encourage learning through the questioning of existing knowledge during learning, taking risks with what one knows, tolerating uncertainty and being prepared to learn by making errors while others value learning through modeling and imitation.

Cultures and learners usually have this knowledge implicitly, encoded in their metaphors, beliefs and assumptions about the learning-teaching interaction. It is rarely made explicit in Western approaches to formal education.

Each learning interaction is a thinking strategy. Third, each learning interaction is a strategy that individuals can use to modify or enhance their knowledge. They help us see how we can improve or enhance knowledge, what we can do, how to convert efficiently information to knowledge, particularly in problem solving contexts and then enhance it. They provide an explicit, systematic framework for transforming knowledge. Much of the current discussion about knowledge management and enhancement is rhetoric; it is not operational. The interactions allow us to operationalise knowledge management and enhancement. Individual differences in learning arise frequently because some students have difficulty managing their thinking and learning in specific ways.

The sequence can become useful 'self talk'. Fourth, the sequence can be used to assist learners and groups of learners to learn explicitly, to guide their thinking, and learn to be self-managing and self-directing. Learners acquire 'self scripts' that they use to manage and direct the range of activities necessary for effective learning, that is, by improve their metacognitive knowledge. Components of self-regulation include motivation to achieve and students' goal orientation (Pintrich & Garcia, 1991). The capacity to learn this competence is influenced by students' ability to reflect, personal goal setting and academic attainment (Zimmerman & Schunk, 1998).

A large body of research has shown the value of strategy teaching for students whose individual differences in learning have led to learning disabilities (Pressley, & Woloshyn, 1995). The set of learning interactions can be learnt as a set of self scripts that students use to guide their learning in any context. The self scripts can catalyse learning or ‘trigger’ each interaction. They can also lead to learning becoming a conversation that learners have with other learners, the teacher, or 'themselves', that is, 'reflection during learning'. Given that a major way in which learners learn in conventional classrooms is by 'doing tasks', there may be a need in the future to help students learn effective self scripts for having conversations about and with the tasks they are doing.
The use of the model of individual difference in learning

We have used the model of learning in several areas of learning:

- Literacy and numeracy learning disabilities.
- Professional learning, learning in communities.
- Gifted learning and education.
- Attentional difficulties during learning, understanding AD/HD.
- Adolescent learning disabilities.
- Improving the quality of regular classroom teaching by taking account of individual differences in learning.
- International learning.
- Creativity and the teaching conditions necessary to foster this.

The remainder of this paper examines the application of the model to some of these areas of learning.

To improve the quality of regular classroom teaching

Individual differences in learning are not restricted to student learning. The model has been used to assist in the area of individual differences in teacher learning in a number of areas.

Teachers have used the model to evaluate their teaching. They have audio-taped a sequence of lessons and evaluated the extent to which their teaching fosters each learning interaction. They have improved their teaching by identifying the interactions their teaching did not include. This research is described in Munro (1999a). Teachers have also used it to coach and mentor colleagues (Munro 2000). The coach and the teacher identified the learning interactions in place and those that could be improved by fine tuning the teaching procedures.

Feedback from students. The model has also been used to assist students to evaluate the teaching in terms of the extent to which it fosters learning. Teachers used a questionnaire to ask students how the teaching helps them learn effectively.

Map into teaching procedures. The set of interactions have been mapped into an extensive set of teaching procedures. Clusters of teaching procedures match and support each learning activity. Examples of the teaching procedures have been described in Munro (2003c).

Teaching students how to be self managing and regulating learners Teachers have used the model to teach their students how to be self managing and regulating learners by teaching, systematically, the learning interactions as student self-talk. Students can learn to ask themselves the above set of self instructions as self scripts (Munro 2001).

Accounting for multiple ways of learning The framework provides a procedure for accounting for multiple ways of learning at each phase of knowledge change (Munro, 1999, 2001). It allows teachers to take account of the fact that different learners display each function in different ways. Individual difference and learning style have an impact on each of the interaction. Learners differ in how they
- are motivated to learn,
- engage with the teaching information and make links with what they know,
- display what they know,
- use corrective feedback throughout the learning,
- change what they know,
• store what they know,
• automatise what they know.

**Plan teaching units** The framework has been used to devise and evaluate instructional and curriculum units that match the various learning functions. The framework indicates types of features that may be included in the design of teaching units.

**Analyse student learning problems from an 'effective learning' perspective.** The framework has been used to deal with problems in teaching such as lack of student engagement and behaviour problems, by describing them in terms of learner interactions (Munro, 1997c). It helps teachers to interpret the problems learners show from a learning perspective and solve them using pedagogy. Teachers can use it to examine the learning interactions students use and the learning interactions fostered by the teaching.

Teachers used the format shown in Table 1 to diagnose learning problems and link them with teaching.

**Table 1 : Student indicators of a learning problem.**

<table>
<thead>
<tr>
<th>key learning activity: The student</th>
<th>Student</th>
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<tbody>
<tr>
<td>has an explicit purpose or reason for learning the ideas</td>
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<td>has an impression of the outcome of the learning</td>
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<tr>
<td>• links the new information with what is known</td>
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<tr>
<td>• believes she /he can learn ideas successfully</td>
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<tr>
<td>• has a positive feeling about the topic</td>
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<tr>
<td>• knows how to learn in formal contexts</td>
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<tr>
<td>learns effectively in specific contexts</td>
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<tr>
<td>responds positively emotionally to the ideas learnt</td>
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<tr>
<td>learns the strategies to learn successfully</td>
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<tr>
<td>sees her /him self making learning progress</td>
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<tr>
<td>encodes efficiently the new idea in long term memory</td>
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<tr>
<td>transfers and applies ideas in a range of situations</td>
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<tr>
<td>automatises them</td>
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<tr>
<td>practises organising the knowledge for display in assessment contexts</td>
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</tbody>
</table>

**Literacy learning disabilities**

The model has been used to assist students who have literacy and numeracy learning difficulties (Munro, 2003f, 2003g). It has also been used to train teachers to assist these students. The framework has been adapted to teach students both literacy strategies and a knowledge of written text.

It is useful to think of the activity in which readers engage in three phases (Munro, 1999c):
1. before reading: the early phase of reading, getting ready or orienting;
2. while reading: processing the text in depth and
3. after reading: the review phase.

Each phase requires readers to use their knowledge in particular ways. There are actions readers use to get their knowledge ready for reading a particular text, for making sense of the text as they read and for learning from their reading activity. Some of these are shown in Figure 2,
<table>
<thead>
<tr>
<th>Stages of reading</th>
<th>Dispositional level</th>
<th>Topic level</th>
<th>Conceptual level</th>
<th>Sentence level</th>
<th>Word level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting ready or orienting stage</td>
<td>Focus on purposes for reading: <em>Why am I reading this text? What will I look for as I read? What will I know when I have finished reading?</em> Readers say how they will read, the strategies they will use</td>
<td>Link text with what reader knows; by using title, pictures. <em>What do I think text is about? What might the key ideas be?</em> Extend knowledge necessary for understanding the text.</td>
<td>Link ideas in text with what you know, use mapping, networking. <em>What other ideas might come up with these? What might happen next? What questions can I ask about it?</em></td>
<td>Focus on how the ideas might be said: <em>How would I put these ideas into sentences? How would I tell someone about them?</em></td>
<td><em>What will I do as I read / come to a strange word?</em></td>
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<tr>
<td>Teaching readers how to manipulate the text: While-reading strategies</td>
<td><strong>Sentence level</strong></td>
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<td></td>
<td>• break text into digestible bits, decide where to pause,</td>
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<td></td>
<td>• listen to themselves as they read,</td>
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<td>• act on ideas, put themselves in the context,</td>
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<td></td>
<td>• paraphrase,</td>
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<td></td>
<td>• visualise what was read,</td>
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<td></td>
<td>• Does it make sense/fit in?</td>
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<td></td>
<td>• re-read</td>
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<td><strong>Conceptual level</strong></td>
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<td></td>
<td>• summarise, What is the main idea so far?</td>
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<td></td>
<td>• infer, Why did that happen?</td>
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<td>• think ahead, predict, anticipate</td>
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<td></td>
<td>• review and consolidate, What do I know now?</td>
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<tr>
<td></td>
<td>• underline, note down useful information</td>
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<tr>
<td></td>
<td>• relate then to what they expected</td>
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<tr>
<td></td>
<td>• gradually build an impression of the text.</td>
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<tr>
<td></td>
<td><strong>Word level</strong></td>
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<tr>
<td></td>
<td>• use context of word + initial few sounds</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• read to end of sentence and re-read</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• use word analysis and re-read</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-reading or review stage</td>
<td>Respond emotionally to text. <em>How did I like the text? Were ideas useful /interesting? Why was the text written?</em></td>
<td>Review text understanding: <em>What did the text tell me?</em> Review, evaluate reading strategies used: <em>What reading actions worked?</em></td>
<td>Learn by reading, What new ideas have been learnt; how has reader's knowledge changed? <em>What new ideas will I remember?</em></td>
<td>Add to their knowledge of language, for example, paraphrase ideas in text, note new ways of saying ideas.</td>
<td>What new words were in the text?</td>
</tr>
</tbody>
</table>

Figure 2: Examples of reader actions at each phase of reading.

Our research agenda has examined various aspects of this model, for example, developmental trends in the acquisition of sentence, conceptual and topic level strategies and matching literacy learning profile with the teaching regime (Munro, 2004, 2005).
Professional learning and learning in communities

Individual differences in learning can also arise in professional learning, particularly when that professional learning is necessary to optimize student learning. The learning model has been used to examine professional learning in organisations such as schools. The research in this area has investigated the proposition that a key function of effective school leadership is developing in a school the capacity to learn. It is proposed that

(1) effective leadership cannot be seen in isolation from the school’s pedagogic practice and

(2) the pedagogic practice implemented in each classroom is related to the school’s capacity to learn professionally.

It sees the relationship between a capacity for professional learning in a school and effective leadership as reciprocal: just as effective leadership fosters the capacity for professional learning, so a well developed capacity for professional learning can enhance school leadership.

The research unpacks the concept of a professional learning capacity and operationalises it using the explicit model of learning. It asks the question: What does a school do when it learns professionally?

It contextualises the explicit model of learning in a school as follows:

(1) The model is differentiated to account for at least three professional functions; the school leadership function, the classroom implementation function and the professional team function. Each function learns different outcomes.

(2) Each interaction in the learning model is applied to each professional function to develop a professional learning framework. This shows what the community can actually do to learn professionally.

(3) An additional function, middle level leading of learning for each professional learning team.

(4) Ways of using the learning framework to deal with problems and difficulties that often arise in a school during efforts to enhance professional learning are identified.

(5) The readiness or preparedness of each function in the school to engage in self managed and directed professional learning, that is, the level of scaffolding necessary for professional learning at each level.

(6) The role of school leadership teams putting in place the optimal conditions and climate for professional learning. The team needs to balance and integrate the professional
learning, both across the areas of the school and in a longitudinal way as the school increases its capacity for self directed professional learning:

The model has been used to enhance professional learning in schools in Australia (Munro, 2004, 2003b). Aspects of the school leadership role as a leader of learning have been explicated in Munro (1997a, 2003b). Improving teacher competence by increasing teacher knowledge of learning has been developed in Munro (1997b, 1999a). Strategies for leading learning communities have been described in Munro (2000, 2002a).

The framework has been used to bring about significant and sustained literacy improvement that is higher than average over the period in both primary schools (Munro, 2004a) and secondary schools (Munro, 2004c) in Australia.
Gifted learning and education

Schools and teachers frequently have difficulty identifying and catering for the learning characteristics of students who are gifted or talented in various domains of knowledge. The model has been used to describe gifted learning profiles in terms of teacher friendly learning factors, to identify gifted learning patterns and to differentiate the teaching.

In terms of the differentiated models of giftedness and talent (Gagne, 2000; Ziegler & Heller, 2000), the learning model has been used to understand gifted knowledge and learning competence and to map this into areas of talent. The learning model has been used to

• Collate known research about how gifted learners learn.
• Use this to compile learning profiles for individual gifted learners.
• To differentiate the teaching to match how individuals and small groups of gifted students learn.
• To differentiate classroom teaching generally to account for the learning needs of these students.

We have also used the model to investigate how giftedness in particular areas of knowledge can influence learning in any subject area.

One area of individual difference in gifted learning has been the study of gifted students have specific literacy learning disabilities in areas such as reading, writing and spelling (Munro, 2002b, 2002c, 2004d). The research uses a ‘differentiated models of giftedness and talent’ framework to examine the learning characteristics of these students.

A general ability scale (the WISC-III) was used to identify three categories or ‘profiles’ of gifted knowledge; students who gifted either verbally or nonverbally or in both areas (Munro, 2005b). The research showed that each category of gifted students displayed a characteristic reading comprehension pattern in inferential reading comprehension tasks.

Comparison with matching cohorts of gifted students who were not literacy disabled and non-gifted students who had a literacy learning disability suggests that the literacy disability is attributed to lower use of analytic information processing strategies that influenced phonemic awareness knowledge and alphanumeric symbolic coding ability.

Students who are both gifted and who have learning difficulties are often noted for the learning difficulties. They frequently don’t get the opportunity to show their gifted knowledge. The research showed that the gifted literacy disabled students could display their gifted knowledge during reading comprehension when provided with appropriate tasks. The findings have implications for the diagnosis and teaching of gifted literacy disabled students.

Conclusion

The model of individual differences in learning that I have presented in this paper is my attempt at a ‘best approximation at this time’. It has been used to understand and identify how individual difference might arise in a range of areas of learning and to modify or differentiate the teaching accordingly.

In terms of future developments, I see the following issues as relevant.

The concept of individual differences in learning is problematic and possibly not the most appropriate or useful for the future. Contemporary educational psychology has developed,
from a range of sources, the concept of multiple ways of learning. In any instructional context it is likely that the teaching makes assumptions about learning that are not equally appropriate for all students. Rather than individual differences in learning, a focus on the extent of match or mismatch between student learning approaches and the demands of the teaching may be more appropriate.

Models for understanding individual differences in learning will need to have an explicit focus on knowledge enhancement. How individuals learn and the demands by pedagogy are likely to change in the twenty first century as new technologies and new ways of solving problems induce new ways of thinking and the need to process different types of information. A model that is sufficiently robust to handle a changing knowledge enhancement focus will be necessary.

With the trend towards internationalism and increased global interaction, models of individual difference in learning will increasingly need to take account of the cultural basis of learning and the associated cultural influences. Concepts such as reflective learning, self managed and directed learning will need to be defined and understood from multi-cultural perspectives.

Individual differences in learning need to be seen as a strength or an asset for a culture. Individual differences, if properly nurtured and fostered, can lead to diversity, breadth, and creativity. Those contemporary education systems that learn how to value and capitalize on these will have the greatest likelihood of innovation.

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