

EFFECTIVE TEACHING and LEARNING PRACTICES INITIATIVE for STUDENTS with LEARNING DIFFICULTIES

PROFESSIONAL LEARNING COMPONENT

A Report to the

Australian Government Department of Education, Science and
Training, the Victorian Department of Education and Training,
Catholic Education Office of Victoria, and the
Association of Independent Schools of Victoria

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This report provides information in fulfilment of a contract between the Department of Education and Training (Victoria) and the University of Melbourne, in cooperation with: the Catholic Education Office of Victoria, the Association of Independent Schools of Victoria, and the Australian Council for Educational Research. Note that the views expressed in the report are those of the authors and not necessarily those held officially by the University of Melbourne.

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Background to this Report

This report has been prepared on behalf of The University of Melbourne to elucidate its role in the project *Effective Teaching And Learning Practices Initiative For Students With Learning Difficulties*. This project was funded by the Australian Government Department of Education, Science and Training (DEST) and administered by the three major school education providers in Victoria; the Department of Education and Training (DE&T), the Catholic Education Office of Victoria (CEO), and the Association of Independent Schools of Victoria (AISV). The University of Melbourne's partner in this project is the Australian Council for Educational Research (ACER).

In brief, the report contains information related to the research component of the project, namely:

1. the development of assessment and reporting tools that are effective in monitoring the literacy and numeracy achievement progress of students with *learning difficulties* in the early and middle years of schooling (Years 1-9), located in Victorian government, Catholic and independent schools; and
2. the identification of teaching and learning practices in the early and middle years of schooling that: (a) meet the literacy and numeracy learning needs of students with *learning difficulties*, and (b) add 'value' to their achievement progress in terms of measurable improvements.

The work of the University of Melbourne, as specified in the Contract, was to

“... to translate the findings of the qualitative synthesis of teaching and learning into professional development packages for teachers that are targeted at the literacy and numeracy learning needs of the target groups with learning difficulties and professional development packages for health professionals working to support the learning of students targeted in this project.

This will involve the:

- translation of the findings of the research project into research validated professional development activities by a team under the direction of Dr John Munro of the University of Melbourne;
- investigation and evaluation of the materials through professional development for teachers and allied health professionals working to support the learning of students with learning difficulties. The professional development activities for teachers and allied health professionals will provide the vehicle for the empirical evaluation through trialing of the materials;
- preparation of a written research evaluation of the professional development trials and contribution to the writing of progress and final reports.

Focus of this Report

The required focus for the Report was specified in a directive from the representatives of the three sectors (Ms Judy Connell, Project Manager, (CEO); Ms Sue Nilsen (AISV); and Ms Karen Underwood (DE&T)) on 6 September 2006 to Associate Professor Munro to

“... produce a contextual statement that draws together the research findings and analysis (above) and the link to the Professional Learning program developed for this project. Please include a rationale for the model and an introduction to the professional learning materials in 1) literacy and 2) numeracy. Please include any other background information you feel is relevant including suggestions for the future implementation of the PL activities for the sectors.”

The directive is referenced in the summary of detailed findings from the Case-Studies, documented in **Appendix 3** of the Report written by ACER as follows:

“Despite the complexity of the obtained information, syntheses suggested that LD students who made the greatest achievement ‘gains’ in either *Reading* or *Numeracy* (at all Year Levels) were taught by teachers who tended to use more explicit, teacher-directed modes of instruction as a basis for subsequent ‘student-directed’ learning activities. Conversely, LD students who made the least achievement gains were located in classes taught by teachers with a preference for predominantly ‘student-directed’ methods. Some of these latter teachers were not aware of the extensive findings from the related evidence-based research that highlight the superiority of direct, explicit instruction methods for students with and without learning difficulties” (page 34).

This Report is a response to the directive. For the sake of clarity, this Report uses as its major headings the key points specified in the directive. To the extent that the directive neglects some aspects of the deliverables specified in the Contract, these are included under the major headings.

1. The contextual statement that draws together the research findings and analysis and the link to the Professional Learning program developed for this project.

1.1 A preferred interpretation of the case studies The findings of the case studies documented in Appendix 3 of the ACER Report are open to multiple interpretations. The preferred one here is as follows: the teachers those learning disabled students who made the greatest achievement ‘gains’ in either *Reading* or *Numeracy* at all year levels:

1. were more able to ascertain the existing knowledge of students at any time and were more likely to implement directed teaching that targeted student relevant knowledge at that time. The teachers would seem to have had a sufficiently

broad and deep repertoire of pedagogic knowledge and skills that allowed them to do this not so much in a pre-determined 'one size fits all' way but rather in response to individual student knowledge at that time. The directed teaching on occasions (1) cued students to engage the appropriate cognitive activity; (2) recognise their relevant existing knowledge; and (3) cued students to see a short term learning pathway.

2. were more likely to focus on and respond to the display of student knowledge at any time and use this as a basis for framing up immediately following instruction. It is possible to infer in some of the reported case studies a focus on explicit student learning outcomes that build on where the student or group was a short time earlier. These can be better described as 'student-referenced teacher-directed' modes of instruction as a basis for subsequent 'student-directed' learning
3. were more likely to respond to student knowledge with an immediacy that suggested both an understanding of the domain of learning (literacy or numeracy), how it is learnt and how it can be strengthened. In the dynamics of the learning-teaching context, the case studies would seem to support the interpretation that it is the teacher's capacity to respond with a level of relevant immediacy that leads to successful student learning.

It is this explicit focus on student learning, with teachers being able to implement explicit instruction that is referenced on relevant student knowledge at any time, that forms the basis for this report.

1.2 Propositions about the knowledge of teachers most likely to lead to the implementation of effective pedagogy. This interpretation of the case studies leads to a number of propositions about the knowledge of teachers most likely to lead to the implementation of effective pedagogy to facilitate the learning of learning disabled students (Munro, 1992, 1993):

1. ***effective pedagogy is referenced on empirically validated models of knowledge.*** This proposition is that pedagogic practice is more effective when teachers have a sufficiently broad and deep understanding of literacy or numeracy and how it is learnt that equips them to (1) audit students' existing knowledge; (2) plan and implement pedagogy that matches students' existing knowledge; (3) monitor strategically student learning; and (4) modify pedagogy to take account of changes in student knowledge and teaching conditions. To achieve this, the present PL program taught the participants models of literacy and numeracy processing that are supported by extensive banks of research.
2. ***effective pedagogy involves strategic and evaluative teacher activity that is referenced on contemporary theories of learning and knowledge enhancement.*** This proposition is that effective pedagogy involves the accurate assessment of students' existing knowledge at any time and the ability to implement directed teaching that targets student relevant knowledge

at that time. To achieve this, the present PL program involved the participants mapping the models of literacy and numeracy processing into a range of systematic teaching behaviour sequences that would most effectively target and stimulate student knowledge and learning. The participants examined and evaluated repertoires of explicit teaching behaviours that

- (1) cued and scaffolded students to engage specific cognitive activity to achieve particular goals, for example, to visualise or paraphrase in order to comprehend a written sentence;
 - (2) cued students to identify and to use their relevant existing knowledge, for example, to use their knowledge of a particular spelling pattern to read unfamiliar words; and
 - (3) cued students to review what they had learnt by reading a paragraph.
3. ***effective pedagogy involves teachers ‘reading’ students’ relevant knowledge, ‘understanding’ patterns in students’ learning behaviours and being efficient decision makers in terms of teacher activity.*** This proposition relates to teachers being able to ‘contextualise’ or ‘reference’ both the literacy or numeracy model and their knowledge of learning in each domain in the learning of individual students and small groups. This is the concept of ‘student-referenced teacher-directed’ modes of instruction. It is based on the assumption that explicit teaching will be most effective when it takes account of what a student knows at that time and how the student learns.

During the PL program the participants were asked to map particular aspects of the models into the display of student knowledge at any time. They were also asked to use these student behaviours to frame up immediately following instruction.

4. ***effective pedagogy involves teachers being able to respond rapidly and efficiently to students’ display of knowledge.*** Teaching is more effective when teachers can make rapid decisions referenced on 1-3 above in terms of the follow-up teaching activity. In other words, they can respond to the display of student knowledge with an immediacy that suggested an understanding of the domain of learning (literacy or numeracy), how it is learnt and how it can be strengthened. Within the time constraints of the PL program, steps in PL were taken to build the participants’ capacity to respond with a level of relevant immediacy that would be likely to lead to successful student learning.

It is this interpretation that was used to guide the work of the University of Melbourne, as specified in the Contract, “... to translate the findings of the qualitative synthesis of teaching and learning into professional development packages for teachers that are targeted at the literacy and numeracy learning needs of the target

groups with learning difficulties and professional development packages for health professionals working to support the learning of students targeted in this project.”

1.3 Indicative student profiles and relevant teaching strategies

Perusal of the student literacy data is consistent with the following interpretation:

- The performance trends for students who achieved lower in inferential comprehension suggested that these students would benefit from teaching that targeted explicit vocabulary enhancement, improved word reading accuracy and fluency, paraphrasing and summarizing as they read.
- The trends of those who achieved lower in literal comprehension suggested in addition that these students would benefit from teaching that taught them explicitly to link questions with what they were reading and to comprehend and use grammar and sentence form while reading.

The links between the literacy trends and teaching are similar to similar patterns reported earlier (Munro 2006, 2005b and c, 2004a, 2003b, 2002c, 2000a, 1999a, 1998b).

Perusal of the student numeracy data is consistent with the following interpretation. Those students who achieved lower in numeracy displayed performance trends that were consistent with the belief that these students would benefit from teaching that targeted:

- understanding particular mathematical ideas and using various aspects of mathematics conceptual knowledge such as knowing 'when to' use particular procedures and 'why'.
- learning relevant mathematical algorithms and procedures; knowing 'how to do' things in mathematics.
- learning to understand and construct mathematical relationships and to relate ideas.
- learning the language of mathematics; to read, write and use maths vocabulary and maths symbolism.
- learning to automatize their mathematics factual knowledge.
- learning problem-solving strategies and how to work through maths tasks in systematic ways and ways of managing their mathematical thinking and activity in strategic ways.

The links between the numeracy trends and teaching are similar to similar patterns reported earlier (Munro 2003c, 2003d, 2002b).

2. A rationale for the model

As a foundation for teacher knowledge in each area, the PL program introduced the participants to two models:

- a literacy model and
- a numeracy model.

The aims and purposes of the models in the PL program were multi-fold: to provide participants with

- a schematic, systematic framework for understanding learning in each area.
- a scaffold for integrating contemporary research in each domain in a systematic way.
- a conceptual 'tool' for collating and understanding student learning and thinking at any time in each domain.
- a means for identifying and understanding explicit student learning behaviours at any time (for example, the particular word reading skills displayed at any time),
- a means for describing and analyzing the demands of pedagogy at any time in terms of student learning variables,
- a means of planning and implementing specific effective pedagogy and
- a means of evaluating the effectiveness of specific explicit instruction in terms of its influence on student knowledge change.
- a research validated learning-based set of models for directing the professional learning of teachers and allied health professionals working to support the learning of students with learning difficulties and for fostering dialogue between them that focused on effective learning and teaching.

Activities were implemented in the PL program to achieve each of these purposes.

2.1 Theoretical model for literacy. The theoretical model for literacy is based on Kintsch's comprehensive model of reader activity during text comprehension, the construction-integration (CI) theory of text comprehension to explain reader activity. This model proposes that readers comprehend written text by identifying its propositions and linking them with corresponding ideas in their existing knowledge. Kintsch refers to the set of propositions derived from text as the text base and its synthesis with propositions in the reader's long-term memory as the reader's 'situation model' of the text (Adam & Butler, 1999). The situation model represents the reader's comprehension of the text at any time.

Readers construct their situation models by generating propositions that match (1) the literal meaning of each sentence, (2) inferential meanings implied by the text and (3) the gist or summary of the text. These types of text comprehension are referred to as sentence, conceptual and topic levels of text processing. Sentence level processing leads to 'local propositions', that are reader's representation of each sentence as it is written. Topic and conceptual level processing leads to propositions that represent the global structure of the text, the 'macropropositions that relate to the theme or gist of a text (Guindon & Kintsch, 1984; Lorch, Lorch, & Mathews, 1985; Mross, 1989).

Conceptual level processing leads to "thematic inferences," and topic level processing leads to a summary or precis of the text. Both provide details for the reader's situation model of the text. This representation includes relationships between ideas that are not specified explicitly in the text. According to Kintsch's theory, mature readers generate these propositions automatically as they read, using their knowledge of written language conventions such as syntax and morphology and explicit markers such as topic sentences or noun phrases where a pronoun would achieve the same comprehension outcome.

The different levels of processing proposed by Kintsch can be linked with the conventional categories of literacy comprehension. Literal text comprehension is likely to be a consequence of the construction of local propositions while inferential and evaluative or critical comprehension is a consequence of constructing macropropositions that are reviewed inferentially by the reader according to different purposes. To achieve inferential comprehension outcomes, the reader's situational model of the text is elaborated while to achieve evaluative comprehension outcomes, the situational model is analyzed and compared with other aspects of a reader's knowledge.

Participants used the model of literacy to examine the processes by which readers form the literal meaning of sentences, identify inferential meanings not specified explicitly in the text and form its gist or summary. They examined how readers learnt to generate these propositions automatically as they read and how they gradually learn the written language conventions of syntax and morphology and explicit markers such as topic sentences or noun phrases. They examined how readers use their existing knowledge while reading and how they learn to read for different purposes.

2.2 A corresponding theoretical model of numeracy learning. Participants were introduced to the theoretical framework for numeracy that assumed that numeracy learning involves learning and using a number of key aspects of numerical processing skills such as generating numeracy concepts from quantitative experiences, reading and writing number symbolism, writing numbers, learning and applying numerical procedures correctly (Gordon, 1992), recalling number facts and using numerical calculations, using mathematics knowledge to categorize and conceptualise and self efficacy as mathematics learners (Gross Tsur, Auerbach, Manor & Shalev, 1996).

The participants learnt to identify the key areas of activity in which individuals completing an arithmetic task need to engage; they need to

- (1) read the data defining the task; this includes naming correctly each arithmetic symbol, including multi digit numbers, comprehending or retrieving its meaning, combining the meanings in the intended ways and discriminating relevant from irrelevant data,
- (2) decide what the acceptable outcome will be like, that is estimate the outcome,
- (3) link the task with earlier learning, that is, categorize or classify the task in terms of existing knowledge,
- (4) recall and apply appropriate procedures to the data given,
- (5) recall particular number facts,
- (6) manage, plan, monitor and evaluate the effectiveness of their efforts, and if these are judged to have been unsuccessful, to re work the task.

The participants identified that the activities are not necessarily used in a uni directional way in the sequence shown and that individuals can perform more than one simultaneously and can move between two or more in a reciprocal way. They discussed how the sequence assists in identifying the types of thinking that may be implicated in numeracy learning disabilities.

Participants used the model of numeracy to examine the processes by which students learn to comprehend particular maths ideas, how, when and why to use them, how to contextualize their maths understanding at any time, how to automatize their knowledge to understand how they learn maths and to form positive beliefs and attitudes both to maths and themselves as maths learners. They examined how students learn to read, write and comprehend the mathematics symbolism, how to generate predictions about maths ideas and to use their existing knowledge while learning mathematics.

2.3 Evidence based support for the literacy model. International evidence supports each aspect of the literacy model. Participants were introduced to this by examining developmental trends in each aspect of literacy. Development in the various aspects are supported as follows:

- 1 Developmental trends in word level skills phonological and phonemic awareness, learning symbolic codes for letters and orthographic processing, building a vocabulary of word meanings, learning to recall the names and sounds of letter clusters (rapid automatized naming speed) and to learning to use what they know about some words to read others (orthographic analogy learning) are exemplified in studies by Berninger, Abbott, Thomson and Raskind (2001), Foorman, Francis, Fletcher, and Lynn (1996), Goswami (1999), Lyon (1995), Seymour and MacGregor (1984), Share (1995), Thompson, Cottrell and Fletcher-Flinn, 1996) and Wolf, Bowers, & Biddle (2000).
- 2 Developmental trends in sentence level comprehension skills are indicated by how readers generate a literal representation of a sentence, use the word order

or grammar and retain ideas in verbal short-term working memory, (for example, to rehearse and to chunk knowledge). Developmental aspects are indicated by Beck, McKeown, Worthy, Sandora & Kucan (1996) and by Palincsar & Brown (1984).

- 3 Developmental trends in conceptual and topic level comprehension skills such as being able to link ideas into themes, to use the links to organize what they know, to think ahead, to summarize and to infer are indicated by Winne, Graham and Prock (1993) and by Gunning (2000). Reading fluency has been examined by Samuels, Ediger and Fautsch-Patridge (2005).
- 4 Developmental trends in dispositional level skills involve understanding how the social context affects how ideas are communicated are indicated in Dermody and Speaker (1995).
- 5 Developmental trends in the use of self-management and control strategies while reading such as learning to plan and monitor one's reading activity, review one's progress and to initiate corrective action are indicated in Asselin (2004), Commander and Smith, (1996), Horner and Shwery, (2002), Lambert, (2000), Pintrich, (2002), Ruban , McCoach, McGuire & Reis, (2003), Stone and May (2002).
- 6 The acquisition of attitudes to literacy and self efficacy in literacy contexts such as individuals believe they read successfully is reported by Pintrich (2002), Casteel, Isom & Jordan, (2000), Chapman & Tunmer (2003) and Linnenbrink & Pintrich, (2003).
7. Literacy knowledge is build from knowledge in a range of other areas ([Aaron, Joshi & Williams, 1999](#)) such as oral language knowledge, reasoning ability, ability to learn visual symbols and to store them in memory (Stothard, 1994). The teaching activities will take this into account.

Participants used the developmental aspects to identify possible profiles of literacy learning disabilities in their students.

2.4 Evidence based support for the numeracy model. International evidence-based research supports each aspect of numeracy learning (for example, Kosci, 1974; Macaruso, Harley and McCloskey, 1992; Temple, 1992; Rosselli & Ardila, 1997). Participants used the following aspects to describe numeracy learning profiles of students who have numeracy learning disabilities: students may have difficulty

- using mathematical concepts in oral language, talking about mathematical relationships sensibly. Kosci noted two aspects of this type of dyscalculia: a difficulty (1) identifying spoken numerals (although the individuals could read the numerals, and (2) recalling the name of a quantity (although they could read and write the number).
- manipulating concrete materials, or enumerating a quantity. A difficulty here involves converting one's arithmetic knowledge to actions or procedures in relation to quantities.

- reading and comprehending mathematics symbols such as numerals. Students with this difficulty can talk about mathematics ideas and comprehend them in oral discussion but have difficulty reading both individual symbols and number sentences.
- writing mathematics symbols. Students can comprehend mathematics ideas in oral discussion and can read numerical information but have difficulty writing their understanding in maths symbolism.
- understanding maths ideas and relationships.
- performing specified mathematical operations. Some students can apply algorithms correctly only when provided the relevant written number facts (Kaufmann, 2002; Temple, 1991). Others have difficulty using calculation procedures (McNeil & Burgess, 2002).
- recalling numerical facts or doing simple arithmetic computations (Shalev, Weirtman & Amir, 1988).

2.5 Evidence from the application of the literacy and numeracy learning model in school practice. The model has an established record for taking account of diverse learning needs in reading and numeracy. To assist them to implement the models in the work of their schools, participants heard and discussed its increasing use in school programs. They heard how it was initially developed to cater for a range of exceptional learning needs and has been trialed and modified over the past two decades:

- it has been used to underpin many professional development activities in Australia that have been independently acknowledged. It is acknowledged as an effective professional development program in the *2005 National Inquiry into the Teaching of Literacy*. In the section on Quality teaching and ongoing professional learning, this program is noted for its positive contribution to literacy gains in the Restart Initiative (page 54).
- it has been shown to meet the literacy learning needs of disadvantaged students in Victorian schools (for example, it formed the basis for the literacy gains at Bellfield Primary School from 1996 – 2005 (Munro, 2004b) and in secondary schools (Munro, 2004c).
- it has been used to general the Progression Points for VELS English and for the VELS Literacy Continuum.
- it was used to design the professional development activity for the Language Support Program and wrote the Workbook for the Language Disorder Program. This set of resources is on the Student Wellbeing web site.

- it has been used to develop an internationally recognized program for teaching numeracy to students who have intellectual disabilities : Munro, J. (2000). *Practical teaching strategies in numeracy for children with learning difficulties. Books 1-5*. Melbourne: Mathematical Association of Victoria.

Participants used this description of the use of the model to reflect on options it might offer them and their schools for catering more effectively for learning disabilities.

3. An introduction to the professional learning materials in literacy and numeracy.

The PL platform on which the professional development activity was based and the assumptions about how pedagogic practice can be modified, are explicated in this section.

3.1 The framework for the PL activity. Teachers will be assisted to develop both the pedagogic practice that characterises effective literacy / numeracy teaching and the relevant conceptual knowledge on which this practice is based and with sustains it and allows it to be used strategically.

This type of framework is justified by research related to professional learning for effective literacy / numeracy and school effectiveness and improvement (for example, Munro 2004b, 2004c, 2003a, 2002b). It is also evidence based.

The PL activity was consistent with and models relevant principles from DE&T's Seven Principles of Highly Effective Professional Learning. The means by which each principle was met are shown in Table 1.

Table 1 : The means by which each of DE&T’s Seven Principles of Highly Effective Professional Learning was met in the PL activity.

<p>Principle 1: Professional learning is focused on student outcomes (not just individual teacher needs)</p>	<p>A key focus throughout the professional learning activities was on maximizing student literacy learning so that all students optimize their learning. Participants were encouraged to contextualize each topic discussed in student learning and to develop indicators of what each would look like in student learning behaviours and outcomes.</p>
<p>Principle 2: Professional learning is focused on and embedded in teacher practice (not disconnected from the school)</p>	<p>In the professional learning activities, participants were encouraged to contextualize each topic in their teaching practice, both to contextualize it initially and later to activity research and trial novel teaching procedures in the classroom.</p>
<p>Principle 3: Professional learning is informed by the best available research on effective learning and teaching (not just limited to what they currently know)</p>	<p>The participants were both exposed to research-validated content in literacy and numeracy learning and teaching and encouraged to question, analyze, evaluate and compare different research-based perspectives on aspects.</p>
<p>Principle 4: Professional learning is collaborative, involving reflection and feedback (not just individual inquiry)</p>	<p>The participants engaged in collaborative professional learning throughout, with a focus on shared problem or issue framing, the pooling of relevant knowledge and reflection in groups.</p>
<p>Principle 5: Professional learning is evidence based and data driven (not anecdotal) to guide improvement and to measure impact</p>	<p>A key focus was on student literacy learning behaviours and procedures for identifying these and monitoring changes in a range of systematic and validated ways. The use of student and teacher data to inform teaching practice at any time was a key aspect of the activities.</p>

<p>Principle 6: Professional learning is ongoing, supported and fully integrated into the culture and operations of the system – schools, networks, regions and the centre (not episodic and fragmented)</p>	<p>The PL throughout had a focus on teachers questioning and researching teaching procedures and on the power of research validated teaching procedures on student learning outcomes. It was intended that participants see PL as a key aspect of their professional work.</p> <p>Through the activity the focus was on building a professional learning capacity in schools, particularly through the model of PL that underpinned this proposal.</p>
<p>Principle 7: Professional learning is an individual and collective responsibility at all levels of the system (not just the school level) and it is not optional</p>	<p>Participants were encouraged to link the various aspects of their PL with that of the collegiate base of their school and with the school as a whole.</p>

The mechanisms for implementing a sequence of PL activities described in the following section.

3.2 The mechanisms for PL. The PD activity had the goal of building the skills of the education workforce to enhance the literacy and numeracy learning-teaching relationships for students who have learning disabilities. The model of PL on which the PD was based had as its goal the building of both the conceptual and pedagogic knowledge and skills of school learning communities and as well positive dispositions to literacy and numeracy knowledge enhancement. The mechanisms for building the capacity for professional learning are described in Munro (2005) and for building and leading professional learning communities in Munro (2002b).

An assumption made for the PD activity was that the participants would be equipped to act as facilitators or ‘middle leader of professional literacy and / or numeracy learning. This role has been described widely in international teacher development research. A contemporary research validated model for doing this is described in Munro (2005) *Professional Learning Teams: Building the capacity for improving teaching and learning*. This paper is available at the web site of the National College for School Leadership <http://www.ncsl.org.uk/publications/publications-authormtos.cfm>.

The model identifies both (1) the types of knowledge middle leaders of literacy numeracy need to lead professional learning effectively and (2) the key learning activities of leaders of professional learning that are needed to stimulate and guide the professional learning of others.

3.3 Approach to professional learning. These mechanisms were mapped into an *Approach to professional learning*. The set of activities implemented included those shown in Table 2.

Table 2 : The set of activities used for each PL mechanism in the *Approach to professional learning*.

Each PL mechanism	Each matching set of activities
<p>Each topic was introduced through a set of challenging professional learning activities</p>	<p>These exercises had a ‘problem based learning’ focus and encouraged participants to explore and trial their understanding and thinking about the topic. The exercises developed lead participants to</p> <ol style="list-style-type: none"> (1) increase their awareness of the topic; (2) identify the problem or issue associated with the topic; (3) assemble what they already know about it. <p>These activities were planned and implemented as collaborative activities.</p>
<p>Participants review and link key ideas.</p>	<p>During and following the information presentation participants were encouraged to review and link key ideas. As noted in the professional learning model, both individual and collaborative learning activities were implemented. Each group of participants operated as a professional learning team and were led to learn in the explicit ways described in the professional learning model. Each group framed up group issues and problems, pooled their existing knowledge into a ‘group knowledge’, engaged in collaborative reflection of ideas being developed at any time and generated collaborative implications and possibilities for each literacy or numeracy topic.</p>
<p>Activities lead participants to learn about contemporary thinking about the topic.</p>	<p>Activities were developed to lead participants to learn about contemporary thinking about literacy and numeracy learning in the following ways. A literature review of each area was re-organized so that the content could be developed in a ‘digestible way’ using various adult learning procedures. The teaching information for each topic was organized and sequenced so that the ideas were developed clearly and easily linked with questions participants might ask. A balanced perspective of the issue was presented and a glossary of key terms provided on the final CD. Where possible, the teaching information was presented in multimedia formats. Prior to exposure to the teaching information, participants were encouraged to ask questions that the information might answer. During and following the information presentation participants were encouraged to review and link key ideas.</p>

<p>The professional development materials were written to assist teachers to select activities according to their interests and needs. The materials provided links to a range of extension materials such as on-line literacy teaching scenarios. An example of these was shown on http://webraft.its.unimelb.edu.au/476696/pub.</p>
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<p>Implications and relevance of the topic for teaching</p>	<p>Activities were developed to lead participants to examine the implications and relevance of the topic for teaching. This included reflecting on how the topic could help them understand and make sense of student learning behaviours, describe problems and issues in their teaching and identify possible teaching options using the topic.</p> <p>Activities were developed to lead participants to reflect on what the teaching options might ‘look like’ in their own teaching. They speculated about the options being contextualized as teaching procedures in their classrooms, how these novel procedures may be associated with changes in student learning behaviours and indicative changes in student learning that may be expected with the issue.</p> <p>Activities to assist participants to share the new teaching procedures with peers, contribute to a group knowledge of improved literacy and numeracy teaching and to a code of literacy and numeracy teaching practice for their schools were implemented.</p>
<p>Implications for long-term school based practice</p>	<p>Activities were developed to lead participants to (1) develop implementation plans for trialing and evaluating the novel literacy and numeracy teaching procedures and (2) decide whether to add the novel teaching procedures to their teaching repertoire, to practise them and to broaden their use.</p> <p>Participants were assisted to reflect on activities they could use to build a ‘professional learning community for literacy / numeracy’ in their school. They examined strategies for assisting collegiate teams to share knowledge, expertise and experience, to frame up problems of literacy teaching and learning in solvable forms, to foster a mutual understanding of effective classroom practice and to develop professional learning pathways for enhancing literacy knowledge at the team and school levels. Procedures for fostering collaborative planning for literacy teaching, peer mentoring and coaching were discussed.</p>
<p>The trialing and evaluation of the PL materials</p>	<p>The set of PL materials were trialed and evaluated by two groups of teachers from P – 10. The outcomes of the evaluation were used to fine tune and modify the materials.</p>

<p>Dialogue and awareness between health professionals and educators</p>	<p>An aim of the PL was to facilitate dialogue and awareness between health professionals and teachers about effective literacy intervention. This was done by ensuring</p> <ul style="list-style-type: none"> • the dialogue of both groups was informed by the one body or research (that what has been shown empirically to be effective); • both have the opportunity to embed this research in their respective contexts and • both have the opportunity to talk with each other about the relevant research in their respective contexts. <p>The PD assumed that both groups need to view the child as “one pair of shoes” with one set of difficulties rather than using either a medical or an educational filter to view the child. The body of research evidence which exists should be made available to health professionals so that dialogue with teachers can begin to develop a common language.</p>
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4. The content of the professional learning activities

This section describes the conceptual knowledge that participants were led to construct during the PL activity. It also describes the procedures used to assist participants to map this conceptual knowledge into pedagogic practice and to develop, therefore, their personal ‘theories of action’ and literacy and / or numeracy teaching protocols.

Based on the interpretations of the case study research, the models of literacy and numeracy and the approach to PL, the following modules examining various aspects of literacy and numeracy were implemented as follows in Table 3.

Table 3 : The modules used to develop teachers’ conceptual knowledge and the related pedagogic practice/ activities.

teachers’ conceptual knowledge	pedagogic practice / activities
<p><i>Literacy knowledge: How fluent readers read and write</i></p> <p>The participants were led to explicate and to reflect on their beliefs about literacy processing. They synthesized these in terms of the literacy model.</p>	<p>Materials and activities to assist teachers to apply the model of literacy to text at the P-3 and 4-9 levels. In the workshop the participants explored the model in terms of its use in classrooms, for example, its use in</p> <ul style="list-style-type: none"> • understanding and unpacking literacy thinking at any time. • identifying the literacy learning demands of texts that they expect students to read and to learn from, evaluating the texts they require their students to read in terms of the each aspect of the model. • auditing and describing the literacy learning and knowledge of students and groups identifying the aspects of knowledge individuals or a group may have in place and the aspects they need to develop further. • developing a systematic and consistent literacy strategies program. • developing a focus on faculty wide and school wide literacy awareness. • evaluating and improving literacy teaching practice and curriculum provision. • examining the demands on aspects of literacy knowledge made by the oral and written texts they use in teaching, identifying the literacy demands of text processing at any time and • matching students and texts. <p>Participants rated highly the model and its applicability to their teaching and to the work of their schools more generally.</p>

<p><i>How literacy knowledge develops: How readers learn gradually to read and spell.</i></p> <p>The participants examined developmental trends in various aspects of literacy and numeracy knowledge as described above.</p> <p>As each aspect was discussed, the participants examined how the developmental acquisition could be used to</p> <ul style="list-style-type: none">• identify and map students' existing knowledge,• diagnose individual students' literacy learning difficulties,• identify the knowledge processes likely to facilitate literacy growth.	<p>Indicators and signposts useful for identifying literacy learning progress</p>
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Explanations of reading difficulties: the causes of literacy learning difficulties.

The participants examined various causes of literacy learning disabilities. They

- examine various patterns in literacy difficulties
- link these with possible causes of the literacy difficulties patterns.

They discuss materials and activities they can use to identify

- those students who have literacy learning difficulties
- the areas in which the literacy learning difficulties occur and
- the causes of the difficulty

Materials and activities to assist teachers to identify the causes of literacy learning difficulties, how these are shown in reading performance.

In the workshop the participants examined how the model can assist them to meet the needs of students who have literacy learning disabilities:

- use the model to collate a literacy profile for students they teach and use it to infer the possible causes of the difficulties..
 - use the model to identify typical reading behaviours of students who had difficulty with each aspect of the model? What would difficulties in each aspect 'look like'?
 - use the developmental aspects to assist identification and teaching, to develop literacy learning profiles, to provide indicators and signposts for identifying literacy learning progress?
 - match the literacy assessment procedures their school currently uses with aspects of the model, review, evaluate and improve their school's approach to literacy assessment and screening?
 - ascertain teacher knowledge and practice in identifying causes of low literacy progress of colleagues in their school, evaluate and improve literacy teaching practice and curriculum provision in your school?
 - examine the demands on aspects of students' literacy knowledge made by the oral and written texts they are required to read and to learn from?
 - identify and foster independent literacy learning?
 - identify how socio-cultural and health factors impact on each aspect of literacy learning.
 - identify links between reading, writing, speaking and listening.
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Implementing effective explicit literacy strategy teaching

The participants mapped the model of literacy into a model of teaching that they can use to enhance students' use of literacy strategies. In particular they examined:

- the teaching conditions likely to foster literacy strategy learning.
- types of oral reading activity.
- teaching reading strategies; comprehending strategies and self management actions.
- three phases for teaching and learning literacy knowledge and strategies: the getting ready or orienting phase, the while-reading phase and the post-reading or review phase.
- templates to accommodate individual differences in learning. Indicate procedures for recognizing the specific ways in which particular students learn and for differentiating of the teaching

Materials and activities for teaching aspects of literacy strategy use for students in years P -9. Participants use the model to

- examine its implications and relevance for their teaching, what it might 'look like'. They apply it to texts they use in their teaching and generate getting ready, while reading and post reading activities.
 - evaluate their teaching practice and identify novel teaching procedures they can trial.
 - identify likely student outcomes to indicate the effectiveness of the novel teaching.
 - cater for individual differences in literacy learning, to modify and differentiate the teaching to take account of the learning characteristics of students who have difficulty learning to read.
 - cater for learning difficulties due to causes such as immature vocabulary knowledge, phonological and phonemic knowledge, symbolic coding and orthographic knowledge, RAN and fluency difficulties, sentence form and meaning difficulties, the use of sentence, paragraph and text level comprehension strategies, the use of metacognitive strategies and negative attitudes and dispositions to their likely success as readers.
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Teaching the conventions of literacy

The participants used the model to identify issues to do with learning the conventions of literacy, and in particular, teaching word level literacy conventions, the letter patterns used to write (that is, spell) words. In particular they examined

- what to teach : a developmental sequence for teaching letter cluster knowledge;
- how to teach; a sequence for teaching any spelling convention.

For any letter cluster the teaching sequence involved readers learning:

- the relevant phonological, semantic and then phonemic knowledge,
- the letter cluster – sound match and
- the automatic reading of the letter cluster.

This was learnt first for reading 1-syllable words and then for words of 2- or more syllables.

Materials and activities to evaluate participants' current teaching of literacy conventions and options for improving it. The participants match their current teaching of literacy conventions with the model and identify areas in which they could modify their teaching. They identified

- phonological, semantic and phonemic teaching activities
- letter cluster –sound teaching activities
- morphographic – letter cluster teaching activities
- orthographic teaching activities
- transfer and generalization activities for orthographic knowledge.

The types of knowledge that lead to numeracy knowledge and skills

The participants were led to explicate and to reflect on their beliefs about numeracy processing. They synthesized these in terms of the numeracy model.

The participants learnt to use a model of numeracy that specified the types of maths knowledge students are expected to learn. The model comprised the following areas:

- conceptual knowledge; what ideas mean, knowing 'when to' and 'why'.
- actions or procedures; knowing 'how to do' things in mathematics
- mathematical relationships; relating ideas
- language of maths; talk, read, write, use maths vocabulary and maths symbolism,
- automatized factual knowledge.
- how to learn maths; ways of thinking about and learning maths ideas and ways of managing their maths learning.
- problem-solving strategies; ways of thinking about mathematical ideas,
- their beliefs and attitudes about maths and how to learn it.

Materials to assist teachers to apply the model of numeracy to content from P-9 levels. Participants used the model of numeracy to identify causes of numeracy learning difficulties.

They examined how the model could help them to

- identify the learning demands of their teaching. How well does their teaching develop each aspect of the model? How could they modify their maths teaching?
 - audit and describe the numeracy learning and knowledge of students.
 - develop a focus on faculty wide and school wide numeracy awareness.
 - identify possible causes of difficulty and what they need to develop further. They examine what particular aspects of numeracy difficulty look like for each aspect of the model and compile a set of indicators and signposts useful for identifying numeracy learning progress at each phase.
 - assess and diagnose areas of numeracy knowledge.
 - discuss what might be useful and effective ways of using tasks to decide rapidly possible causes of students' low numeracy learning.
 - see what teacher colleagues know about how to identify possible causes and reasons for low numeracy progress in their classes
 - provide indicators and signposts useful for identifying numeracy learning progress.
 - evaluate and improve numeracy teaching practice and curriculum provision.
 - identify independent numeracy learning.
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How numeracy knowledge develops, causes of numeracy learning difficulties and diagnosing these.

The participants learnt to use the model of numeracy processing to examine

- how numeracy knowledge develops
- possible causes of numeracy learning difficulties and
- ways of diagnosing numeracy learning difficulties.

They used this to develop an approach to analyzing the confusions students show in learning mathematics ideas and the errors they make in completing maths tasks.

Materials and activities were used that would assist teachers to

- determine the level of numeracy development for students from P-9 levels
- assist teachers to identify the causes of numeracy learning difficulties and how these are shown in mathematics performance
- assist teachers to identify (1) those students who have numeracy learning difficulties (2) the areas in which the numeracy learning difficulties occur and (3) the causes of the difficulty.

A framework for numeracy teaching

The participants learnt a model of numeracy teaching that guides students who have learning disabilities to learn numeracy ideas in the following phases:

use what	challenge students to learn
they know	stimulate what they know
Learn the	learn ideas in specific contexts
new ideas	abstract ideas
	identify learning strategies used
	link emotion with the ideas learnt
	see their progress
consolidate	encode ideas in memory
what they	automatize aspects of ideas learnt
learnt	generalize, transfer what they learnt
	evaluate learning outcomes

Participants used the model of numeracy learning to

- examine its implications and relevance for their teaching, that is, what it might 'look like' in their own teaching,
- evaluate their teaching practice and identify novel procedures they can trial in their teaching.
- identify likely student outcomes to evaluate the effectiveness of the novel teaching
- accommodate multiple ways of learning and individual differences in numeracy learning.

Implementing effective numeracy teaching in the foundation numeracy areas

Participants learnt how to apply the numeracy teaching framework to the foundation areas of

- counting,
- place value,
- arithmetic computations for whole numbers,
- mental arithmetic
- fractions and decimal numbers.

Participants learnt to use materials and activities for teaching students who have numeracy learning difficulties to acquire knowledge and skills in these areas.

Participants reflected on and evaluated their students' knowledge on the foundation areas of numeracy and

- examined the teaching procedures recommended and relevance for their teaching, that is, what they might 'look like' in their own teaching,
- evaluated their current teaching of the foundation areas and identify teaching procedures they might use.
- identified likely student outcomes to indicate the effectiveness of the modified teaching in the key areas.
- catered for numeracy learning difficulties in the foundation areas due to causes such as representing quantities, symbolic processing, maths fluency difficulties, sequencing maths ideas, the use of metacognitive and self-management strategies and negative attitudes and dispositions to low self efficacy to their likelihood of success as readers.
- examined how the numeracy templates can be used to meet individual differences in learning.

The PL program, including the workshop sessions, are shown in the following.

PROGRAM

Day and Session	Time	Topic
Day 1 Session 1	9.00 – 10.30 am	Literacy knowledge: How fluent readers read and write
Day 1 Workshop 1	11.00 – 11.45 am	Ways of using the model of reading.
Day 1 Session 2	11.45 – 12.30 pm	The developmental pathway
Lunch		
Day 1 Session 3	1.30 – 2.15 pm	Characteristics and causes of reading difficulties
Day 1 Workshop 2-3	2.30 – 3.30 pm	Using the model of reading to identify areas of learning need for students who have literacy difficulties
Day 2 Session 4	9.00 – 10.30 am	Implementing effective literacy teaching in years P -9
Day 2 Workshop 4	11.00 – 11.45 am	Ways of using the teaching model
Day 2 Session 5	11.45 – 12.30 pm	Teaching the conventions of literacy
Lunch	12.30 – 1.30 pm	
Day 2 Workshop 5	1.30 – 2.00 pm	Ways of designing word level intervention
Day 2 Session 6	2.00 – 3.30 pm	ACER
Day 3 Session 7	9.00 – 10.30 am	The types of knowledge that lead to numeracy knowledge and skills. Causes of numeracy learning difficulties. Diagnosing numeracy learning difficulties
Day 3 Workshop 7	11.00 – 12.00 pm	Using the model to identify students who have numeracy learning difficulties, the areas in which they occur and their causes
Day 3 Session 8	12.00 – 12.30 pm	A framework for mathematics teaching
Lunch	12.30 – 1.30 pm	
Day 3 Session 9	1.30 – 2.45 pm	Implementing effective numeracy teaching in the areas of counting, place value, arithmetic computations
Day 3 Workshop 9	2.45 – 3.30 pm	Planning teaching be implemented in the foundation areas of counting, place value, arithmetic computations