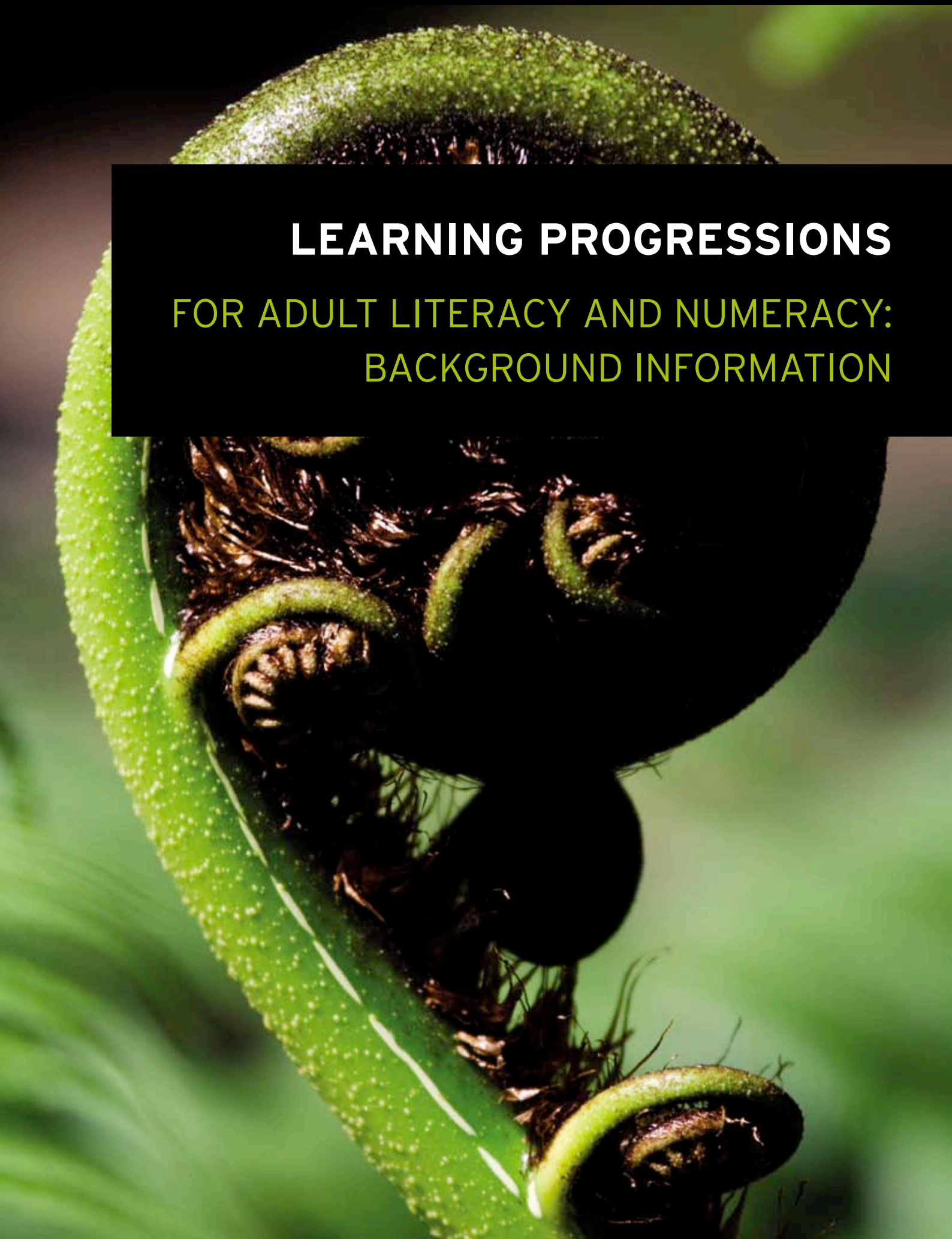
Tertiary Education Commission
Te Amorangi Mātauranga Matua

LEARNING PROGRESSIONS

FOR ADULT LITERACY AND NUMERACY: BACKGROUND INFORMATION



Mā te mōhio ka ora:
mā te ora ka mōhio

Through learning there is life:
through life there is learning!

Acknowledgments

The Tertiary Education Commission would like to thank all those who contributed to this work, especially:

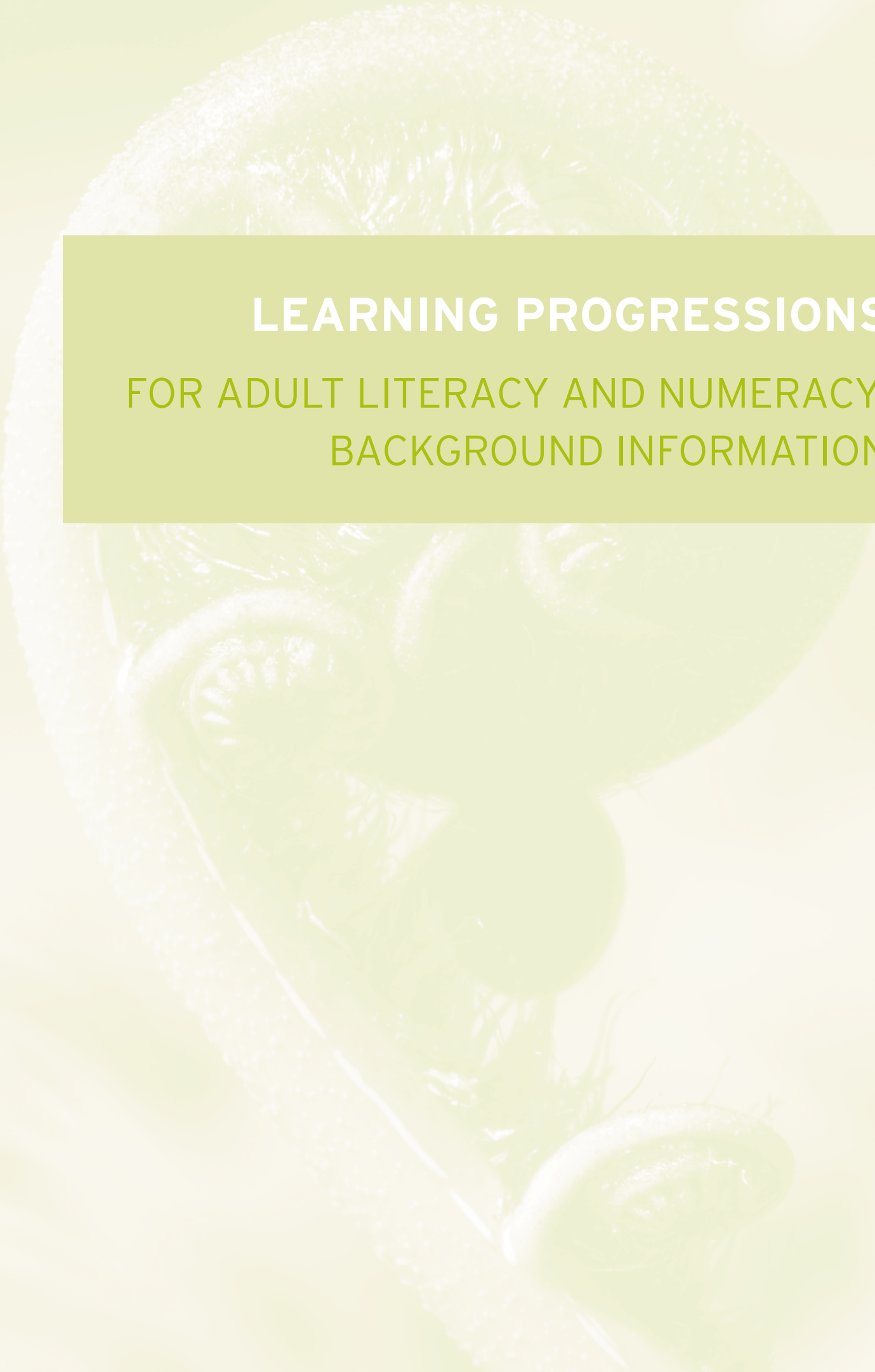
- the original development team: Murray Britt (The University of Auckland), Robyn Chandler (Christchurch), Sue Douglas (Learning Media Limited), Sue Dymock (The University of Waikato), Margaret Franken (The University of Waikato), Garry Nathan (The University of Auckland), Kevin Roach (Auckland University of Technology), Warren Shepheard (Mathtec), Gill Thomas (New Zealand Maths Technology) and Sue Brown (writer).

  The development team referred to work already undertaken in the tertiary sector in New Zealand and internationally and the school sector teaching and learning materials developed for New Zealand schools as part of the government's Literacy and Numeracy Strategy, especially the Numeracy Project, which formed the basis for the number progressions. The team found the Equipped for the Future content standards and performance continuums particularly useful as a starting point for their thinking.
- all those who contributed to the review process through their feedback and experience using the documents: tertiary providers and tutors; other agencies and individuals; developers with the Learning for Living professional development clusters including Erica O'Riordan, David Gough, Carole Craighead, Louise Hawkins, Janet Coup, Janet Hogan, Phil Kane, Jenny Amaranathan, Warren Shepheard
- the review team: Margaret Franken (The University of Waikato), Sue Dymock (The University of Waikato), Gill Thomas (New Zealand Maths Technology) and advisers Jill Heinrich, Jane Terrell, Aroha Puketapu-Dahm
- Learning Media Limited, for professional services.

Note: The Tertiary Education Commission has made every reasonable attempt to contact all the holders of copyright for material quoted or adapted in this publication. We would be pleased to hear from any copyright holders whom we have been unable to contact.

LEARNING PROGRESSIONS

FOR ADULT LITERACY AND NUMERACY: BACKGROUND INFORMATION



Foreword

E ngā iwi, e ngā reo, e ngā mana, e rau rangatira mā.

Tēnā koutou, tēnā koutou, tēnā tatou katoa.

We are delighted to release this latest version of the learning progressions, knowing that many people involved with adult literacy and numeracy in New Zealand are keen to put it to use.

Thank you so much to the many people who have contributed to the production of this document, through the preparation of material and by providing advice and suggestions for improvement.

As we continue our effort to ensure that every New Zealander has the crucial literacy and numeracy skills they need for living and learning, the progressions offer a robust framework for other tools and resources, a focus for continuing to develop high quality teaching and learning, and a common language for use in the many settings where literacy and numeracy are developed.

Supporting adults to develop these skills is not as easy as ABC. This sector will always need evidence-based research, informed managers and dedicated tutors who are committed to the challenge of improving their teaching. These progressions, with their accent on strengthening learners' expertise, are key tools in our "kete" to help us rise to the task.

Mā te mōhio ka ora: mā te ora ka mōhio

Through learning there is life: through life there is learning!

Janice Shiner
Chief Executive
Tertiary Education Commission

Contents

Introduction 4

The need for a focus on reading, writing, speaking, listening and numeracy 4

The adult learning progressions 4

The progressions and Te Reo Rangatira 5

The theoretical basis for the learning progressions 6

Competencies and a continuum model 6

Movement along the continuum 6

The learners 8

The nature of adult learners and learning 8

ESOL learners 8

Connecting the learners and the progressions 11

Patterns of progress 11

Learning in context 11

Digital media 11

Background to the listening, speaking, reading and writing progressions 12

Key concepts 12

The research base 14

Listen with Understanding, Speak to Communicate 15

The demands of listening and speaking 15

Listening comprehension 16

Listening critically 17

Speaking to communicate 17

Vocabulary for listening and speaking 18

Interactive communication 18

ESOL learners: listening and speaking 19

Read with Understanding 20

What is involved in adults' reading? 20

Rationale for the sequence of the reading progressions 21

Decoding 21

Vocabulary for reading 23

Knowledge of language and text features for reading 24

Reading comprehension 24

Reading critically 28

ESOL learners: the demands of reading 28

Write to Communicate 29

Writing as a process 29

Rationale for the sequence of the writing progressions 29

Spelling 30

Vocabulary for writing 31

Knowledge of language and text features for writing 31

Planning and composing 32

Revising and editing 32

ESOL learners: the demands of writing 33

Background to the numeracy progressions 34

What is numeracy? 34

Key concepts 34

The progressions and the research base 37

Using the numeracy progressions 37

Make Sense of Number to Solve Problems 38

Reason Statistically 39

Measure and Interpret Shape and Space 40

Appendix A 41

Second language learning of reading and writing 41

References 42

Introduction

The need for a focus on reading, writing, speaking, listening and numeracy

New Zealand has a significant proportion of adults who are unable to participate effectively or fully in a knowledge society because of low language, literacy and/or numeracy skills. The *1996 International Adult Literacy Survey*[1] revealed that in New Zealand, as in many other countries, almost half of all adults aged from 16 to 65 years old had pressing literacy and numeracy needs. One in five New Zealanders were found to have very poor literacy skills. The majority of Māori and Pacific adults performed well below average on all aspects of literacy and almost half of all unemployed people were at the lowest level of literacy. The more recent *2006 Adult Literacy and Life Skills Survey*[2] compared results internationally for numeracy (the ability to understand and process mathematical and numerical information) and document literacy (the ability to read and understand discontinuous texts such as graphs, charts and tables). This survey shows that approximately 50 percent of the adult New Zealand population still have low numeracy and (document) literacy scores. Of particular concern once again is the over-representation of Māori and Pacific populations at the lowest levels of numeracy performance (results are not yet available for document literacy).

Literacy (which here includes listening, speaking, reading and writing) and numeracy skills are often integral to the work and activities adults need to do. Developing these skills enables people to participate more effectively in our society.

The adult learning progressions

Listening, speaking, reading, writing and numeracy demands are embedded in many of the tasks that adults need to undertake in real life across a wide variety of contexts. The progressions provide a framework and language for describing the challenges that adult learners may have to overcome to meet these demands.

In order to develop adult learners' expertise, tutors need to recognise the learners' current knowledge and skills (in whatever areas they are demonstrated). Tutors and learners together build on these and transfer the learning to more and more different contexts, with increasing independence for learners. As they develop their expertise, adult learners are able to meet the demands of a wider range of tasks with increasing ease and independence.

The learning progressions describe the main elements or strands of learning that adults require in order to:

- Listen with understanding
- Speak to Communicate
- Read with Understanding
- Write to Communicate
- Make Sense of Number to Solve Problems
- Reason Statistically, and
- Measure and Interpret Shape and Space.

1 Refer to Walker, Udy and Pole, 1996.
2 The Adult Literacy and Life Skills (ALL) Survey: Headline Results and Background, Ministry of Education, December 2007.

This booklet, *Learning Progressions for Adult Literacy and Numeracy: Background Information* provides the theoretical basis for each strand and for the progressions within each strand.

The progressions within each strand are described in detail in the two accompanying books, *Learning Progressions for Adult Literacy* and *Learning Progressions for Adult Numeracy*. Note that each of these books contains a glossary of relevant terms.

The supporting tutor resource booklets for reading, writing, number, measurement and statistics explain how tutors can identify learners' needs and the demands of a variety of tasks. They also provide activities that can be used to teach aspects of each strand.

The progressions and Te Reo Rangatira (the Māori language)

The progressions show the development of expertise in listening, speaking, reading and writing in New Zealand English and the examples used include some words from Te Reo that are commonly used in New Zealand. This acknowledges Māori iwi as tangata whenua and reflects the fact that Te Reo is one of our official languages. Most New Zealanders regularly use, see or hear Te Reo and Māori concepts in their everyday lives. People who are fluent in Te Reo as well as English move easily between both languages and may respond to a question in English by using both languages. Tutors can acknowledge and reflect this in their own teaching, while at the same time using the progressions as a guide for literacy development.

The theoretical basis for the learning progressions

Competencies and a continuum model

The term *competencies* covers the knowledge, the cognitive and practical skills and the attitudes (including motivation) needed to meet demands or carry out tasks successfully.[3] Competencies are used in combinations (generic and specific) in particular contexts. Internationally, there is general agreement that language, literacy and numeracy competencies are *foundation competencies*, which underpin the learning and performance of all other generic competencies (for example, the ability to work co-operatively) as well as of specialised skills needed in home, work, educational and social settings.

The learning progressions have been developed in seven strands that reflect the key competencies of listening, speaking, reading, writing and numeracy. Each strand is made up of progressions that together describe the development of expertise within the strand. As with other models that describe learning pathways,[4] the learning progressions have been developed as a set of continuums. Each continuum describes how adult learners build their expertise, with each step along the continuum representing a significant learning development. The learning progressions also reflect the cumulative nature of learning – an adult learner may start at different places along the different continuums and all adult learners build on and extend their existing knowledge and skills.

Movement along the continuum

The term *progression* implies a continuous, sequential movement towards expertise rather than a series of separate tasks to be mastered in order to move "up". For this reason, individual steps within a progression are distinguished from one another by referring to their place in the sequence (for example, *the second step in the Reading Comprehension progression*) rather than by using definitive numbers or levels.

The *steps* in the learning progressions can also be imagined as signposts, each one indicating a significant stage of development. The progressions describe the learning represented by each signpost. Because not all learning occurs at the same rate, these signposts are not always evenly spaced. Development within any one strand or progression is not even and some of the shifts in development involve more learning than others. The amount of learning needed will also depend on the learner. Adults do not all learn in the same way. Some need to spend more time than others on learning or consolidating certain skills.

For some steps in some of the progressions, learners need to develop prerequisite knowledge, skills, or strategies in one or more of the other progressions before new learning can take place. For example, in the Read with Understanding strand, a learner requires vocabulary knowledge in order to comprehend written texts and therefore the learner's use of strategies in the Comprehension progression will generally be a step behind their vocabulary knowledge. In an example from the Make Sense of Number to Solve Problems strand, a learner would need to have reached at least the second step of both the Number Sequence progression and the Number Facts progression before they would be able to work at the third step of the Additive Strategies progression. Although some of these prerequisites are obvious, others depend on the learner's relative expertise, the learner's prior knowledge, or the challenges of the task in hand.

3 Organisation for Economic Co-operation and Development (OECD), 2005.
4 For example, in *Equipped for the Future Content Standards*. See Stein, 2000.

Starting points

The learning progressions for reading, writing, speaking and listening pick up the learning process from a point where some basic, essential skills, knowledge and attitudes have already been developed.[5] These include the ability to articulate words and to hear the sounds of whole words and a basic understanding of concepts about print. These progressions go on to identify the key steps along a continuum up to a point that describes the competencies that an adult needs in order to be able to meet the literacy demands in most of the spoken and written texts that they will engage with in their everyday lives. Because of the complex range of issues and experiences that may account for the needs of learners who do not have the basic, essential knowledge and skills, the decision was made to assume these as prerequisites for the listening, speaking, reading and writing progressions. A small number of adult learners may require a specialised plan to enable them to develop these competencies. See *Learning Progressions for Adult Literacy* for further information about the relationships between the strands and the progressions. For adults who are learning English, the information on page 8 will also be relevant to the starting points of these progressions.

The nature of numeracy knowledge and skills means that the learning progressions for numeracy should start at an earlier point, to ensure that essential initial numeracy learning is not overlooked. They identify most of the key steps in learning, up to a point that describes what adults need to know and be able to do in order to solve most of the mathematical problems they will meet in their everyday lives. See *Learning Progressions for Adult Numeracy* for further information about the relationships between the strands and the progressions.

5 In recognition of the fact that the starting point for the Literacy Progressions assumes basic knowledge and skills, an additional resource has been developed and is due for publication in 2008.

The learners

The nature of adult learners and learning

A key factor in adult education is the variability of adults' learning. In the past, it was often assumed that all adults would learn in the same way. Current theories of adult learning reflect the understanding that adults learn in many different ways for many different reasons. Because of this, it is very important that adult education programmes are learner-centred.

Adult learning is recognised as a form of participation in social practices. This means that learning occurs in all contexts of people's lives. Learning is not just about behaviour and cognitive processing: current research findings[6] emphasise the importance of using the life experiences and life roles of adult learners and suggest that learning develops as adults engage in interactions with other people and with their social environment.[7]

Early models of adult learning that characterised adult cognition as either "stable" or "declining" have been rejected in favour of models that show continuing cognitive growth.[8] As adult learners develop their expertise, they are able to engage with a wider range of more complex texts, or to solve more challenging mathematical problems, with greater independence and fluency. As their knowledge, skills and strategies develop, their confidence is likely to increase and, with it, their willingness to undertake more complex tasks that involve engaging with text or solving mathematical problems.

The adult learner's increasing expertise is accompanied by an increasing awareness and control of their knowledge and skills. This means they are able to deliberately select from a wider repertoire of strategies and apply them in a wider range of contexts. When competent adults engage with texts or solve mathematical problems, they do so by automatically integrating strategies they have learnt.

ESOL learners

In the context of these learning progressions, adult English for Speakers of Other Languages (ESOL) learners can be broadly described as those adults who use a first language other than English at home (and elsewhere), but who have learning needs relating to English language. The term ESOL, which is used in this book, is widely recognised in New Zealand. Some people prefer to use the term EAL (English as an Additional Language). Both terms recognise that for many learners, English may well be one of several languages they know and use.

ESOL learners are an extremely diverse group with widely varying experiences and proficiencies in language, literacy and numeracy. While many may be literate and/or numerate in their first language, many others may not, or may have specific areas of competence that can transfer to learning in English. Furthermore, the varying degrees of "distance" between languages (see page 37) make it impossible to generalise about the needs of adult ESOL learners in relation to learning progressions.

The two most critical variables that distinguish new learners of English from their English-speaking peers are differences in prior knowledge (including cultural knowledge) and differences in English language proficiency.[9]

A number of hypotheses and theories[10] have been developed to account for the relationship between what one knows and can do in a first language and what one then subsequently knows and can do in a second or additional language. Three of

6 For example, Fenwick and Tennant, 2004; Tusting and Barton, 2003.
7 Ivanič and Tseng, 2005.
8 Pogson and Tennant, 1999.
9 Ministry of Education, 2006, pages 128–129.
10 Vandergrift, 2006; Franken and McComish, 2003.

these, which apply to all aspects of learning, are summarised below. They can be taken into account as the learning progressions are used and adapted to meet the varying needs of adults who are learning English.

The *linguistic threshold hypothesis* suggests that learners require a certain amount of ability in the new language in order to use their existing (first-language) reading or listening skills to aid learning. For example, learners may be able to predict the next words when reading in their first language, but they may not have enough knowledge of English to use this skill when reading in English.

The *linguistic interdependence hypothesis* suggests that the reading and listening skills that learners have in their first language will be available to them as they learn a new language. Research shows that learners who are literate in their first language can transfer the knowledge and strategies they have to literacy in a second language.

An important factor that will influence how easily ESOL learners can transfer their existing literacy knowledge is that of *language distance*.[11] This term refers to the degree to which languages are similar. Similarities or differences may be found in many aspects of written and spoken languages, such as the alphabet used, the word order, the use of tonal distinctions, word derivations and the conventions of print. Finding similarities to one's first language is part of the task of acquiring a new language. For example, Samoan is not as distant from English as Japanese would be, but it is more distant from English than Spanish in terms of a number of grammatical and discourse-related language variables.

There are strong dependencies and connections between the learning progressions and these have implications for ESOL learners. The learning progressions have not been developed specifically for ESOL learners. However, tutors can take the needs of these learners into account by carefully examining the challenges of the texts and tasks that the learners (as individuals or groups) need or choose to engage with. The knowledge, skills and strategies used by competent adults are the same for first-language English speakers and ESOL learners.

ESOL learners are likely to have an uneven spread of needs in different strands. For example, an adult who can communicate effectively when speaking and listening may still need to spend considerable time learning about the spelling and grammatical aspects of written English. Similarly, a learner who has excellent mathematical skills may still need support in tasks that require reading in English.

Why the learning progressions are not ESOL progressions

While the steps in these progressions describe knowledge and skills relevant to all learners, they do not account for all of the related learning and development of specific groups of learners. They do not, for example, specify all the elements we might consider to reflect development in ESOL learning. Some of these elements might be:

- a detailed analysis of developmental sequences
- typical processes that ESOL learners demonstrate, for example, over-generalisation
- metalinguistic development
- the development of language learning strategies
- communication strategies.

11 Elder and Davies, 1998.

The progressions describe steps in the development of listening, speaking, reading and writing for adult learners. This means they can include but are not restricted to use with native speakers of English. The beginning steps, therefore, potentially apply to all learners, including:

- learners who speak English as their first language, and
- learners who speak English as a second or additional language (referred to as ESOL learners).

They do not reflect steps in pre-literacy development for either group.

The low steps of the listening and speaking progressions do, however, reflect the development of ESOL learners' oral skills. As such, the steps may appear to be quite low but they are well aligned with the lower steps in the reading and writing progressions for these learners. This is because we can assume that many ESOL learners will have developed at least some reading and writing expertise in their first language.

See also *Appendix A: Second language learning of reading and writing* on page 41.

Connecting the learners and the progressions

Patterns of progress

Adult learners will show uneven patterns of development. Each learning progression, however, describes a typical pattern or pathway. This means if a tutor knows where a particular learner "fits" on any one progression, they can be reasonably sure of what the learner will need to learn next in order to develop their expertise in that area. Conversely, if a learner is struggling with a particular aspect of learning, the tutor can use the relevant progression to identify earlier learning that may have been missed and that the learner needs in order to progress.

The professional development tutor resource books that support each strand provide information to assist tutors as they use the progressions as a tool for identifying learner progress.

Learning in context

Developing any one specific competency will almost always be most effectively achieved in the context of learning other generic or specialised competencies and in the context of real-life situations. Adult learners develop their language, literacy and numeracy most effectively in contexts that have meaning and purpose, for example, when they need specific skills or knowledge in order to be able to use new technology in their workplace, interact with their child's teacher, or get their driver's licence. That is, adults learn best when they are meeting the demands of authentic tasks associated with their roles as workers, learners and family and community members.

The goal of the learning progressions is to support the building of adult learners' fluency and independence as they apply their literacy and numeracy knowledge and skills in real-life situations, including education settings and workplace training courses.

The professional development tutor resource books that support each strand provide information and suggested activities to contextualise learning.

Digital media

The spread and use of technologies for communication has created new modes for reading and writing. Many adult learners are highly motivated by digital modes or technologies, such as text messaging, email and social networking on the internet. Some modes, such as hypertext, allow readers to use text in non-linear ways, following links or buttons to read, view, listen and write. These modes, which are changing the ways in which people learn and engage with ideas and information, provide many excellent learning opportunities for adult learners.[12]

12 Prensky, 2001.

Background to the listening, speaking, reading and writing progressions

Key concepts

Sociocultural practices

Written and oral language practices exist within specific social and cultural contexts.[13] This means that individuals are members of a society (which consists of groups or organisations that are not all organised on a formal basis) and the language practices of individuals can be seen as part of the activities of those groups or organisations. The group both influences and is influenced by the communications of its members. For example, consider the graffiti and rap music associated with hip-hop culture, in which the graphic and oral forms of communication are important parts of the identity of the group. The legal jargon used by lawyers is another example of the way in which a group influences the form of communication used by its members and is in turn influenced by it.

This has implications for adult education, where social and cultural factors are particularly significant for adults who are developing their expertise with written and oral language. Adult learners bring a wealth of diverse social and cultural experiences to most learning situations and belong to a wide variety of social and cultural structures, all of which influence and inform their learning.

Purpose and audience

All oral and written texts have a meaning and a purpose. The ability to distinguish between the different purposes of texts may be developed through examining the purposes that adults themselves have as they prepare to listen, speak, read or write. These purposes can be very diverse, for example, to entertain, to build a friendship, to get something done, to comfort, to influence, to subvert, to deceive, to persuade, to build community or to shock. The purposes can be direct, indirect, or a combination within one text. The purpose may be to express the writer's or speaker's point of view, perspective or attitude and these may be expressed in direct or indirect ways. Listeners and readers who think critically are able to consider different perspectives along with the different intentions of texts.

Given that all texts (oral and written) have a purpose, it follows that all texts have one or more intended audiences. Even personal diaries have the writer of the diary as an audience. The audience may be obvious (a children's picture book is usually assumed to be written for children), less obvious, or even obscured (sometimes adults may speak to children in a way that carries a different meaning for an adult audience).

Vocabulary

The concept of vocabulary, as used in the progressions, encompasses understanding as well as recognising words in written and spoken language. More than this, knowledge of vocabulary includes knowledge of how words work in relation to each other and within specific contexts.

Learning vocabulary is a complex and sometimes difficult task for adults. For many adults, understanding the differences between oral and written language can pose problems. The fact that about 70 percent of English words have more than one meaning[14] adds to the complexity of the task and the different ways in which words are learnt can make it even more complicated. Learning new words takes time. A word is unlikely to become part of a learner's vocabulary after a single exposure to the word or one definition of it.

13 For example, as described by Gunnarsson, 1997.
14 Lederer, 1991.

Adult learners have several different and overlapping kinds of vocabulary. Stein (2000) identifies the following four:

- Receptive vocabulary. The words an individual understands, either orally (heard) or in print (read).
- Productive vocabulary. The words an individual is able to use orally (by speaking) or in print (by writing).
- Oral vocabulary. The words an individual can use or recognise in speaking or listening.
- Reading vocabulary. The words an individual recognises in a printed form.

Because of this complexity, word learning is incremental and occurs over many exposures. For example, the word *bright* has numerous shades of meaning and it takes multiple exposures to the word in different contexts to understand the full complexity of its meanings and applications (*The light is bright; The future looks bright; John is bright; Sarah has a bright personality*).

Vocabulary size

Researchers' interest in vocabulary size has mainly focused on the needs of ESOL learners. Different researchers use different methods for counting vocabulary size, making estimates hard to compare. Some use word families as the basis for counting and others use total numbers of individual words. Paul Nation[15] estimates that a five-year-old starting school generally has a vocabulary of 4,000 to 5,000 word families and a university graduate generally knows about 20,000 word families. A word family is taken to include a root or base word, its inflected forms and a small number of reasonably regular derived forms.[16]

For example, the word family of *concept* includes *concepts, conceptual, preconception* and other words. The notion of a word family makes for more efficient learning because when the learner knows the root or base word, it is easier for them to learn the related items.

Critical thinking

Texts are never neutral. The values and beliefs of the writer or speaker affect the messages that are communicated. For this reason, it is important for adult learners to develop the skills for thinking critically about the texts they read, view or hear. Thinking critically involves analysing and interpreting meanings, responding critically to texts when reading and listening, and being critically aware when writing and speaking. Adult learners need to develop their awareness of speakers' and writers' different perspectives and purposes in order to gain deeper levels of meaning, to avoid being manipulated by writers and speakers, and to gain insights and enjoyment from the texts they engage with.

The interrelationships between listening, speaking, reading and writing

The learning progressions describe the development of expertise across the four strands that relate to listening, speaking, reading and writing. Within these strands, progressions have been developed for specific areas of learning, such as vocabulary and comprehension. However, these divisions do not mean that each area of learning is isolated. They overlap one another and in some cases certain learning in one progression is a prerequisite for learning in another. The interrelationships between reading and writing and between listening and speaking also mean that no

15 Nation, 2001.
16 Bauer and Nation, 1993.

one strand should be considered on its own. To emphasise the strong interrelationship between listening and speaking, there is a progression for Interactive Listening and Speaking that is repeated in both the Listen with Understanding and the Speak to Communicate strands.

Many learners who are native speakers of English may not seem to fit into the lower steps of the listening and speaking progressions, but they may fit the lower steps of the reading and writing progressions. This reflects the fact that their oral skills development outstrips their written skills development. This can be seen, for example, in adult learners who have strong oratory skills but who have not had similar success with reading and writing.

Second language learning

A number of premises distinguish these progressions from ones that may describe or account for second language learning in general. These relate specifically to the nature of interaction and transfer between the ESOL learner's reading and writing skills and knowledge in their first language, and their reading and writing skills and knowledge in English. These premises are detailed in *Appendix A: Second language learning of reading and writing* on page 41.

The research base

The research bases for listening and speaking, reading and writing are described under separate headings below.

Listen with Understanding, Speak to Communicate

In order to meet the demands of being a worker, a learner and a family and community member, adults need to be active listeners and to be able to speak so that others can understand them.

The listening and speaking strands are underpinned by the notion that listening and speaking are not passive acts but interactive and social skills.[17] These two strands are closely connected and the Interactive Listening and Speaking progression is included in both strands.

The interactive progression specifically focuses on the management of dynamic interaction between participants in conversational contexts. The listening and speaking strands also consider other aspects of a developing communication repertoire. The strands take account of the fact that expertise is characterised by the important ability to move beyond small-group contexts.[18]

The listening and speaking strands acknowledge the transactional or information transferring function of listening and speaking.[19] Any learning progression in the skills of listening and speaking must include the development of comprehension and the increasingly expert use of comprehension strategies. It must also describe the development of increasing expertise in communicating information effectively. The listening comprehension progression incorporates a view that with increasing expertise comes increasing metacognitive awareness in the monitoring of comprehension,[20] a view that is also included in the reading strand. The development of increasing expertise in communicating information effectively needs to be considered alongside the development of awareness of purpose and audience.

The demands of listening and speaking

The listening and speaking learning progressions reflect a model in which listening and speaking tasks are understood to include:

- Functional competence. The ability to convey and interpret communicative intent.
- Sociocultural competence. The ability to recognise and use the forms of listening and speaking that are appropriate to different contexts: this includes an awareness of register, for example, the use of appropriate vocabulary and attending to relevant tikanga.
- Strategic competence. Enables listeners to integrate and apply the various components of listening and speaking.

Adults also need to have knowledge of language and text features in order to hear, produce and understand meaningful speech.[21]

Oprandy (1994) states:

> ... there is an enormous amount of information that needs to be sorted out by listeners and speakers ... What is done with that information has a lot to do with the personal and social connections listeners make with the aural input, not to mention the grammatical and lexical knowledge they must bring to the speech event.

For these reasons, both the listening and speaking strands include a progression for vocabulary and a progression for knowledge of language and text features. The listening strand describes an increasing ability to understand more complex vocabulary, grammar and types of oral discourse (which may include text types in oral form, such as

17 Van Dijk and Kintsch, 1983.
18 Hunter, Gambell and Randhawa, 2005.
19 As identified by Brown and Yule, 1983, cited in Oprandy, 1994.
20 Peterson, 1991, cited in Oprandy, 1994; Vandergrift, 2006.
21 Pawlikowska-Smith, 2002.

recounts, or information reports). It also describes an increasing ability to understand vocabulary and grammar associated with less personal and familiar topics. The speaking strand shares these focuses and also recognises that speakers need to develop a repertoire of discourse forms so they can choose the form that best matches their audience and purpose. The term *register* captures the sense of "fit for the occasion" choices of language, non-verbal features and forms of listening and speaking. In many community, work and social settings, there are registers that apply to specific situations and competent adults are aware of how to adjust their register when needed. Examples include the registers used when chatting with a friend, the technical language and close attention used in an instructional situation and the formal, respectful ways of speaking and listening that may be used in a church. To some extent, a speaker's ability to select the text type and features that best match their purpose and audience determines what it means to be communicatively competent.[22]

Listening comprehension

Listening shares many characteristics with reading, particularly in relation to comprehension. Vandergrift (2006) explains this in detail.

> Both require receptive language processing, which involves decoding and comprehension. Thus, both processes use two basic knowledge sources, language knowledge and world knowledge (eg, topic, text structure, schema and culture) for purposes of comprehension. Like reading, listening also entails two major processes, top-down and bottom-up, in applying such knowledge to the input during comprehension.

However, listening does differ from reading and arguably could be considered to be more demanding. Vandergrift (2006) explains the reasons why.

> First, listeners must pay attention to the sounds, which often can be indistinct, and to the prosodic features of stress and intonation that carry important information. Second, listening takes place in real time and is ephemeral; the listener does not have the option of reviewing the information presented and has little control over the rate of speech. Third, speech is often unplanned and can exhibit hesitations, false starts, pauses and short idea units. Fourth, listening is more context-sensitive than reading ...

The majority of most adults' listening is done "in the moment". This means that listeners may not be able to review what they hear, although they may ask the speaker (where present) for help when meaning breaks down. The exceptions include all forms of recorded speech that allow for replaying.

Active listeners attend to oral information, clarify a purpose for listening and use listening strategies appropriate to that purpose. The comprehension strategies that listeners use are very similar to those used by readers (see pages 24–28). They include making connections with the speaker and between ideas, identifying and responding to the main ideas, summarising information and inferring information that has not been made explicit. Active listeners monitor their comprehension, using and adjusting strategies to overcome barriers or obstacles.

The variability of social, cultural and emotional contexts adds to the complexity of any listening task, particularly for adults who are not fluent in English. The listening strand includes the idea that these strategies are flexible and can be adapted in response to the cognitive demand of a particular task.[23]

Listeners develop strategies for negotiating meaning with speakers. Initially, such strategies may be at a formulaic level ("I don't understand"). Later they extend to more sophisticated ways of

22 Hymes, 1968.
23 Vandergrift, 2006.

communicating what the listener has understood and what further clarification or information they may require.

Listening critically

Listening includes the development of critical thinking, leading eventually to the listener being able to evaluate not only the difference between literal and implied meaning but also a speaker's attitude or bias.

The learning progressions in the strand Listen with Understanding include a progression for listening critically, which describes development from having a limited awareness of purpose and audience to having well-developed skills of reflection, analysis and evaluation. In order to listen critically, adult learners need first to be able to engage with oral texts at the literal level (for example, basic listening skills, including comprehension skills, are needed before the listener is in a position to be more critical about what they hear). This does not mean that critical listening has to wait for adult learners to be "ready" in some way. All adults will be able to relate to some of the ways in which spoken language (such as a powerful speech or a coaxing invitation) is used to achieve a particular purpose with a specific audience in mind.

Speaking to communicate

A central consideration for adult learners is that of communicating information and ideas effectively. Speakers plan and make decisions about when and how to use information in order to communicate their meaning or message clearly. They do this using strategies that are similar to those used by writers.

Competent speakers are aware of their audience and are able to use verbal and non-verbal strategies to modify their communications as they speak.

The elements of speaking that capture the language choices the speaker makes are called the register (see page 16) and the style[24] (or voice). Every speaker has their own style and adapts it according to the situation.[25] The situation includes what is taking place, who is taking part and what part language is playing. Register is often distinguished by the vocabulary choices and syntactical features used. For example, "Would you mind kindly stepping this way?" is spoken in a very different register from "Get over here!" and there are differences in the underlying as well as surface meanings.

Another aspect of a speaker's language expertise is fluency. Fillmore (1979) describes the following four abilities as those demonstrated by expert speakers:

- the ability to talk at length and fill time with talk
- the ability to talk in coherent, reasoned and semantically dense sentences, mastering the syntactic and semantic resources of the language
- the ability to find appropriate things to say in a wide range of contexts
- the ability to be creative and imaginative in language, for example, by telling jokes, punning, varying styles and creating metaphors.

Confidence in speaking

Confidence plays a significant role in speaking. Confidence is portrayed through both verbal and non-verbal aspects of communication. Speakers tend not to explicitly state whether they are confident or not when speaking (for example, saying "I speak with confidence" or "I do not have confidence"). Instead, the listener gains an insight into the speaker's confidence through less direct

24 Lee, 2001.
25 Halliday, 1978.

verbal and non-verbal aspects of their speech. Fatt (1999), in "It's not what you say it's how you say it", stresses the important role of non-verbal communication in speaking.

Non-verbal aspects

Confident speakers will consider and attend to the following non-verbal aspects of speaking: eye contact, gesture, posture, facial expression and personal appearance.

Verbal aspects

Volume, speed, pitch and pronunciation also contribute to how the speaker is portrayed. Enunciation and volume can place the speaker in control. Mumbling or very fast speaking can be an indication that the speaker lacks confidence. The use of verbal fillers ("um", "ok", "uh", "ya know") is also a characteristic of a speaker who may lack confidence.

Vocabulary for listening and speaking

Knowledge of vocabulary encompasses understanding as well as recognising words in spoken language. In addition, knowledge of vocabulary includes knowledge of how words work in relation to each other and within specific contexts. Learning new words takes time. A word is unlikely to become part of a learner's vocabulary after a single exposure to the word or one definition of it. Learning new words occurs over many exposures to the words.

An important aspect of speakers' and listeners' vocabulary knowledge relates to the idea of appropriateness in understanding and producing speech, which includes correct pronunciation. This involves being sensitive to register and having knowledge of the rules of politeness, of idioms and figurative language and of culture and customs.

Refer to pages 12–13 for more information about vocabulary, including vocabulary size.

Interactive communication

The Interactive Speaking and Listening progression, which is identical in the two strands Speak to Communicate and Listen with Understanding, describes the learning a person needs in order to become an active participant in the most dynamic of speaking and listening situations – face-to-face interaction. The progression focuses on particular speaking skills:[26]

- *Skills in the management of interaction*. These can include taking the floor, interrupting, redirecting a conversation, agreeing while disagreeing, reiterating a point of view and closing a discussion. Other examples include hesitation and withholding a turn.[27]
- *Skills in negotiating meaning*. These skills are important for all adults. Participants negotiate meaning by using communication strategies to ensure they have expressed or understood meaning clearly. Examples include the ways in which listeners (and speakers) check that they understand correctly ("So what you're saying is ...; But I thought you meant ..."). The negotiation of meaning that can occur around meaningful interaction is an excellent context for ESOL learners who are working to improve their language knowledge. Further examples of these strategies are given in *Learning Progressions for Adult Literacy*.
- *Skills in using appropriate conversational formulas and fillers*. Effective speakers and listeners are able to give and respond to feedback, using such oral language forms as appropriate formulas ("I see what you mean ..."; "Would you mind ...?"), conversation fillers ("Isn't that always the way?"; "Really?"; "You wouldn't read about it") and evaluative comments ("That's right"; "I know just what you mean"), as well as repetition.[28]

26 Nunan, 1989.
27 Oprandy, 1994.

- *Skills in taking short and long speaking turns*. These skills enable people engaging in conversations to take speaking turns of increasing length and complexity. Such speaking skills are a mark of expertise. They are more likely than the other kinds of speaking skills to be constrained by a speaker's lack of language knowledge because they cannot be based on memorised or formulaic oral language.

ESOL learners: listening and speaking

There are specific constraints that apply to ESOL learners across all the progressions in Listen with Understanding and Speak to Communicate.

These constraints are expressed below as listening skills that are prerequisites for developing the knowledge, skills and strategies that are described in both the listening and the speaking progressions. Note that when learners are still developing these skills, the learning that is taking place may be difficult to identify, with the result that learners' abilities may be underestimated.

Prerequisite listening skills

ESOL learners who are just beginning to learn English need to learn to:

- discriminate between intonation contours in sentences
- discriminate between phonemes
- listen selectively for known morphological word endings
- select details from oral texts (including the recognition of specific words), and
- listen for normal sentence word order.

ESOL learners at an intermediate stage need to learn to:

- recognise fast speech forms
- find (identify) stressed syllables
- recognise words with reduced syllables (abbreviations)
- recognise words as they are linked in the speech stream, and
- recognise pertinent details in a speech stream.

ESOL learners who have learnt these skills have reached a stage of competence in spoken English that will enable them to learn the knowledge, skills and strategies described in the progressions.

28 Franken, 2001.

Read with Understanding

In order to meet the text-based demands of being a worker, a learner and a family and community member, adults need to be able to read a range of everyday material with understanding.

What is involved in adults' reading?

The theoretical framework for the reading progressions stems partly from the "simple view" of reading.[29] The simple view suggests that reading consists of two components: decoding and language comprehension. According to the simple view, if the learner is unable to decode, then they are not a reader. Likewise, if the learner is unable to comprehend, they are also not a reader. The reader is one who has good decoding and good comprehension skills. A sub-component of language comprehension is vocabulary. Both language comprehension and reading comprehension are at risk if the listener or reader does not know what most of the words mean. Nagy and Scott (2000) claim that the reader needs to know the meaning of 90–95 percent of the words in the text for adequate comprehension. In fact, vocabulary plays such a major role in comprehension that some researchers do not separate vocabulary from comprehension. There is also a high correlation between spoken and written language comprehension: "the potential for comprehending a written text is set by the ability to comprehend that same text when it is spoken," (Rayner, et al. 2001).

Researchers suggest that when the cognitive processes of decoding that a reader uses to decode letters and words no longer require conscious attention, the reader's brain has more capacity available to focus on comprehension.[30] Thus, in the reading progressions, there is an emphasis on fluency of decoding to the point where decoding becomes automatic and the reader's vocabulary and knowledge of language (which are part of comprehension in this "simple view") take over.

The reading progressions are also based on research evidence that indicates the need for all learners to develop a knowledge base, a repertoire of strategies and an awareness of how to put their knowledge and strategies together to comprehend written texts. More specifically, research summaries describe reading as the development of phonological awareness, decoding (which includes accuracy and fluency), vocabulary and comprehension.[31] These elements are all incorporated into the progressions that describe the development of adult expertise in reading.

Self-efficacy

Self-efficacy is the reader's opinion of their reading ability, as well as how they believe others view their reading. Readers who feel that they are effective readers (efficacious about their reading) will put more effort into both reading and reading-associated tasks. The belief readers hold about their reading ability and the result of their efforts impacts on how they behave towards reading. Research has shown that people engage in activities they feel competent in and avoid tasks that they do not feel competent in. Reading is no exception. Research shows that young readers are very positive and optimistic about their reading abilities even if they are experiencing reading challenges. However, their optimism and positive attitude towards reading do not necessarily continue over time. Connie Juel (1988) found that poor readers became more negative about reading as they progressed through school. Learners who do not read well usually develop low levels of self-efficacy over time and will try to avoid tasks that require reading. Self-efficacy affects performance

29 Gough, 1996; Gough and Hillinger, 1980; Hoover and Gough, 1990.
30 LaBerge and Samuels, 1974.
31 Snow, 2002.

as it influences the readers' effort, persistence and willingness to persevere. Readers with high self-efficacy, regardless of their ability, will put in more effort and persevere longer than those with low self-efficacy.

Rationale for the sequence of the reading progressions

The reading progression sequence reflects the simple view of reading, as described above. Although reading has been broken into several progressions, this is of course an artificial separation of competencies that are interconnected and that function together in many different ways.

Decoding, the one component that is unique to reading, is first in the sequence. Because *Vocabulary* is fundamental to reading comprehension it has been placed second in the reading progression sequence. The *Language and Text Features* progression has been placed between Vocabulary and Reading Comprehension. The reason for this is that vocabulary knowledge relates to single words and knowing what the words mean. *Reading Comprehension* relates to understanding at the sentence, paragraph and whole text level. Understanding Language and Text Features (for example, syntactic functions of words, rules of grammar) is necessary for sentence, paragraph and whole text comprehension. Therefore, the language and text features progression has been placed between the Vocabulary and Reading Comprehension progressions. The ability to *Read Critically* is dependent upon decoding skill, vocabulary, an understanding of language and text features and the reader's comprehension. If the reader is unable to decode, or does not know what most of the words mean, or is unable to comprehend, they will not be able to read critically. For this reason, the Reading Critically progression is the last in the reading progression sequence.

Decoding

An essential and central skill for reading is decoding: "The act of translating written words into vocal or subvocal speech" (Henry 2003). Decoding is not enough in itself to enable comprehension, but research shows that good readers are good decoders.[32]

In order to become good decoders, learners need to have some basic understandings about print and how it relates to spoken English. While many expert readers may not be able to articulate exactly what it is they are doing as they read, research has shown that readers use specific understanding about print and its relation to the sounds of spoken English. These include:

- *The alphabetic principle*. Learners need to know that letters in print represent sounds in speech. An understanding of this overarching principle means knowing that speech can be turned into print, that print can be turned into speech and that letters are used to represent sounds in the language. It includes knowledge of the names and shapes of the letters of the alphabet.
- *Phonological awareness* is the awareness of the different levels of the speech sound system. In order to learn to decode (or read words) learners need to be aware that the words they hear in spoken English are made up of small segments of sound and that these sounds can be represented in print. Phonological awareness is the awareness that words can be separated in three ways and at three levels, by syllables, onset and rimes, and phonemes. Syllable awareness is an awareness that words can be divided into syllables. A learner who has phonological awareness at the syllable level will know that the word *mat* has one syllable, that

32 National Reading Panel, 2000; Pressley, 2000; Snow, Burns and Griffin, 1998.

rabbit has two syllables and *hospital* has three syllables. Onset-rime awareness is phonological awareness at the intra-syllable level. At this level the learner knows that in the word *mat* the *m* is the onset (the initial consonant/s of a syllable) and *at* is the rime[33] unit of the syllable (the vowel and any consonants that follow it). The third level of separating words is by phonemes – or phonemic awareness. Phonemic awareness is knowing that mat has three phonemes (*/m/ /a/ /t/*). According to Ziegler and Goswami (2005), as children develop, they display first an awareness of syllables as speech segments, followed by onset and rime and finally by phonemes.

- *Phonemic awareness* is the most advanced level of phonological awareness. It is the awareness of sounds or phonemes in spoken words and the ability to manipulate the sounds. Phonemes are a minimal sound unit that can change the meaning of a word. For example the difference between *hit/sit*, *hit/hot* or *hit/hid* is one phoneme. In the English language there are 42–46 phonemes. These phonemes are represented by 26 letters. The 42–46 phonemes produce over 500,000 words. Knowing that the word *mat* has three phonemes */m/ /a/ /t/* or that the difference between *mat* and *pat* is one phoneme /p/ are examples of learners having phonemic awareness. Phonemic awareness is very important for learning to read. English is an alphabetic language and in alphabetic languages letters or graphemes represent sounds or phonemes. Readers must develop an awareness that words are made up of phonemes. This awareness does not, however, necessarily come easily because phonemes are abstract. Phonemes are heard, not seen. Learners who lack phonemic awareness experience great difficulty understanding letter-sound (or grapheme-phoneme) relationships as well as learning to spell. These learners also have difficulty learning to read and write.
- *Concepts about print*. Learners need to understand how print works in written text. Concepts[34] include the left-to-right movement of print, the return sweep from one line to the next and the spacings between words, sentences, lines of print and paragraphs.
- *Grapheme–phoneme knowledge*. When learners understand that the words in speech are composed of small segments of sound (phonemes) and that letters in print can represent these sounds, they are then able to understand the ways in which letters (graphemes) represent specific sounds. This is not an easy understanding for all learners, because *phonemes* is an abstract concept and the match between phonemes and graphemes is not always regular. However, this knowledge of the relationship between sounds and their print representations is essential for decoding written text.
- *Word analysis*. Learners use their increasing knowledge of the ways in which many words are built up from base or root words, prefixes and suffixes to help them work out (decode) new words. For example, by recognising the way *kind* changes when the prefix *un-* is added. There are many ways in which this process can be supported and some of these are outlined in the learning progressions (in writing, this word analysis is associated with spelling).

33 Note that rime is not the same word as rhyme: see glossary in *Learning Progressions for Adult Literacy.*
34 Clay, 1991.

- *Developing the ability to decode or spell automatically*. Good decoders and spellers quickly develop a store or bank of words that they recognise or can write automatically.[35] These words are variously known as high-frequency (words that appear very frequently in written texts), everyday (words that a person may encounter in their everyday life), or familiar (words that a person knows well, often because they have particular relevance for the person).[36] Such categories overlap, but knowing many of these kinds of words is essential for reading and writing. By accessing this bank of words, readers are able to speed up their processing of print, pausing to decode only those words they do not yet recognise automatically. Similarly, writers are able to speed up their writing, pausing for words they are not yet able to write automatically. At the early stages of reading and writing, the words most likely to be used automatically are short, everyday words (typically of Anglo-Saxon origin), for example, *he*, *hand*, *bread* and *dog*. Many readers have difficulty progressing past this stage to automatic recognition of multi-syllabic words (typically of Greek or Latin origin), because they need to apply more complex strategies to decode these words. The strategies they need to learn are described in the decoding progressions. Related strategies are needed for writing words and these are described in the spelling progression.

Vocabulary for reading

The first time a reader encounters an unknown word, the reader has several options. One option is to skip the word. When encountering the occasional unknown word, a reader will often skip it if it does not affect the overall gist of the passage. The reader, however, does store away one or more aspects of the word (that is, they remember something about the word; perhaps a spelling pattern or the context in which the word occurred). The reader may also search for familiar word patterns, such as known prefixes or word roots. After each encounter with the word, the reader stores away more information until eventually the word is known. Multiple exposures to a word are essential if the word is to become part of an individual's vocabulary. Nagy and Scott (2000) cite research showing that after 40 encounters with a word, students were still extending their knowledge of the word.

Adult learners may have an oral vocabulary that is larger than their reading or writing vocabulary. This means they have heard and can use in speaking many more words than they can decode. As their decoding skills improve, the difference between their oral and reading vocabularies may decrease. In addition to this, explicit teaching of new vocabulary is needed to ensure, they are able to understand the longer, less familiar words they will meet in more sophisticated or specialised texts.

Studies of vocabulary have shown that a basic 2,000 word vocabulary of high-frequency items enables a reader to understand approximately 80 percent of the words in an academic text[37] (see page 24 for a discussion of academic vocabulary and texts). At this level, however, the learner will probably not be able to extend their word knowledge independently – 95 percent coverage is needed before learners can successfully guess the meanings of unknown words.[38]

35 Ehri, 1998.
36 Many websites provide lists of such words: see for example, http://www.english-zone.com/reading/dolch.html or www.wgtn.ac.nz/lals/resources/academicwordlist
37 Coxhead, 2000.
38 Nation, 2001.

Different levels of knowledge about a word (that is, variations in how well a word is known) can become apparent in contexts where detailed knowledge may be needed because of the degree of precision and expertise required. A reader without specialised knowledge may know a word well in everyday contexts, but in specialised contexts the same word may take on particular meanings. For example, most people know and use the word *hormones*, but when listening to a talk or reading an article by a doctor, they may find that they don't have a deep enough understanding of the word to fully comprehend the talk or article.

Academic vocabulary

The vocabulary that adults need to use in academic work, particularly in reading and writing, is different from the vocabulary they need to use for everyday interactions. The 2,000 word vocabulary that allows for 80 percent of the words in most texts needs to be expanded to include useful words that appear across a wide range of academic texts.

A well-recognised list of such words is the Academic Word List (AWL) developed by Averil Coxhead.[39] This list comprises 570 word families and can account for as much as 10 percent of the remaining words in a text (that is, those words not in the 2,000 high-frequency word list).

The words in the AWL are likely to be more than one syllable long and to be abstract rather than concrete. These words express abstract notions (for example, *ideology*, *capacity* and *phenomenon*), descriptions (for example, *ethnic* and *compatible*), processes (for example, *decline* and *trend*) and aspects of academic tasks (for example, *define*, *demonstrate* and *contrast*). Half of the high-frequency words and two-thirds of all academic and technical words are derived from Latin, French and Greek. This indicates the importance of learning the meanings of Latin, French and Greek roots and affixes.

The remaining vocabulary challenge for learners is to read the relatively small numbers of technical (subject-specific) words as well as small numbers of low-frequency words. While these words may appear a number of times within a specific text, the general reader is not likely to meet them again for a long time. However, it is the 2,000 high-frequency words and the academic words that will provide almost all of the vocabulary needed for reading.[40]

Knowledge of language and text features for reading

The reading progression for Language and Text Features reflects the fact that adults need knowledge of these features in order to read with understanding. Language features include the syntactic functions that words have (for example, as verbs, nouns, adjectives and adverbs), the forms of words (for example, in terms of tense or singular and plural forms), the rules of grammar that govern how words are put together to form sentences, clauses and phrases, and the complexity and length of sentences. The text features of written texts vary depending on the form or type of text and include the length and layout of the text, the different parts of the text and the cohesive devices, such as the sequencing of paragraphs, that link the text.

Reading comprehension

Comprehension is the ultimate goal of reading.[41] The RAND Reading Study Group defined comprehension in a way that has informed the

39 Coxhead, 2000 (this is available on: http://www.vuw.ac.nz/lals/research/awl/).
40 Coxhead and Nation, 2001.
41 Hock and Mellard, 2005.

thinking of many educators in this field. This definition was written about child learners, but it applies equally well to adult literacy learners.

> We define reading comprehension as the process of simultaneously extracting and constructing meaning through interaction and involvement with written language. We use the words *extracting* and *constructing* to emphasize both the importance and the insufficiency of the text as a determinant of reading comprehension. Comprehension entails three elements:
>
> The *reader* who is doing the comprehending
>
> The *text* that is to be comprehended
>
> The *activity* in which comprehension is a part.
>
> ... These three dimensions define a phenomenon that occurs within a larger *sociocultural context* ... that shapes and is shaped by the reader and that interacts with each of the three elements.
>
> Snow, 2002, page 11

Knowledge for comprehension

In order to comprehend written texts, the reader needs to have some basic knowledge, strategies and awareness. These include:

- the ability to decode print accurately and fluently
- knowledge about language, including vocabulary and syntax, and strategies for applying that knowledge
- knowledge and experiences of the world, including life experiences, content knowledge, background knowledge and knowledge about texts
- an awareness of their own processes and strategies as they approach reading. Relevant processes and strategies include motivation and engagement, comprehension strategies, monitoring strategies and "fix-up" strategies.

Schema theory and comprehension

An important source of understanding about the nature of the knowledge that informs comprehension is schema theory.[42] Schema theory is concerned with how knowledge is represented and organised in long-term memory (as sets of information, or schemas) and then brought to mind as new information comes in. The theory suggests that individuals relate all new information to what they already know or have experienced. In the context of reading, schema theory emphasises the critical role of the reader's prior knowledge in comprehension.

Researchers have identified different kinds of schema that are particularly significant for reading.[43] *Content* schemas concern knowledge about the world, ranging from the very personal and everyday to broad and specialised knowledge. *Textual* schemas concern knowledge that readers (and writers) have about the forms and organisation of written texts, from word-level information to complex information about structure and register.

Schemas are activated when a reader sees and starts to read a text. The textual schema will enable the reader to recall and interpret the text in the light of what they already know about texts, for example, about text types or genres, vocabulary, different kinds of sentences, tone and register. These schemas may also enable the reader to make predictions about the kind of text this will be by referring to their stored knowledge of text types. Content schemas will be activated as the reader engages with the words and any pictures in the text, from the title onwards. For example, as a reader starts an article about rugby, they will bring to mind everything they already know about rugby. If the reader knows very little about rugby, the article may be difficult to comprehend. The more relevant prior knowledge the reader has, the more they will comprehend when they read a text that connects with their existing content schema.

42 Anderson, 2004.
43 Singhal, 1998.

Readers from diverse cultural and language backgrounds will have diverse schemas, but for all learners, the more knowledge that is stored, the more that can be interpreted, understood and added to the store.[44] The implication for ESOL learning is that accessing the learner's textual schema and building new language knowledge is the key to increasing expertise in English. Likewise, accessing the learner's content knowledge and helping them to relate it to new contexts will help them to comprehend texts in English.

Comprehension strategies

> Comprehension strategies are specific, learned procedures that foster active, competent, self-regulated and intentional reading.
>
> Trabassco and Bouchard, 2002, page 177

A large amount of research[45] has shown that good readers use a range of comprehension strategies. Good readers also monitor their comprehension[46] and apply fix-up strategies when they experience a breakdown in comprehension.[47] There is sound evidence that readers can be taught to use comprehension strategies and to monitor their use.[48] There is some experimental evidence that indicates that this is also true for adult literacy learners, even though many adults may be relatively unaware of their own comprehension strategies.[49] The learning progression for comprehension reflects what we know from research and describes points along the continuum from beginner to expert reader. It includes suggestions for ways in which tutors may assist the development of adult learners' awareness of how to engage actively in the process of comprehending written texts.

Researchers may describe comprehension strategies in different ways and their lists of strategies may vary somewhat, but there is general agreement about the kinds of strategies that readers employ as they use their knowledge to comprehend texts. Strategies are not discrete behaviours; they are used in a great many different ways by different readers who are able to combine and integrate them as they encounter new problems or ideas in texts.

The reading progressions in this book are based on the following set of reading comprehension strategies. Vocabulary knowledge and the reading context are of central importance to all of them.

- *Activating prior knowledge or making connections*. Readers bring to mind the knowledge (schemas) they already have about the world, words and texts, and they apply that prior knowledge to help them understand the new knowledge in a text.[50]
- *Forming and testing hypotheses or making predictions*. Readers form expectations about texts before and during reading. Their expectations lead them to make predictions, which good readers will check as they read, to confirm or revise them against the new information they are gaining from the text. Hypotheses may be based on any aspect of the text, such as the text structure, the subject matter, the size and shape of a book, or the context or task within which the reading is required.[51]

44 Singhal, 1998.
45 Duke and Pearson, 2002; Dymock, 2005; Dymock and Nicholson, 1999; National Reading Panel, 2000; Pressley, 2000 and 2002; Snow, 2002; Sweet and Snow, 2003.
46 Paris and Meyers, 1981.
47 Brown, 2002; Pearson and Fielding, 1991; Pressley, 2000.
48 Rosenshine and Meister, 1994; Rosenshine, Meister and Chapman, 1996; Brown et al., 1996.
49 Gambrell and Heathington, 1981.
50 Anderson, 2004; Anderson and Pearson, 1984; Stanovich, 1986.
51 Pearson and Duke, 2002; Pressley, 2002.

- *Identifying the main ideas*. Readers determine what the most important or central ideas in texts are. To do this, they draw on their prior knowledge and experience of the ways in which texts are structured (for example, knowing that newspaper articles often state the main idea in the first sentence), they infer meaning and determine relative importance. Readers may also hypothesise and synthesise different aspects of the text in order to identify the main ideas.[52]
- *Making use of text structure knowledge*. The way in which text is structured plays an important role in comprehension. Readers use what they already know or are learning about text structure to help navigate and comprehend new texts.[53]
- *Summarising*. Readers make rapid summaries (rather like making mental notes) of what they are reading as they work through a text, checking for connections and clarification and using their knowledge of topics, vocabulary and text structure to find and connect important points.[54]
- *Drawing inferences or reading between the lines*. Readers make educated guesses to fill in gaps as they read, inferring the information that the writer has not made explicit. To do this, readers draw on their background knowledge as well as the words on the page, making and testing hypotheses about what the writer probably intended.[55]
- *Creating mental images or visualising*. Readers construct mental images as they read in order to represent the information or ideas in ways that help them connect with their own background knowledge. Readers also use mental images to help them see patterns, for example, in ideas or text structure, which will lead them to a deeper understanding of the text.[56]
- *Asking questions of the text and seeking for answers*. Most readers are constantly posing and answering questions while they read, as a strategy for understanding the text they are engaged with. Questions may relate to the meanings of words or sentences; to the structure of the text as a whole; to the plot or character development (in a story); or to any other aspect of the text and its context. Through asking questions, readers are able to form and test hypotheses, make inferences, summarise and co-ordinate the use of other comprehension strategies.[57]

Selecting and combining comprehension strategies

Readers draw on a vast range of information and use it strategically through an interplay of these comprehension strategies. For example, a key source of information for adults is their knowledge of text structure. Readers approaching a text will have some prior knowledge of text structure (the ways in which texts are organised at sentence, paragraph and whole-text level in order to convey information or ideas in particular ways). They will have gained this knowledge from their experiences of seeing, reading and listening to written texts. As they approach the new text, they will use this text structure knowledge to help them identify and understand the structures used in the text. This in turn will help them to form hypotheses about

52 Afflerbach and Johnston, 1986; Hock and Mellard, 2005.
53 Kintsch and van Dijk, 1978; Meyer, 1975; Meyer, Brandt and Bluth, 1980.
54 Pressley, 2002.
55 Pressley and Afflerbach, 1995.
56 Gambrell and Bales, 1986; Sadoski, 1985.
57 Pressley, 2002.

the content and how it might be organised. The text structure will also assist them as they use the strategies of identifying the main ideas and summarising the content of the text.

Metacognitive thinking and reading comprehension

Most readers use comprehension strategies without consciously thinking about their own complex processing and accessing of knowledge, but expert readers have the ability to bring the strategies to mind. They also have an awareness of what to do and how to do it (that is, they think metacognitively) as they read.[58]

Reading critically

Reading includes the development of critical ability, which leads eventually to expertise in evaluating not only the difference between literal and implied meaning, but also a writer's attitude or bias. A writer may show an attitude (for example, of intolerance for tattoos and body piercings) in obvious ways "People who mutilate their bodies are just crazy," or in ways that are not so obvious "It was hard to see the real person behind the face that had been heavily scarred with ink and metal". Likewise, bias can be shown as much by what a writer doesn't say as by what is stated explicitly: an advertisement that only refers to or shows young, attractive, white, wealthy women may be implying that other women are excluded from using the product advertised. The learning progressions in the strand Read with Understanding include the idea of thinking critically and each progression describes development from having only a limited awareness of purpose and audience to having well developed skills of reflection, analysis and evaluation.

In order to read critically, adult learners need first to be able to read texts at the literal level. For example, basic reading skills, including comprehension skills, are needed before the reader is in a position to apply a more critical eye to a text. This is not to say that critical reading has to wait for adult learners to be "ready" in some way. All adults will be able to relate to some of the ways in which written and visual language (such as an amusing television ad, a strongly worded letter to the editor, or a clear set of instructions) is used to achieve a particular purpose and with a specific audience in mind.

ESOL learners: the demands of reading

An ESOL learner's understanding of English text is affected by their own cultural background and the literacy practices associated with that culture. They will not be able to make predictions about a text on the basis of their own experiences as easily as first-language speakers of English. Text structure, word order and spelling may be very different in their first language, making any transfer of learning difficult (refer to page 9 for information about the concept of language distance).

It is likely that refugees and some immigrants will have special literacy needs if their prior schooling was disrupted. The schooling they have received may not have been sufficient for them to establish a strong academic base in their first language. These learners may appear to be quite proficient in English if they have acquired what Cummins[59] calls Basic Interpersonal Communication Skills (BICS) – that is, the verbal fluency in English needed for everyday informal situations. However, they are not likely to have the foundation oral-language and literacy skills to prepare them to understand (and produce) more abstract, complex and academic texts.[60]

58 Pressley, 2000; Snow, 2002.
59 Cummins, 1979, 1981.
60 In recognition of the fact that the starting point for the Literacy Progressions assumes basic knowledge and skills, an additional resource has been developed and is due for publication in 2008.

Write to Communicate

In order to meet the text-based demands of being a worker, a learner and a family and community member, adults need to communicate ideas and messages in writing.

Writing is an area of adult learning that may sometimes be overlooked, or regarded simply as an area for skill instruction rather than as an essential context for learning and developing thinking processes. Less attention has been given to research and theory in writing than in reading, but there is a now a growing body of knowledge that can be used to understand the development of adult learners' expertise in writing.

The research that led to the writing process models (described below) investigated writers writing in their first language and also writers writing in their second or additional language. These studies established both differences and similarities in the way in which the two groups carried out the writing process (see *Appendix A: Second language learning of reading and writing*).

Writing as a process

The writing research theories of the late 1970s and early 1980s emphasised an understanding of the processes involved in how we write.[61] The writing progressions in this publication are based on the understanding that writers follow recognised processes as they write: planning (deciding what to say and how to say it), composing (translating ideas into written text) and revising (improving existing text). These are cognitive processes that involve problem solving and meaning making. Writing is a recursive endeavour,[62] which means that the parts of the processes may be repeated. For example, revising can occur at any time during the process of composing and the writer's plan may change as the writing progresses. In the process of writing, learning takes place as the writer discovers or changes meanings.

Writing is now seen by many theorists to be a problem-solving process (one that occurs within a sociocultural context).[63] The problem may be set by a teacher in a learning setting (for example, a writing task or assignment), or it may arise from the person's own need or desire to communicate something in writing. Whenever a person writes, they have a purpose for writing and they begin by setting up writing goals relating to that purpose, which will mainly concern the content (what they want to say) and how to express it. As the writing progresses, the writer may read back over their work, making changes to the ideas and information as well as to word-level and sentence-level features, such as spelling, grammar and the order of sentences. The more experienced and confident the writer becomes, the more automatic some parts of the process (such as letter formation, spelling and the use of grammar) become. Other aspects of the writing process continue to require conscious planning and skill, even for the most expert writers.

Rationale for the sequence of the writing progressions

The writing progressions, in adopting a similar sequence to the reading progressions, reflect the fact that reading and writing are closely connected processes. We know that a major factor in writing success is the fact that writers have engaged in reading. They draw on knowledge of vocabulary, language and text features gained in reading to use as resources. They use strategies from reading to help them in the task of constructing text and reviewing what they have written.[64]

61 Perl, 1979; Roca De Larios, Murphy and Marin, 2002.
62 Dyson and Freedman, 1991.
63 Flower and Hayes, 1981.
64 Langer, 1985.

The *Purpose and Audience* progression is an important progression to begin a consideration of writing development. It draws attention to the socio-cognitive demands that writing places on a writer. The writer needs to consider the knowledge and expectations of an intended audience (or audiences), the purpose (or purposes) for writing and the context in which the writing is carried out. Writers need to juggle these complex demands.[65]

The *Spelling* progression, the *Vocabulary* progression and the *Language and Text Features* progression together represent the structural knowledge that writers need to have to create not only accurate texts, but ones that are appropriate for their audience and fit for their purpose.

The four progressions that precede the *Planning and Composing* progression all represent the type of knowledge that writers need to draw on as they are planning, both before and during composing.

The *Reviewing and Editing* progression, like the *Planning and Composing* progression that precedes it, represents part of the writing process as it is described by a long tradition of writing researchers.[66] While these two progressions are often presented together in a four part sequence,[67] in practice we know that writers, especially as they become more expert, work recursively in cycles of planning, composing reviewing and editing. They do this in relation to the intentions they have and the language they use to realise their intentions.[68]

The learning progressions take into account the role of language in writing development. They therefore describe how expertise develops in the area of language use, including expertise in the use of grammar, vocabulary, discourse markers and punctuation.[69] These considerations apply to adults for whom English is their first language as well as to ESOL learners.

As adults progress from beginner to expert writers, the ways in which they carry out the processes of writing change. These changes are reflected in the progressions.

Spelling

If the aim of writing is to communicate with a reader, then any barriers that come between writer and reader make it less likely that the communication will be successful. Spelling is important because the reader needs to be able to work out what the writer is saying at the word level, as well as at the wider text level. If incorrect spelling prevents or slows this process, the communication may be misunderstood or may fail altogether. Poor spelling can often (incorrectly) be seen as a sign of carelessness or lack of intelligence and the writer may be wrongly judged by the reader.

Technically, spelling comes after vocabulary in the writing process: a person formulates the words they want to write before actually putting them down on paper. Many adults know the words they want to use, but they may have great difficulty in actually encoding or spelling some of those words. In this book, spelling is placed before vocabulary to acknowledge its place in relation to decoding in reading. Just as readers decode marks on paper, turning them into words, so writers use a reverse process as they encode (spell) the words they want to use in their writing. Encoding and decoding are very closely related and the skills used for encoding are usually developed alongside and as a mirror of decoding. In order to become good spellers, learners need to first develop some basic

65 Bereiter & Scardamalia, 1987.
66 see Juzwik, et al., 2006.
67 see, for example, early models of the writing process by Hayes & Flower, 1980.
68 Bereiter & Scardamalia, 1987; Levy & Ransdell, 1996.
69 Grabe, 2001.

understandings about print and how it relates to spoken English. In particular, learners must have developed phonological awareness and phonemic awareness (see pages 21–23 for a discussion of the prerequisite understandings and skills required for decoding and encoding).

Writers draw on a variety of strategies to spell unfamiliar words, often using more than one strategy.[70] These include:

- recalling words from memory
- working out words by using sound-letter relationships
- spelling rules and conventions
- using knowledge of root words and affixes
- writing the word then checking to see if it looks right, and
- making analogies to known words or parts of words.

Expert spellers draw on these strategies automatically, using them flexibly to solve particular spelling problems. Adult learners who are poor spellers benefit from systematic instruction in the use of spelling strategies, using words that the learners already have in their oral vocabulary and that they want or need to use in their writing.[71] As an example of systematic instruction, effective spelling instruction can be based on words that learners misspell.

Learners need to develop expertise in the use of dictionaries and other tools to check their spelling, including knowing how to select the correct spelling when there are choices. As they develop their expertise, adult learners need access to suitably-levelled dictionaries and spelling aids, including electronic tools. Learners may require explicit instruction and guided practice in the use of these aids to avoid frustration and to help make appropriate choices.

Fluent writers are able to encode words quickly and accurately, using their increasing knowledge to write more complex and less familiar words.

Vocabulary for writing

Knowing a word involves a complex network of connections (including collocations), images and understandings. A writer uses memory, knowledge of the world, knowledge of language and texts, and appropriate strategies to activate and connect elements within their own network of word knowledge. For further information about the development of vocabulary knowledge, refer to the discussion on pages 12–13.

Knowledge of language and text features for writing

Because of their greater experience with reading and writing, more expert writers have a greater knowledge than beginner writers of the ways in which their choices of words, sentence structures, metaphors and other language features can be manipulated to reflect their own voice and to create a particular effect.

Development of expertise in using text types

As they develop expertise in the writing process, beginner writers have some general process knowledge,[72] while more expert writers have knowledge of the generic patterns of various text types that they bring to mind as they write. For example, more expert writers know that if they wish to persuade their readers, they can use argument text forms that have a conventional and predictable form. They also use their knowledge about what features are associated with the particular type

70 Kwong and Varnhagen, 2005.
71 Gordon, 1994.
72 Perl, 1979; Raimes, 1985; Zamel, 1983.

of text they want to write. They know there is a particular way to write an argument that is text different from the way to write a narrative text.[73] Writers have gained this knowledge through reading and writing many examples of persuasive texts as well as through their experience of oral texts that are designed to persuade.

Writers use their knowledge of generic patterning at three levels:

- to inform the overall structure of the text
- to help shape the ideas in the text
- to decide on the appropriate language items to use.

Planning and composing

Planning is the part of the process in which a writer, at the very least, has an awareness of wanting to convey something in writing. At the early stages of development, writers may need strong support or scaffolding in order to plan. As the writer develops expertise, these supports are gradually removed. Planning is part of the recursive process of writing and the writer's plans can change as the writing continues.

Beginner writers carry out limited planning and tend to have few goals. The goals they have relate mostly to content and show little evidence of an awareness of their overall purpose and their audience. Expert writers develop a network of goals that are concerned with purpose and audience as well as content. Experts' plans are flexible and expert writers take time to pause and think as they plan. The learning progressions reflect the development of independence and expertise in planning for writing.

Composing at its simplest has been characterised as "knowledge telling"[74] – the writer simply puts basic information or ideas directly into written text. There is little monitoring to check whether the ideas are well developed and make sense within the text. As writers' expertise develops, they are able to *transform* knowledge by bringing together what they know about the content they are conveying and what they know about the rhetorical structures they can use to convey it. Composing becomes an interaction between knowledge and thinking and in that interaction new learning takes place. For example, beginner writers translate their thoughts directly into written form. Expert writers transform knowledge as they move between the content and the form of the text, drawing on an extensive knowledge of content, vocabulary, grammar, text features, audience and text type. Beginner writers will have little knowledge of composition to draw on beyond a basic knowledge of content, vocabulary and language features.

Revising and editing

As expert writers compose, they are constantly reviewing what they write in the light of their purpose, the plans they formed, their audience and the clarity and effectiveness of their writing. Many beginner writers are not aware of the need to review by rereading or, if they do reread their work, they are not sure what they are looking for. They generally lack awareness of the quality of what they have written, focusing instead on the accuracy of the surface features. They often make changes to surface features if they reread, but they may miss even surface errors because they tend to read what they intended to write rather than what they have actually written.

73 Bereiter and Scardamalia, 1987b; Carter, 1990.
74 Bereiter and Scardamalia, 1987a.

Expert writers also proofread their work, checking such surface features as legibility, spelling, grammar and punctuation. More importantly, they review their writing, checking elements of style and appropriateness to purpose and audience, and they restructure and adjust the text to suit the audience and the purpose. In addition, expert writers view writing as a process of discovering meaning.

The use of technology for writing extends the options available to adult learners. Email, text messaging and writing for the internet all provide learners with engaging contexts in which they can learn to write for a range of purposes and audiences. Each form has its own rules and constraints as well as providing access to a wider audience than print forms. Computers support writing development because they enable users to revise their text quickly and easily. Computer spelling and grammar checks provide non-threatening tools for checking accuracy.

ESOL learners: the demands of writing

As with reading, an ESOL learner's understanding of writing in English is affected by their own cultural background and the literacy practices associated with that culture. Text structure, word order and spelling may be very different in their first language, making any transfer of learning difficult. Refer to page 9 for information about the concept of language distance.

It is likely that refugees and some immigrants will have special literacy needs if their prior schooling was disrupted. The schooling that they have received may not have been sufficient for them to establish a strong academic base in their first language. These learners may appear to be quite proficient in English if they have acquired what Cummins[75] calls Basic Interpersonal Communication Skills (BICS) – that is, the verbal fluency in English needed for everyday informal situations. However, they are not likely to have the foundation oral-language and literacy skills to prepare them to produce more abstract, complex and academic texts[76] (see *Appendix A: Second language learning of reading and writing* for further information).

75 Cummins, 1979, 1981.

76 In recognition of the fact that the starting point for the Literacy Progressions assumes basic knowledge and skills, an additional resource has been developed and is due for publication in 2008.

Background to the numeracy progressions

What is numeracy?

The term numeracy is relatively new. It was first used in 1959 in the UK Crowther Report, where it was characterised as the mirror image of literacy. Since then, numeracy has been interpreted in different ways internationally, mostly because of the very different needs of the users of the term. The view of numeracy that underpins the numeracy learning progressions is about knowing and understanding: it is therefore both broad and contextualised. The following definitions most closely represent the view taken here.

> To be numerate is to have the ability and inclination to use mathematics effectively in our lives – at home, at work and in the community.
>
> Ministry of Education, 2001, page 1

> To be numerate means to be competent, confident and comfortable with one's judgements on **whether** to use mathematics in a particular situation and if so, **what** mathematics to use, **how** to do it, what **degree of accuracy** is appropriate and what the answer means in relation to the context.
>
> Coben, 2000, cited in Coben, 2003, page 10

> We believe that numeracy is about making meaning in mathematics and being critical about maths. This view of numeracy is very different from numeracy just being about numbers and it is a big step from numeracy or everyday maths that meant doing some functional maths. It is about using mathematics in all its guises – space and shape, measurement, data and statistics, algebra and of course, number – to make sense of the real world and using maths critically and being critical of maths itself. It acknowledges that numeracy is a social activity.
>
> Tout, 1997, cited in Coben, 2003, page 11

The view of numeracy that underpins the numeracy learning progressions places an emphasis on the need for learners to gain:

- a conceptual understanding of mathematical knowledge, and
- the ability to use mathematical knowledge to meet the varied demands of their personal, study and work lives.

The numeracy learning progressions are based on the belief that in order to meet the demands of being a worker, a learner and a family and community member, adults need to use mathematics to solve problems.

Key concepts

Several key concepts can be identified as central to the understandings about numeracy and about adult learners that have informed the development of the numeracy learning progressions. These concepts are covered below, under the following headings:

- Meaningful contexts and representations
- Understanding and reasoning
- Degree of precision
- Algorithms.

Meaningful contexts and representations

In 1992, the *International Adult Literacy Survey* (IALS)[77] was redesigned to include a numeracy survey that assessed the distribution of basic numeracy skills in adult populations. The concepts underlying the assessment included the recognition that mathematical ideas are embedded within meaningful contexts and may be represented in a range of ways, for example, by objects and pictures,

77 Walker et al., 1996.

numbers and symbols, formulas, diagrams and maps, graphs and tables, and texts. The importance of teaching mathematics in meaningful contexts was also emphasised in the SCANS report (1991) and is an integral part of national adult education standards in Australia and the United Kingdom.

When adult learners need to know and use mathematics, the need always arises within a particular context. Numeracy is the bridge between mathematics and the diverse contexts that exist in the real world.

> In this sense ... [there] is no particular 'level' of Mathematics associated with it: it is as important for an engineer to be numerate as it is for a primary school child, a parent, a car driver or a gardener. The different contexts will require different Mathematics to be activated and engaged in.
>
> Johnston, 1995, page 54

Many adults are unaware of the ways in which they use mathematics in the course of their everyday lives. For example, measurement is used in a great many routine activities.

> All in all, measurement is revealed as a complex and somewhat contradictory area for teaching and learning: at once at the heart of mathematics and surprisingly absent, for some people, from activities which are commonly assumed to involve a lot of measurement, such as cooking, shopping and merchant banking.
>
> Baxter et al., 2006, page 52

By grounding learning within authentic contexts, the numeracy learning progressions can raise learners' awareness of the mathematics all around them – and of the mathematical knowledge, skills and strategies they already possess.

Understanding and reasoning

The demands for adult numeracy arise from three main sources: community and family, the workplace and further learning. While each of these sources is likely to require different mathematical skills at varying achievement levels, all mathematics needs to be learnt with understanding so that it can be generalised and adapted by the learner for a variety of situations.

Knowing certain mathematical facts or routines is not enough to enable learners to use that knowledge flexibly in a wide range of contexts. Being able to do mathematics does not necessarily mean being able to use mathematics in effective ways. Knowledge of procedural operations and facts is essential to reasoned mathematical activity, but is of little value in itself. A learner who counts decimal places to determine the number of decimal places in an answer without understanding the number operation involved may get 0.7 x 0.5 correct, but 0.7 + 0.5 incorrect. The learner's lack of understanding of the mathematical process means that they have no way of knowing why some of their answers are correct and others incorrect, because they are unable to use reasoning.

> ... the notion of *understanding mathematics* is meaningless without a serious emphasis on reasoning.
>
> Ball and Bass, 2003, page 28

Degree of precision

In real-life problems that require adults to use mathematics for a solution, there is generally a certain amount of flexibility around the degree of precision necessary. When students in schools solve mathematics problems, the problems are often purely theoretical, but adult learners need to make decisions about how to manage problems in real-life situations. In order to choose the best approach to solving a problem, an adult needs to begin by making a decision about the degree of precision required. For example, a practical problem may involve working out how much carpet is needed to cover the floor of a room. As a classroom exercise in school, the purpose of setting the problem may be to have the students learn and practise measuring skills. The task would probably involve

scaled drawings with precise measurements. The students might be expected to use calculators or to apply what they have learnt about formulas and multiplying numbers to arrive at a solution. As a real problem for an adult, solving this problem may involve first asking and answering practical questions, for example:

- "How accurate do I need to be?"
- "What tools (such as a calculator, a measuring tape, or pen and paper) should I use?"

Depending on their specific purpose in this situation, the adult judges the degree of precision that would be reasonable. This could vary from very precise (for ordering and cutting the carpet) to a rough estimate (for thinking about whether or not to re-carpet). The degree of precision required dictates the measurement units and tools to be used, for example:

- "Will I use hand spans, strides, or a tape?"
- "Should I measure in metres, centimetres, or millimetres?"

Algorithms

Algorithms form part of the numeracy learning progressions, but the progressions make it clear that learners who use algorithms and calculators need to be able to determine and justify the reasonableness of the answers they obtain (by explaining or demonstrating how they know that each answer is reasonable). If learners cannot do this, they will need to develop either a better understanding of the algorithm or an alternative approach to calculating.

The traditional algorithms are methods for working out number problems that have been developed over time. They involve a sequence of steps in a procedure that can be followed to solve a problem. Each is based on performing the operation on one place value at a time with transitions to adjacent positions. Historically these transitions are referred to as renaming, trading, borrowing etc. Traditional algorithms tend to treat the problem in terms of digits rather than the composite number that the digits make up. The traditional algorithms work for all numbers but are often not the most efficient or useful method of computing. Most often, algorithms in mathematics are associated with the vertical working form traditionally used to solve operational problems.

For example:

$$\begin{array}{r} 345 \\ \underline{\times 4} \\ 1{,}380 \end{array}$$

Although it is helpful for adult learners to know written procedures for the number operations, the standard algorithms taught in school are often not the most appropriate or understandable procedures to use.[78] Standard algorithms are accurate and efficient, but their meaning is often unclear to learners. Steps such as borrowing, carrying, moving the decimal point and shorthand notations can be confusing to learners. They can result in "buggy" procedures that the user has no way of fixing when solutions appear to be unreasonable. When adult learners try to use procedures that have "bugs", they often become frustrated and negative attitudes towards mathematics may be reinforced.[79]

To those who have learned an algorithm, the process of simply following that familiar algorithm may be faster and feel more comfortable than thinking about other ways to understand and solve a new problem. Learners need to know that they can continue to use this preferred method as long as they are always able to check that the answer they have obtained is reasonable and makes sense for the actual problem they are solving.

78 Carroll and Porter, 1998.
79 National Institute for Literacy, n.d.

The progressions and the research base

The numeracy learning progressions are consistent with the best and most recent evidence about learning mathematics. However, there are significant gaps in the existing research and not all areas of mathematics learning have a strong research base. For example, there is considerably more research, nationally and internationally, into the ways that learners develop numeric understandings than there is into the ways that they develop spatial or statistical understandings. The empirical research in the field of adults' mathematics learning is limited.[80] Because of this, the development of the numeracy learning progressions has been informed by and builds upon the extensive research on children's learning of mathematics. The writers of the progressions have also drawn on the development that was undertaken for the mathematics component of the Equipped for the Future Content Standards.[81]

The numeracy learning progressions necessarily cover only a portion of the possible aspects of numeracy development. Some aspects may fall below those described at the start of each progression and there are also, of course, levels of numeracy expertise that are higher than those described in the progressions.

Using the numeracy progressions

Fostering number sense is the key aim of the Make Sense of Number to Solve Problems strand. Number sense refers to a person's general understanding of number and number operations along with the ability and inclination to develop useful and efficient strategies for managing numerical situations.[82]

The six progressions in the Make Sense of Number to Solve Problems strand reflect the fact that number is a multifaceted concept. Developing fluency with number involves an understanding of numbers, ways of representing numbers, relationships among numbers, number systems, as well as understanding the number operations and how they relate to one another. Fluency with number also requires a balance between conceptual understanding and computational proficiency. The six progressions draw on the research base for the Number Framework used in the Schools Numeracy Project, which was informed by research showing there are identifiable progressions in how children develop number concepts.[83]

Three of the progressions in the Make Sense of Number to Solve Problems strand focus on number strategies and three focus on key aspects of number knowledge. Number strategies are the processes that learners use to solve operational problems with numbers – strategies that make it easier to solve number problems with understanding. Rather than a single strategy for subtracting (or any operation), the most appropriate strategy can and should change flexibly as the numbers and the content or problem change. The three number knowledge progressions describe the key items of knowledge that people need to understand and include: number sequences, number facts and place value. The strategy and knowledge progressions are viewed as interdependent with the strategy progression creating new knowledge through use and the knowledge progression providing the foundation for the development of new strategies.[84]

80 Baxter et al., 2006.
81 Stein, 2000.
82 McIntosh, A., Reys, B., Reys, R., Bana, J., Farrell, B., 1997.
83 For example, Steffe, Cobbe and von Glasserfield, 1988; Wright 1998; Young-Loveridge and Wright, 2002.
84 Ministry of Education, 2007.

The progressions in the Make Sense of Number to Solve Problems strand are related to progressions in the other strands in two ways: firstly, the other strands provide content or contexts that interact with and enhance the development of number and secondly, the content of the other strands is directly affected by how well number concepts have been developed.

The numeracy progressions are called Make Sense of Number to Solve Problems, Reason Statistically and Measure and Interpret Shape and Space.

Make Sense of Number to Solve Problems

In order to meet the demands of being a worker, a learner and a family and community member, adults need to be able to solve operational problems with numbers.

Number strategies

Number strategies are the mental processes learners use to solve operational problems with numbers. They are strategies that make it easier to solve number problems without having to rely on poorly understood algorithms that may lead to confusion. Number strategies can be grouped into counting strategies and partitioning strategies.

Counting strategies

Counting strategies involve counting in 1s to solve problems, often with the support of objects (such as fingers).

Counting all of the objects
This involves joining or separating sets to solve addition or subtraction problems. Learners count all the objects in both sets to find the answer.

Counting on
Learners count on or back to solve addition or subtraction problems. For example, instead of counting all objects to solve 8 + 5, the learner counts on from 8: *9, 10, 11, 12, 13*.

Partitioning strategies

Partitioning strategies are based on using knowledge of number properties to split numbers (partitioning) and combine them again in ways that make it easier to reach the solution. Partitioning strategies include the following strategies and can be applied to addition, subtraction, multiplication, division and proportional problems.

Deriving from known facts
The learner derives unknown information from a known fact. A learner may solve 25 + 26 by using what they know (25 + 25 = 50), then adding 1 to reach 51. Similarly, if a learner knows 6 x 7 = 42, they can solve 6 x 70 = 420.

Place value partitioning
The learner breaks the numbers into 1s, 10s and 100s, adds numbers of the same place value together and then combines these numbers. For example:

63 + 35 can be solved as (60 + 30) + (3 + 5) = 98.

45 x 6 can be solved as (40 x 6) + (5 x 6) = 270.

Using tidy numbers with compensation
The learner rounds a number to the nearest 10 or 100, then compensates for what has been added or subtracted. For example,

73 – 29 can be solved as 73 – 30 + 1 = 44

and 64 + 28 can be solved as 64 + 30 – 2 = 92.

Alternatively, the learner may make the compensatory adjustment at the start of the problem, for example, 73 – 29 can be solved as 74 – 30.

Using reversibility
The learner changes a subtraction problem into an addition problem in order to have an easier route to the solution. For example,

66 – 48 becomes 48 + ? = 66; 48 + 2 + 16 = 66, so 66 – 48 = 18.

Halving and doubling (or dividing by 3 and trebling)
The learner uses knowledge of number doubling and trebling. For example,

16 x 8 can be solved as 2 x (8 x 8) = 2 x 64 = 128

16 x 4 can be solved as 8 x 8 = 64

3 x 27 can be solved as 9 x 9 = 81.

Reason Statistically

In order to be an informed citizen, employee and consumer, an adult needs to be able to reason statistically.

The amount of statistical information available to help people make decisions in business, politics, research and everyday life is vast. For example, consumer surveys guide the development and marketing of products, experiments evaluate the safety and efficacy of new medical treatments, and statistics sway public opinion on issues and represent (or misrepresent) the quality and effectiveness of commercial products.

Current thinking in statistics education emphasises the need for learners to undertake statistical investigations in order to understand statistics and use them wisely. There are two main types of investigation. In the first type, learners pose questions, gather data and use the data to answer the questions. In the second type of investigation, learners look for patterns and trends in existing data sets and generate questions to be answered. It is the second type of investigative approach that is addressed in these learning progressions. The decision to focus on existing data sets reflects the fact that most adults are seldom engaged in data collection, but often need to consider data that has already been collected and presented.

Three of the four progressions in the Reason Statistically strand focus on different aspects of the investigative cycle: the Preparing Data for Analysis progression focuses on sorting and organising a given data set ready for analysis. The Analysing Data for Interpretation progression uses statistical measures to describe the data set. Finally, the Interpreting Data to Predict and Conclude progression supports the learner to make evidence-based statements about the data.

Probability learning progression

Probability impacts on people's everyday decision making in such varied contexts as buying a lotto ticket, purchasing a car, taking medicine, or taking an umbrella to work (What are the chances of winning, surviving a crash in that particular model, experiencing one of the listed side effects, the forecasted rain eventuating?). Probability is often counter-intuitive in the way it operates, so it is important that people not assume that their initial assessment of a probability situation takes all the relevant factors into account and relates them correctly.

Because the impact of probability is so pervasive, it has given rise to a broad range of terminology, both informal and formal. *Chance* and *likelihood* are often used as synonyms for *probability*; probability may be expressed in terms of odds (particularly in gambling contexts), percentages and proportions.

The key ideas of probability that are developed in the learning progression are:

- *Independent* and *dependent* events: Where events are independent, the outcomes of past trials do not impact in any way on the outcomes of future trials.
- The probability of any event will be located somewhere on the impossible–certain continuum and can be expressed as a number between 0 and 1, a percentage between 0 and 100, or as odds (for example, 4:5, which is the same as 4/9).
- The *relative frequency* with which a particular outcome occurs can be used as an estimate of its probability (known as *experimental probability*). The greater the number of trials or observations, the more accurate the estimate will be.
- In some situations, the precise probability of an event can be determined mathematically (known as *theoretical probability*).

Measure and Interpret Shape and Space

> Measures are a cornerstone of mathematics and of our lives: it is difficult to think of anything that is not measured.
>
> Baxter et al., 2006, page 6

Measurement exists in all human cultures as one of the six pan-cultural mathematics activities identified by Alan Bishop (1988) along with counting, locating, designing, explaining and playing. The influential Cockcroft report (1982) states that "it is possible to summarise a very large part of the mathematical needs of employment as 'a feeling for measurement'" (page 85).

Measurement is the assignment of a numerical value to an attribute of an object, such as the width of a window or the area of an office. At more sophisticated levels, measurement involves assigning a number to a characteristic of a situation, as is done by the consumer price index. Understanding what a measurable attribute is and becoming familiar with the units and processes that are used in measuring attributes is a major emphasis in the Measurement progression. Experiences with measurement build understanding, making adults more aware of the dimensions of the world.[85] Measurement also offers an opportunity for learning and applying other mathematics, including number operations, geometric ideas and statistical concepts.

The approach to measurement is a practical one, like the approach taken in the other numeracy progressions. The Measurement progression emphasises the appropriateness and precision of the measure to the particular measurement problem or task.

An understanding of geometry and a sense of space are fundamental components of numeracy. Adults use ideas of shape and space when representing and solving problems in real-world situations and in other areas of mathematics. Geometric representations can help people make sense of area and fractions, while the shapes and patterns in histograms and scatter plots can give insights about data.

Adults use spatial reasoning when following maps, planning routes, designing floor plans and creating art. The Shapes and Transformations progression and the Location progression are more about describing relationships and reasoning than about definitions and theorems.

85 Steinback et al., 2003.

Appendix A

Second language learning of reading and writing

SKILL	LITERACY LEARNERS WHO ARE NATIVE SPEAKERS ARE ASSUMED TO:	ESOL LITERACY LEARNERS ARE ASSUMED TO:
General	• have had some (not necessarily positive) literacy experiences in English, and • have acquired a degree of literacy in English.	• have had some literacy experiences in their first language, and • have acquired a degree of literacy in their first language. **Note** that first language literacy needs to develop to a certain level if it is to benefit ESOL literacy development (Riches & Genesee, 2006, p. 78).
Read: Decoding	• have some degree of phonological awareness in English • have a bank of automatically recognised vocabulary, and • have a far larger oral vocabulary in English to underpin their reading vocabulary.	• have some degree of phonological awareness in their first language • have a bank of automatically recognised vocabulary, and • be able to (in some cases) draw on cognates from their first language to underpin their reading vocabulary in English. **Note** that phonological awareness is seen to some degree as an underlying proficiency, knowledge of which will transfer to some extent to the second language context (Riches & Genesee, 2006, pp. 73–74).
Read: Comprehending	• need support to use appropriate strategies if they are unsuccessful readers in English.	• need support to use appropriate strategies if they are unsuccessful readers in their first language and, consequently, in English **BUT** • need little support with strategies if they are successful readers in their first language. This is because unsuccessful readers see reading in English and reading in their first language as separate processes and tend not to make use of transfer. However, readers who are successful readers in their first language employ similar strategies in English as they do in their first language (Riches & Genesee, 2006, p. 79). In addition, they make greater use of textual features than first language readers and have "access to a bilingual reservoir of literacy abilities and strategies" (Riches & Genesee, 2006, p. 80).
Write: Encoding	• have some awareness of sound-letter correspondences in English • have a bank of words they can write accurately.	• have some problems with spelling. This is because differences in the sound-letter correspondence in the first language and in English are likely to result in negative transfer from the first language (Riches & Genesee, 2006, p. 74).
Write: Planning and Composing; Revising and Editing	• use ineffective or less sophisticated strategies for constructing text if they are unsuccessful writers.	• use ineffective or less sophisticated strategies for constructing text if they are unsuccessful writers in their first language **BUT** • employ similar strategies in English as they do in their first language if they are successful writers in their first language.

References

Adams, M. J. (1990). *Beginning to Read: Thinking and Learning about Print*. Cambridge, Mass.: MIT Press.

Afflerbach, P. P. and Johnston, P. H. (1986). "What Do Expert Readers Do when the Main Idea Is Not Explicit?" In J. F. Baumann (ed.), *Teaching Main Idea Comprehension* (pp. 49–72). Newark, Del.: International Reading Association.

Anderson, R. C. (2004). "Role of Reader's Schema in Comprehension, Learning and Memory". In R. B. Ruddell and N. J. Unrau (eds), *Theoretical Models and Processes of Reading*, 5th ed. (pp. 594–606). Newark, Del.: International Reading Association.

Anderson, R. C. and Freebody, P. (1981). "Vocabulary Knowledge". In J. T. Guthrie (ed.), *Comprehension and Teaching: Research Reviews* (pp. 77–117). Newark, Del.: International Reading Association.

Anderson, R. C. and Pearson, P. H. (1984). "A Schema-theoretic View of Basic Processes in Reading". In P. D. Pearson (ed.), *Handbook of Reading Research* (pp. 255–291). New York: Longman.

Ball, D. and Bass, H. (2003). "Making Mathematics Reasonable in School". In J. Kilpatrick, W. Martin and D. Shifter (eds), *A Research Companion to Principles and Standards for School Mathematics* (pp. 27–44). Reston, Va.: National Council of Teachers of Mathematics.

Bauer, L. and Nation, I. S. P. (1993). "Word Families". *International Journal of Lexicography*, vol. 6, no. 4, pp. 253–279.

Baxter, M., Eamonn, L., Richards, L., Tomlin, A., Wresniwiro, T. and Coben, D. (2006). *Measurement Wasn't Taught when They Built the Pyramids – Was It? The Teaching and Learning of Common Measures in Adult Numeracy*. London: National Research and Development Centre for Adult Literacy and Numeracy.

Bazerman, C. (2000). "Letters and the Social Grounding of Differentiated Genres". In D. Barton and N. Hall (eds), *Letter Writing as a Social Practice* (pp. 15–29). Amsterdam: John Benjamins Publishing.

Bereiter, C. and Scardamalia, M. (1987a). "An Attainable Version of High Literacy: Approaches to Teaching Higher-order Skills in Reading and Writing". *Curriculum Inquiry*, vol. 17, no. 1, pp. 9–30.

Bereiter, C. and Scardamalia, M. (1987b). *The Psychology of Written Composition*. Hillsdale, NJ: L. Erlbaum Associates.

Bishop, A. (1988). "Mathematics in Its Cultural Context". *Educational Studies in Mathematics*, vol. 19, pp. 179–191.

Blachman, B. A. (2000). "Phonological Awareness". In M. L. Kamil, P. Mosenthal, P. D. Pearson and R. Barr (eds), *Handbook of Reading Research*, vol. 3 (pp. 483–502). Mahwah, NJ: L. Erlbaum Associates.

Britton, J., Burgess, T., Martin, N., McLeod, A. and Rosen, H. (1975). *The Development of Writing Abilities* (11-18). London: MacMillan Education.

Brookfield, S. D. (1995). "Adult Learning: An Overview". In A. Tuinjman (ed.), *International Encyclopedia of Education*. Oxford: Pergamon.

Brown, R. (2002). "Straddling Two Worlds: Self Directed Comprehension Instruction for Middle Schoolers". In C. C. Block and M. Pressley (eds), *Comprehension Instruction: Research-based Best Practices* (pp. 337–350). New York: Guilford.

Brown, R., Pressley, M., Van Meter, P. and Schuder, T. (1996). "A Quasi-experimental Validation of Transactional Strategies Instruction with Low-achieving Second-grade Readers". *Journal of Educational Psychology*, vol. 88, no. 1, pp. 18–37.

Carrell, P. (1983). "Background Knowledge in Second Language Comprehension". *Language Learning and Communication*, vol. 2, no. 1, pp. 25–34.

Carroll, W. and Porter, D. (1998). "Alternative Algorithms for Whole-number Operations". In L. Morrow (ed.), *The Teaching and Learning of Algorithms in School Mathematics: 1998 Yearbook* (pp. 106–114). Reston, Va.: National Council of (Teachers of) Mathematics.

Carter, M. (1990). "The Idea of Expertise: An Exploration of Cognitive and Social Dimensions of Writing". *College Composition and Communication*, vol. 41, no. 3, pp. 265–286.

Carter, R. and McCarthy, M. (2006). *Cambridge Grammar of English*. Cambridge: Cambridge University Press.

Chall, J. S. (1983). *Stages of Reading Development*. New York: McGraw-Hill.

Chapman, J. W. and Tunmer, W. E. (2003). Reading difficulties, reading-related self-perceptions and strategies for overcoming negative self-beliefs. *Reading and Writing Quarterly*, 19, 5-24.

Clay, M. (1991). *Becoming Literate: The Construction of Inner Control*. Portsmouth, NH: Heinemann.

Coben, D. (2000). "Numeracy, Mathematics and Adult Learning". In I. Gal (ed.), *Adult Numeracy Development: Theory, Research, Practice* (pp. 33–50). Cresskill, NJ: Hampton Press.

Coben, D. (2003). *Adult Numeracy: Review of Research and Related Literature*. London: National Research and Development Centre for Adult Literacy and Numeracy. Retrieved 10 August 2006 from www.nrdc.org.uk

Cockcroft, W. H. (1982). *Mathematics Counts: A Report of the Committee of Inquiry into the Teaching of Mathematics in Schools*. London: HMSO.

Conrad, S. and Biber, D. (eds). (2001). *Variation in English: Multi-dimensional studies*. London: Longman (Pearson Education).

Coutant, C. and Perchemlides, N. (2005). "Strategies for Teen Readers". *Educational Leadership*, vol. 63, no. 2, pp. 42–47.

Coxhead, A. (2000). "A New Academic Word List". *TESOL Quarterly*, vol. 34, no. 2, pp. 213–238.

Coxhead, A. and Nation, P. (2001). "The Specialised Vocabulary of English for Specific Purposes". In J. Flowerdew and M. Peacock (eds), *Research Perspectives on English for Academic Purposes* (pp. 252–267). Cambridge: Cambridge University Press.

Cummins, J. (1979). "Cognitive/Academic Language Proficiency, Linguistic Interdependence, the Optimum Age Question and Some Other Matters". *Working Papers on Bilingualism*, no. 19, pp. 121–129.

Cummins, J. (1981). "The Role of Primary Language Development in Promoting Educational Success for Language Minority Students". In California State Department of Education (ed.), *Schooling and Language Minority Students: A Theoretical Framework*. Los Angeles: Evaluation, Dissemination and Assessment Center, California State University.

Cunningham, A. E. and Stanovich, K. E. (1997). "Early Reading Acquisition and Its Relation to Reading Experience and Ability 10 Years Later". *Developmental Psychology*, vol. 33, no. 3, pp. 934–945.

Dale, E. and O'Rourke, J. (1987). *Vocabulary Building*. Columbus, OH: Zaner-Bloser.

Derewianka, B. (1999). *Exploring How Texts Work*. Rozelle, NSW: Primary English Teaching Association.

Duke, N. K. and Pearson, D. (2002). "Effective Practices for Developing Reading Comprehension". In A. E. Farstrup and S. J. Samuels (eds), *What Research Has to Say about Reading Instruction*. Newark, Del.: International Reading Association.

Dymock, S. (2005). "Teaching Expository Text Structure Awareness". *The Reading Teacher*, vol. 59, no. 2, pp. 177–181.

Dymock, S. J. and Nicholson, T. (1999). *Reading Comprehension: What Is It? How Do You Teach It?* Wellington: New Zealand Council for Educational Research.

Dyson, A. H. and Freedman, S. W. (1991). "Writing". In J. Flood, J. Jensen, D. Lapp and J. R. Squire (eds), *Handbook of Research on Teaching the English Language Arts*. New York: MacMillan.

Eggins, S. and Martin, J. R. (1997). "Genres and Registers of Discourse". In T. van Dijk (ed.), *Discourse as Structure and Process* (pp. 230–56). London: Sage.

Ehri, L. C. (1998). "Grapheme–phoneme Knowledge is Essential for Learning to Read Words in English". In J. L. Metsala and L. C. Ehri (eds), *Word Recognition in Beginning Literacy* (pp. 3–40). Mahwah, NJ: L. Erlbaum Associates.

Elder, C. and Davies, A. (1998). "Performance on ESL Examinations: Is There a Language Distance Effect?" *Language and Education*, vol. 12, no. 1, pp. 1–17.

Fatt, J. P. T., (1999, June 1). "It's not what you say, it's how you say it – non-verbal communication." *Communication World*. Retrieved November 2007, from http://findarticles.com/p/articles/mi_m4422/is_6_16/ai_55580031/print

Fenwick, T. and Tennant, M. (2004). "Understanding Adult Learners". In G. Foley (ed.), *Dimensions of Adult Learning: Adult Education and Training in a Global Era* (pp. 55–73). Maidenhead, England: Open University Press.

Fillmore, C. (1979). "On Fluency". In C. Fillmore, D. Kempler and W. Wang (eds), *Individual Differences in Language Learning Behavior*. New York: Academic.

Flower, L. and Hayes, J. R. (1981). "A Cognitive Process Theory of Writing". *College Composition and Communication*, vol. 32, no. 4 (December), pp. 365–387.

Foley, J. and Thompson, L. (2003). *Language Learning: A Lifelong Process*. London: Arnold.

Franken, M. (2001). "Identifying Productive Talk for the Writing of Argument Texts". *TESOLANZ Journal*, vol. 9, pp. 39–56.

Franken, M. and McComish, J. (2003). *Improving English Language Outcomes for Students Receiving ESOL Services in New Zealand Schools, with a Particular Focus on New Immigrants: Report to the Ministry of Education*. Wellington: Ministry of Education.

Franken, M., May, S. and McComish, J. (2005). *Pasifika Language Research and Guidelines Project: Literature Review*. Wellington: Ministry of Education.

Gal, I., van Groenestijn, M., Manly, M., Schmitt, M. J., & Tout, D. (2005). "Adult numeracy and its assessment in the ALL survey: A conceptual framework and pilot results." In Murray, S. T., Clermont, Y., & Binkley, M. (Eds.), *Measuring Adult Literacy and Life Skills: New Frameworks for Assessment* (pp. 137-191). Ottawa, Canada: Statistics Canada. [online:www.statcan.ca/cgi-bin/downpub/listpub.cgi?catno=89-552-MIE2005013]

Galbraith, M. W. (2004). *Adult Learning Methods: A Guide for Effective Instruction*, 3rd ed. Malabar, Fla.: Krieger.

Gambrell, L. B. and Bales, R. J. (1986). "Mental Imagery and the Comprehension-monitoring Performance of Fourth- and Fifth-grade Poor Readers". *Reading Research Quarterly*, vol. 21, no. 4, pp. 454–464.

Gambrell, L. B. and Heathington, B. S. (1981). "Adult Disabled Readers' Metacognitive Awareness about Reading Tasks and Strategies". *Journal of Reading Behavior*, vol. 13, no. 3, pp. 215–221.

Gillon, G. T. (2004). *Phonological Awareness: From Research to Practice*. New York: Guilford.

Ginsburg, I., Manley, M., Schmitt, M.J. (December, 2006). "The components of numeracy." *Occasional Paper*. National Center for the Study of Adult Learning and Literacy (NCSALL): Boston, MA

Gordon, A. I. (1994) "Successful Spelling Strategies for Adult Learners". Michigan Adult Education Practitioner Inquiry Project. Retrieved from Educational Resources Information Center (ERIC), November 2007.

Gough, P. B. (1996). "How Children Learn to Read and Why They Fail". *Annals of Dyslexia*, no. 46, pp. 3–20.

Gough, P. B. and Hillinger, H. L. (1980). "Learning to Read: An Unnatural Act". *Bulletin of the Orton Society*, no. 30, pp. 179–196.

Gough, P. B. and Tunmer, W. E. (1986). "Decoding, Reading and Reading Disability". Remedial and Special Education, vol. 7, no. 1, pp. 6–10.

Grabe, W. (2001). "Reading–Writing Relations: Theoretical Perspectives and Instructional Practices". In D. Belcher and A. Hirvela (eds), *Linking Literacies: Perspectives on L2 Reading-writing Connections* (pp. 15–47). Ann Arbor: The University of Michigan Press.

Graves, M. F., Juel, C. and Graves, B. B. (2004). *Teaching Reading in the 21st Century*, 3rd ed. Boston, Mass.: Allyn and Bacon.

Graves, M. F., Slater, W. H. and White, T. G. (1989). "Teaching Content Area Vocabulary". In D. Lapp, J. Flood and N. Farnan (eds), *Content Area Reading and Learning* (pp. 214–224). Englewood Cliffs, NJ: Prentice-Hall.

Gunnarsson, B.-L. (1997). "The Writing Process from a Sociolinguistic Viewpoint". *Written Communication*, vol. 14, no. 2, pp. 139–150.

Halliday, M. A. K. (1978). *Language as a Social Semiotic: The Social Interpretation of Language*. London: Edward Arnold.

Halliday, M. A. K. and Hasan, R. (1976). *Cohesion in English*. London and New York: Longman.

Hart, B. and Risley, T. R. (1995). *Meaningful Differences in the Everyday Experience of Young American Children*. Baltimore: Brookes.

Hayes, J. R. and Flower, L. (1980). "Identifying the organization of writing processes." In L. Gregg and E. R. Steinberg (eds)., *Cognitive processes in writing* (pp. 3-30). Hillsdale, NJ: Lawrence Erlbaum Associates.

Hayes, J. (1996). "A New Framework for Understanding Cognition and Affect in Writing". In C. M. Levy and S. Randsdell (eds), *The Science of Writing: Theories, Methods, Individual Differences and Applications* (pp. 29–55). Mahwah, NJ: L. Erlbaum Associates.

Henry, M. (1997). "The Decoding/Spelling Continuum: Integrated Decoding and Spelling Instruction from Pre-school to Early Secondary School". *Dyslexia*, vol. 3, pp. 178–189.

Henry, M. (2003). *Unlocking Literacy: Effective Decoding and Spelling Instruction*. Baltimore: Paul H. Brookes.

Hirsch, E. D. (2003). "Reading Comprehension Requires Knowledge of Words and the World". *American Educator*, vol. 27, no. 1, pp. 10–13, 16–22, 28–29, 48.

Hock, M. and Mellard, D. (2005). "Reading Comprehension Strategies for Adult Literacy Outcomes". *Journal of Adolescent and Adult Literacy*, vol. 49, no. 3, pp. 192–200.

Hoover, W. A. and Gough, P. B. (1990). "The Simple View of Reading". Reading and Writing: *An Interdisciplinary Journal*, vol. 2, no. 2, pp. 127–160.

Hunter, D., Gambell, T. and Randhawa, B. (2005). "Gender Gaps in Group Listening and Speaking: Issues in Social Constructivist Approaches to Teaching and Learning". *Educational Review*, vol. 57, no. 3, pp. 329–355.

Hymes, D. (1968). "The Ethnography of Speaking". In J. A. Fishman (ed.), *Readings in the Sociology of Language*. The Hague: Mouton.

Ivanic, R. and Tseng, M. L. (2005). *Understanding the Relationships between Learning and Teaching: An Analysis of the Contribution of Applied Linguistics*. London: National Research and Development Centre for Adult Literacy and Numeracy.

Johnston, B. (1995). "Critical Numeracy?". *Fine Print*, vol. 16, no. 4 (Summer), pp. 32–35.

Juel, C. (1988). "Learning to read and write. A longitudinal study of 54 children from first through fourth grades." *Journal of Educational Psychology*, 80, 437-447.

Juzwik, M. M., Curcic, S., Wolbers, K., Moxley, K. D., Dimlimng, L. M. and Shankland, R. K. (2006). "Writing into the 21st century: An overview of research on writing, 1999 to 2004." *Written Communication*, 23(4), 451-476.

Kintsch, W. and van Dijk, T. A. (1978). "Toward a Model of Text Comprehension and Production". *Psychological Review*, vol. 85, no. 5, pp. 363–394.

Konold, C. (1995), "Issues in Assessing Conceptual Understanding in Probability and Statistics," *Journal of Statistics Education* [Online], 3(1). (http://www.amstat.org/publications/jse/v3n1/konold.html)

Krashen, S. (1984). *Writing: Research Theory and Application*. Oxford: Pergamon.

Kwong, T. E. and Varnhagen, C. K. (2005). "Strategy development and learning to spell new words: Generalization of a process." *Developmental Psychology*, vol. 41, (no. 1, pp 148-159.

LaBerge, D. and Samuels, S. J. (1974). "Toward a Theory of Automatic Information Processing in Reading". *Cognitive Psychology*, no. 6, pp. 293–323.

Langer, J. (1985). Reading, writing and understanding. An analysis of the construction of meaning. *Written Communication*, 3(2),219-267.

Lederer, R. (1991). *The Miracle of Language*. New York: Pocket Books.

Lee, D. Y. W. (2001). "Genres, Registers, Text Types, Domains and Styles: Clarifying the Concepts and Navigating a Path through the BNC Jungle". *Language Learning and Technology*, vol. 5, no. 3, pp. 37–72. Retrieved 3 May 2006 from http://llt.msu.edu/vol5num3/lee/default.html

Levy, M. and Ransdell, S.E. (Eds.), *The Science of Writing: Theories, methods, individual differences and applications*. Mahwah, NJ: Lawrence Erlbaum Associates.

Luke, A. and Freebody, P. (1999). "A Map of Possible Practices: Further Notes on the Four Resources Model". *Practically Primary*, vol. 4, no. 2, pp. 5–8.

Mace, J. (2002). *The Give and Take of Writing: Scribes, Literacy and Everyday Life*. Leicester: The National Institute of Adult Continuing Education.

McIntosh, A., Reys, B., Reys, R., Bana, J., Farrell, B. (1997). *Number Sense in School Mathematics. Student Performance in Four Countries*. Perth: MASTE

Merriam, S. B. and Caffarella, R. S. (1991). *Learning in Adulthood: A Comprehensive Guide*, 2nd ed. San Francisco: Jossey-Bass.

Meyer, B. J. F. (1975). *The Organization of Prose and Its Effect on Memory*. Amsterdam: North- Holland.

Meyer, B. J. F., Brandt, D. M. and Bluth, G. J. (1980). "Use of Top-level Structure in Text: Key for Reading Comprehension of Ninth-grade Students". *Reading Research Quarterly*, vol. 16, no. 1, pp. 72–103.

Meyer, B. J. F. and Rice, G. E. (1984). "The structure of text." In P. D. Pearson, R. Barr, M. L. Kamil and P. Mosenthal (Eds.), *Handbook of reading research* (pp. 319-351). New York: Longman.

Ministry of Education (1992). *Mathematics in the New Zealand Curriculum*.

Ministry of Education (2001). *Curriculum Update 45: The Numeracy Story*. Wellington: Learning Media.

Ministry of Education (2006). *Effective Literacy Practice in Years 5 to 8*. Wellington: Learning Media.

Ministry of Education (2007). *The New Zealand Curriculum. Wellington*: Learning Media.

Ministry of Education (2007). *The Adult Literacy and Life Skills (ALLS) Survey: Headline Results and Background*. Wellington: Ministry of Education Fact Sheet.

Ministry of Education (2007). *Book 1: The Number Framework*. Wellington: Ministry of Education.

Nagy, W. E. and Herman, P. A. (1987). "Breadth and Depth of Vocabulary Knowledge: Implications for Acquisition and Instruction". In M. McKeown and M. Curtis (eds), *The Nature of Vocabulary Acquisition* (pp. 19–35). Hillsdale, NJ: L. Erlbaum Associates.

Nagy, W. E. and Scott, J. A. (2000). "Vocabulary Processes". In M. L. Kamil, P. B. Mosenthal, P. D. Pearson and R. Barr (eds), *Handbook of Reading Research*, vol. 3 (pp. 269–294). Mahwah, NJ: L. Erlbaum Associates.

Nation, I. S. P. (1984). *Vocabulary Lists*. English Language Institute Occasional Publication no. 17. Wellington: Victoria University of Wellington.

Nation, I. S. P. (1990). *Teaching and Learning Vocabulary*. New York: Newbury House.

Nation, I. S. P. (2001). *Learning Vocabulary in Another Language*. Cambridge: Cambridge University Press.

National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics*. NCTM: Reston VA

National Council of Teachers of Mathematics (2003). *A Research Companion to Principles and Standards for School Mathematics*. NCTM: Reston VA

National Institute for Literacy (http://eff.cls.utk. edu). http://eff.cls.utk.edu/fundamentals/standard_use_ math.htm

National Reading Panel (2000). *Teaching Children to Read. An Evidence-based Assessment of the Scientific Research Literature on Reading and Its Implications for Reading Instruction: Reports of the Subgroups*. Washington, DC: National Institute of Child Health and Human Development, National Institutes of Health.

National Research and Development Centre (2004). *Teaching and Learning Writing: A Review of Research and Practice*. London: National Research and Development Centre for Adult Literacy and Numeracy Institute of Education.

Nicholson, T. (2005). *At the Cutting Edge: The Importance of Phonemic Awareness in Learning to Read and Spell*. Wellington: New Zealand Council for Educational Research.

Nunan, D. (1989). *Designing Tasks for the Communicative Classroom*. New York: Cambridge University Press.

Oprandy, R. (1994). "Listening/Speaking in Second and Foreign Language Teaching". *System*, vol. 22, no. 2, pp. 153–175.

Organisation for Economic Co-operation and Development (OECD) (2005). "Definition and Selection of Competencies: Executive Summary". Downloaded from www.portal-stat.admin.ch/deseco/index.htm

Paris, S. G. and Myers, M. (1981). "Comprehension Monitoring, Memory and Study Strategies of Good and Poor Readers". Journal of Reading Behavior, vol. 13, no. 1, pp. 5–22.

Pawlikowska-Smith, G. (2002). *Canadian Language Benchmarks 2000: Theoretical Framework*. Ottawa: Centre for Canadian Language Benchmarks. Available at www.language.ca

Pearson, P. D. and Duke, N. K. (2002). "Comprehension Instruction in the Primary Grades". In C. C. Block and M. Pressley (eds), *Comprehension Instruction: Research-based Best Practices* (pp. 247–258). New York: Guilford.

Pearson, P. D. and Fielding, L. (1991). "Comprehension Instruction". In R. Barr, M. L. Kamil, P. B. Mosenthal and P. D. Pearson (eds), *Handbook of Reading Research: Vol II* (pp. 815–860). White Plains, NY: Longman.

Perl, S. (1979). "The Composing Processes of Unskilled College Writers". *Research in the Teaching of English*, vol. 13, no. 4, pp. 317–336.

Pogson, P. and Tennant, M. (1999). "Understanding Adult Learners". In G. Foley (ed.), *Understanding Adult Education and Training*, 2nd ed. (pp. 24–34). St Leonards, NSW: Allen and Unwin.

Prensky, M. (2001). "Digital Natives, Digital Immigrants". *On the Horizon* (NCB University Press), vol. 9, no. 5 (October).

Pressley, M. (2000). "What Should Comprehension Instruction Be the Instruction of?" In M. L. Kamil, P. B. Mosenthal, P. D. Pearson and R. Barr (eds), *Handbook of Reading Research: Vol. III* (pp. 545–561). Mahwah, NJ: L. Erlbaum Associates.

Pressley, M. (2002). "Comprehension Strategies Instruction". In C. C. Block and M. Pressley (eds), *Comprehension Instruction: Research-based Best Practices* (pp. 11–27). New York: Guilford.

Pressley, M. and Afflerbach, P. (1995). Verbal Protocols of Reading: *The Nature of Constructively Responsive Reading*. Hillsdale, NJ: L. Erlbaum Associates.

Pressley, M., Johnson, C. J., Symons, S., McGoldrick, J. A. and Kurita, J. (1989). "Strategies That Improve Children's Memory and Comprehension of Text". *The Elementary School Journal*, vol. 90, no. 1, pp. 3–32.

Raimes, A. (1985). "What Unskilled ESL Students Do as They Write: A Classroom Study of Composing". *TESOL Quarterly*, vol. 19, pp. 229–258.

Rayner, K., Foorman, B. R., Perfetti, C. A. and Petetsky, D. (2001). "How Psychological Science Informs the Teaching of Reading". *Psychological Science in the Public Interest*, no. 2, pp. 31–75.

Riches, C. and Genesee, F. (2006). "Literacy: Crosslinguistic and cross modal issues". In F. Genesee, K. Lindholm-Leary, W. M. Saunders and D. Christian (eds). *Educating English Language Learners* (pp. 64-108). Cambridge: Cambridge University Press.

Roca De Larios, J., Murphy, L. and Marin, J. (2002). "A Critical Examination of L2 Writing Process Research". In S. Ransdell and M. L. Barbier (eds), *Studies in Writing, Volume 11: New Directions for Research in L2 Writing* (pp. 11–47). Amsterdam: Kluwer Academic.

Rosenshine, B. and Meister, C. (1994). "Reciprocal Teaching: A Review of the Research". *Review of Educational Research*, vol. 64, no. 4, pp. 479–530.

Rosenshine, B., Meister, C. and Chapman, S. (1996). "Teaching Students to Generate Questions: A Review of the Intervention Studies". *Review of Educational Research*, vol. 66, no. 2, pp. 181–221.

Rumelhart, D. E. (1980). "Schemata: The Building Blocks of Cognition". In R. J. Spiro, B. C. Bruce and W. F. Brewer (eds), *Theoretical Issues in Reading Comprehension* (pp. 33–58). Hillsdale, NJ: L. Erlbaum Associates.

Sadoski, M. (1985). "The Natural Use of Imagery in Story Comprehension and Recall: Replication and Extension". *Reading Research Quarterly*, no. 20, pp. 658–667.

SCANS (The Secretary's Commission on Achieving Necessary Skills) (1991). *What Work Requires of Schools*. Washington, DC: SCANS, US Department of Labour. Downloaded from www.wdr.doleta.gov/ SCANS/ whatwork/

Share, D. L. and Stanovich, K. E. (1995). "Cognitive Processes in Early Reading Development: Accommodating Individual Differences into a Model of Acquisition". *Issues in Education: Contributions from Educational Psychology*, no. 1, pp. 1–57.

Singhal, M. (1998). "A Comparison of L1 and L2 Reading: Cultural Differences and Schema". *The Internet TESL Journal*, vol. 4, no. 10. Retrieved 3 May 2006 from http://iteslj.org/Articles/Singhal-ReadingL1L2.htm

Snow, C. E. (2002). *Reading for Understanding: Toward an R & D Program in Reading Comprehension*. Santa Monica, Calif.: RAND.

Snow, C. E., Burns, S. and Griffi n, P. (1998). *Preventing Reading Difficulties in Young Children*. Washington, DC: National Academy Press.

Stahl, S. A. (1983). "Differentiating Word Knowledge and Reading Comprehension". *Journal of Reading Behavior*, vol. 15, no. 4, pp. 33–50.

Stahl, S. A. (1985). "To Teach a Word Well: A Framework for Vocabulary Instruction". *Reading World*, vol. 24, no. 3, pp. 16–27.

Stahl, S. A. (1986). "Three Principles of Effective Vocabulary Instruction". Journal of Reading, no. 29, pp. 662–668.

Stanovich, K. E. (1986). "Matthew Effects in Reading: Some Consequences of Individual Differences in the Acquisition of Literacy". *Reading Research Quarterly*, no. 21, pp. 360–407.

Stanovich, K. E. (2000). *Progress in Understanding Reading*. New York: Guilford.

Steffe, L. D., Cobb, P. and von Glaserfeld, E. (1988). *Construction of Arithmetical Meanings and Strategies*. New York: Springer Verlag.

Steffe, L., von Glasersfeld, E., Richards, J. and Cobb, P. (1983). *Children's Counting Types: Philosophy, Theory and Application*. New York: Praeger.

Stein, S. (2000). *Equipped for the Future Content Standards: What Adults Need to Know and Be Able to Do in the 21st Century*. Washington, DC: National Institute for Literacy.

Steinback, M., Schmitt, M. J., Merson, M. and Leonelli, E. (2003). "Measurement in Adult Education: Starting with Students' Understandings". In D. Clements and G. Bright (eds), *Learning and Teaching Measurement: 2003 Yearbook* (pp. 318– 331). Reston, Va.: National Council of Teachers of Mathematics.

Sweet, A. P. and Snow, C. E. (2003). *Rethinking Reading Comprehension*. New York: Guilford.

Thorndike, E. L. (1917). "Reading as Reasoning". *Journal of Educational Psychology*, no. 8, pp. 323–332.

Torgesen, J. K. (1997). "The Prevention and Remediation of Reading Disabilities: Evaluating What We Know from Research". *Journal of Academic Language Therapy*, no. 1, pp. 11–47.

Tout, D. (1997). "Some Reflections on Adult Numeracy". In D. Coben (ed.), *Adults Learning Maths–3: Proceedings of the Third International Conference of Adults Learning Maths – A Research Forum* (ALM–3) (pp. 13–15). London: Goldsmiths College, University of London, in association with ALM.

Trabasso, T. and Bouchard, E. (2002). "Teaching Readers How to Comprehend Text Strategically". In C. C. Block and M. Pressley (ed.), *Comprehension Instruction: Research-based Best Practices*. New York: Guilford.

Tusting, K. and Barton, D. (2003). *Models of Adult Learning: A Literature Review*. London: National Research and Development Centre for Adult Literacy and Numeracy. Available at www.nrdc.org.uk

Van de Walle, J. (2007). *Elementary and Middle School Mathematics: Teaching Developmentally*. Boston, MA: Pearson Education Inc.

Van Dijk, T. A. and Kintsch, W. (1983). *Strategies of Discourse Comprehension*. New York: Academic.

Vandergrift, L. (2006). "Second Language Listening: Listening Ability or Language Proficiency?" *Modern Language Journal*, vol. 90, no. 1, pp. 6–18.

Walker, M., Udy, K. and Pole, N. (1996). *Adult Literacy in New Zealand: Results from the International Adult Literacy Survey*. Wellington: Ministry of Education.

West, M. (1953). *A General Service List of English Words*. London: Longman, Green.

Widmayer, S. A. (n.d.). "Schema Theory: An Introduction". Retrieved 3 May 2006 from http://chd.gmu.edu/immersion/knowledgebase/strategies/cognitivism/SchemaTheory.htm

Wright, R. J. (1998). "Children's Beginning Knowledge of Numerals and Its Relationship to Their Knowledge of Number Words: An Exploratory, Observational Study". In A. Oliver and K. Newstead (eds), *Proceedings of the 22nd Conference of the International Group for the Psychology of Mathematics Education*, 4 (pp. 201–208). Stellenbosh, South Africa: University of Stellenbosh.

Young-Loveridge, J. and Wright, V. (2002). "Data from the Numeracy Development Project and the New Zealand Number Framework". Paper presented at the 2nd biennial conference of the Teacher Education Forum of Aotearoa New Zealand (TEFANZ), 28–31 August.

Zamel, V. (1983). "The Composing Process of Advanced ESL Students: Six Case Studies". *TESOL Quarterly*, vol. 17, no. 2, pp. 165–186.

Ziegler, J. and Goswami, U. (2005). "Reading Acquisition, Developmental Dyslexia and Skilled Reading across Languages: A Psycholinguistic Grain Size Theory". *Psychological Bulletin*, vol. 131, no. 1, pp. 3–29.

All text copyright © Crown 2008 except:

the extract on page 20 [Rayner] which is copyright © 2001 American Psychological Society, reprinted with the permission of Blackwell Publishing; the extract on page 21 [Henry] which is copyright © 2003 Paul H. Brookes Publishing Co.; the extract on page 25 [Snow] which is copyright © 2002 RAND Corporation; the extract on page 26 [T&B] which is copyright © 2002 The Guilford Press; the first extract on page 34 [MOE] which is copyright © 2001 New Zealand Ministry of Education; the second extract on page 34 [Coben] which is copyright © 2002 Hampton Press; the third extract on page 34 [Tout] which is copyright © 1997 D. Tout; the first extract on page 35 [Johnston] which is copyright © 1994 B. Johnston; the second extract on page 35 [Baxter p38] and that on page 40 [Baxter] which are copyright © 2006 Crown, reprinted with the permission of the National Research and Development Centre for Adult Literacy and Numeracy, London; the extract on page 35 [Ball & Bass] which is copyright © 2003 The National Council of Teachers of Mathematics Inc.; the extract on page 40 [Cockcroft] which is copyright © 1982 Crown. Crown copyright material is reproduced with the permission of the Controller of HMSO and the Queen's Printer for Scotland.

Published 2008 by the Tertiary Education Commission.

Catalogue number TE177
ISBN 978-0-478-08784-0

Tertiary Education Commission
Te Amorangi Mātauranga Matua
National Office
44 The Terrace
Wellington, New Zealand
PO Box 27048
© The Crown 2008

www.tec.govt.nz