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# *Improving the reading achievement of middle-years students with learning difficulties*

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*Many students with learning difficulties exhibit consistent weaknesses in basic reading skills that can be challenging to address within the context of the regular classroom. This paper outlines an innovative pedagogic intervention, QuickSmart, which focuses on improving reading fluency and comprehension skills. The effective application of QuickSmart in a high school setting is described in detail.*

## *Introduction*

In general, students with learning difficulties or learning disabilities are considered to have significant and pervasive problems acquiring and using some combination of listening, speaking, reading, writing, reasoning, or mathematical skills due to underlying difficulties involving their use of language and manipulation of abstract concepts (e.g., Swanson & Hoskyn, 1998). While definitions of learning disabilities and learning difficulties vary, and controversies over identification procedures persist (e.g., Fuchs & Fuchs, 1998), there is a significant proportion of students identified with learning difficulties (LD).

In Australia and New Zealand, where the definition of LD is broad and includes students with various learning difficulties, at least 20% of school students are considered to have problems in academic areas (Westwood & Graham, 2000). This view that there are relatively large numbers of LD learners in Australia is supported by the Australian National Benchmark data (MCEETYA, 2007) that show an increase in percentages of students not meeting established benchmarks as students proceed from Year 3 through Year 5 to Year 7. These findings are compounded when a metropolitan versus rural filter is applied to the 2005 Year 7 data with approximately 9% and 11% of students in metropolitan and provincial areas falling below benchmarks in reading compared with 21% and 47% of students in remote

and very remote areas.

The intervention described in this paper targeted middle-school students who are experiencing difficulties with reading and understanding texts. Most of these students have already experienced considerable failure in school and have not benefited significantly from classroom instruction and in-class support. Instead, such students require the kind of individual and explicit instruction that is integral to an effective intervention program such as the one described in this article. To situate this intervention within the relevant literature, the first section of this article provides a brief overview of research on learning difficulties in the middle-school years, while the second section reviews effective literacy instruction and interventions for students with LD. The third section focuses on learning difficulties in reading and considers the key role of working memory and automaticity in learning and literacy for students with learning difficulties. In the last section, we report on the pedagogic initiative, *QuickSmart*, and its application in a high school setting.

## *Learning difficulties in the middle-school years*

There are many successful research-based approaches available to support students with emerging learning difficulties during their first few years of schooling. Such intervention programs include therapy programs, small group or individual support programs, school-based learning difficulties support programs or more formalised intervention programs such as Reading Recovery (Bouck, 2005). Many of the young students who use these programs may have difficulties that are transitory, and with or without early intervention programs, these students catch up with their better-performing peers. However, despite effective classroom teaching and early intervention programs, there are some children who continue to struggle with learning throughout the middle-school years (Louden et al., 2000), and whose academic needs require focused intervention.

In their middle-school years, students with LD present with particular characteristics. Although many of these students will have received some kind of learning support in the previous years of schooling, they still display persistent learning difficulties. Additionally, because many students in the middle years of schooling with LD have experienced repeated failure, they may have developed strong sensitivities to lagging behind their peers in schoolwork. These students' feelings of poor self esteem and negative perceptions of themselves as learners can lead to reduced motivation, an avoidance of risk-taking in learning, a passive disengagement from the curriculum, and behaviour problems. The lack of self-efficacy that leads students to the belief that they are unable to succeed has a highly debilitating effect on academic performance (Diener & Dweck, 1980). Experiencing sustained learning difficulties contributes to students' experience of 'learned

helplessness' whereby they feel powerless, and interpret their actions as irrelevant and without impact on subsequent outcomes (Torgesen, 1982).

Along with these affective characteristics, LD students in the middle years of schooling also present with particular cognitive characteristics. In a series of research projects supported by the National Centre of Science, Information and Communication Technology, and Mathematics Education for Rural and Regional Australia (e.g., Graham & Bellert, 2005; Graham, Bellert & Pegg, 2001; Graham, Bellert, Thomas & Pegg, in press), it was observed that the strategy use of students in the middle years of schooling with LD could be characterised as dependent on a limited repertoire of tactics with an over-reliance on inefficient strategies. These observations of cognitive processing inefficiencies are consistent with findings (e.g., Ashbaker & Swanson, 1996; Keeler & Swanson, 2001) that students with learning difficulties do not implement strategies spontaneously, flexibly and efficiently and have poor declarative knowledge related to working memory performance.

## *Effective literacy instruction and interventions for students with LD*

When designing and implementing effective teaching and learning support for students with LD in the middle years of schooling, it is vital to consider the social and emotional needs of early adolescents. During adolescence, interpersonal and intrapersonal issues are of foremost importance with peer relationships the key focus (Arnold, 2000; Fuller, 2003). Learning experiences that build upon this understanding potentially meet the students 'where they are' and promote opportunities for peer connectedness. This appears to be a key factor in developing resilience in learners (Fuller, 2001).

In the middle-school years, basic reading skills (e.g., decoding, vocabulary knowledge, fluency and comprehension strategies) are routinely required to access the curriculum in all content areas. Students with LD, however, often need explicit teaching of both prerequisite skills and the key concepts of content areas. Explicit teaching – clear teaching of important skills, information and appropriate strategies – involves showing, telling, using think-aloud protocols and self talk, as well as modelling and demonstrating by both teacher and peers so that a systematic and structured approach to teaching the desired content leads students toward mastery and success. Explicit teaching also requires that the objectives and the purpose of the intended content is made clear to students and that they are provided with regular opportunities for purposeful feedback.

At all levels of schooling, effective teachers rely on a repertoire of flexible practices and authentic learning experiences that that they can selectively implement in a variety of educational situations. Pedagogical content knowledge, that is, knowing which method to use with particular content in

a specific context with an individual or group of students (Mizell, 1999 cited in Beutel, 2003; Shulman, 1987) is evident when teachers modify the level of task difficulty so that students with LD have the opportunity to develop and practice successfully desired skills or strategies rather than unsuccessfully attempting difficult tasks. This kind of knowledge is particularly important when teaching higher-order processing (e.g., metacognition, cognitive strategies, and problem solving) to students with LD. Instructional interventions that constructively control task difficulty have great potential to influence student-learning outcomes positively (Vaughn, Gersten & Chard, 2000).

## *Learning difficulties in reading*

Some of the most important and currently influential research findings in the field of learning difficulties have been related to establishing the relationship between deficits in phonological processing and reading problems. Stanovich (1988) posited that students with learning disabilities in reading have core deficits in phonological processing, defined as the use of information about the sounds of oral and written language. Research has linked deficits in phonological processing to problems in word recognition, oral reading and reading comprehension (Chan & Dally, 2001).

In 1986, Stanovich coined a phrase, 'The Matthew Effect' that has become a potent way of describing the effects of learning difficulties in reading. He proposed that students' problems with phonological processing at school entry differentially disadvantaged those with learning difficulties. Stanovich (1986) described this pattern of increasing disadvantage as a situation where 'the rich get richer and the poor get poorer'. The middle-school years are when the Matthew Effect in reading really begins to affect students' learning and motivation – with each passing year students who have learning difficulties fall further and further behind their peers.

Interestingly, research by Wolf (2001) extended the single phonological core deficit model to accommodate the 'double deficit hypothesis' that integrates the phonological core deficit model with literature related to the underlying processes of naming speed or rate of word recognition. Students with the most debilitating learning difficulties have deficits in both naming speed and phonology. Others with less severe LD will have deficits in phonological awareness or naming speed, both of which can lead to impaired comprehension. Wolf's work has resulted in the emphasis on improving reading fluency as a vital component of effective reading interventions (see Chard, Vaughn & Tyler, 2002).

With regard to middle-school students with learning disabilities, Swanson's (1999) meta-analysis indicated that the most important instructional components associated with their improvements in reading comprehension are:

- directed response questioning (e.g., the teacher directing students to ask questions using a specified language or format)
- controlling the difficulty of the processing demands of tasks
- elaboration (e.g., additional or redundant explanations about the concepts, procedures or steps in a strategy)
- modelling by the teacher to demonstrate the required processes
- small group instruction and
- strategy cues that include reminders to use strategy steps.

**Working memory**

Despite the wide variety of theoretical explanations for LD discussed in the literature, the processes and functioning of working memory have been identified as a common factor in all learning difficulties. For example, Keeler and Swanson (2001, p. 418) stated: 'Research examining specific subtypes of learning disabilities has found that working memory deficits underlie the difficulties of students with reading and mathematical disabilities.' Similarly, Miyake and Shah (1999, p. 1) described working memory as 'the theoretical construct that has come to be used in cognitive psychology to refer to the system or mechanism underlying the maintenance of task relevant information during the performance of a cognitive task.' Other definitions similarly describe working memory as a temporary, simultaneous storage mechanism in memory geared to hold incoming information required in the performance of a complex task (Baddeley, 1992; Hulme & McKenzie, 1992; Swanson & Siegel, 2001).

In general, poor readers take more time to decode words, and have more difficulty constructing meaning from text because their limited working memory capacity is allocated almost entirely to decoding. The working memory capacity and duration of students with LD is not thought to be less than those of non-LD students; rather it appears that students with LD have difficulties in efficiently coordinating processes which operate between the components of working memory (Swanson & Siegel, 2001). From this perspective fast, efficient recall, or automaticity, is a product of efficient and effective cognitive processing.

**Automaticity**

Students with learning difficulties are visibly 'slowed down' by their lack of automaticity. Automaticity develops when processes 'become fast, obligatory and autonomous, and require only limited use of cognitive resources' (Wolf, 1991, p. 126). Just as a person beginning to play a sport or a musical instrument is slower and more error prone than an expert, students with learning difficulties require longer to process and execute many aspects of a task. Their effortful attempts tend also to be less successful than those of many of their classmates.

Developing automaticity in reading is particularly important for middle-school students because these students need to comprehend what they read and problem-solve in order to engage appropriately with the middle-school curriculum. Students are better able to focus on higher-order skills when sub-skills such as decoding are less effortful. Until this time, automatic processes may have little or no effect on the processing capacity available to perform complex tasks because only the retrieval of heavily over-learned information is relatively effortless (Borich & Tombari, 1997). There is good reason to expect that improving students' processing efficiency in basic skills frees up cognitive capacity that will becomes available for tackling higher-order or novel aspects of tasks.

## QuickSmart: *A research-based reading intervention for middle-school students with learning difficulties*

This section of our paper reports on an innovative intervention dubbed *QuickSmart*. The program, which incorporates extensive and specifically designed paper and material resources as well as the Computer-based Academic Assessment System (CAAS), is designed to improve students' information retrieval times to levels that free working-memory capacity from an excessive focus on mundane tasks. The name *QuickSmart* is appropriate because the aim of this program is for students to become *quick* (and accurate) as well *smart* in strategy use when completing reading tasks. Although the *QuickSmart* program is currently available to schools as either a reading- or numeracy-focused program (see Pegg, Graham & Bellert, 2005 for a description of the numeracy program), this article describes the implementation of the *QuickSmart* reading intervention in a high-school setting.

As discussed in the first section of the paper, LD students in their middle-school years have particular learning characteristics and needs. In order to assist these students in meeting their potential, it seems clear that intense academic interventions should be organised using small interactive groups (Vaughn, Gersten & Chard, 2000). The *QuickSmart* reading program was developed specifically to support students in their middle years of schooling experiencing LD. Specifically, it is designed to improve students' fluency and facility with basic academic aspects of reading.

The *QuickSmart* program incorporates technology developed at the Laboratory for the Assessment and Training of Academic Skills (LATAS) at the University of Massachusetts. CAAS is a software package with record keeping capabilities that measures simple perception, letter naming, word naming, pseudoword naming (e.g., plok), concept activation, and sentence understanding. Students respond to the computer-based tasks by answering into a microphone attached to the computer as soon as a stimulus appears on the computer screen.

The CAAS system provides measures of how rapidly students complete

the tasks (vocalisation latency data). An examiner then scores the response for accuracy. The students' assessment results are automatically summarised and made available in either a graph or report form that is easily interpretable by both students and teachers. The students' graphs depicting accuracy results aim for 100% while their graphs recording response speed aim to decrease the average time taken to respond to each assessment item. The CAAS is a unique component of the *QuickSmart* program. It provides ongoing monitoring of students' basic academic skills and supports the instructional focus of the *QuickSmart* intervention.

**Participants**

The students who participated in the *QuickSmart* Literacy program described in this study were drawn from the school population of a disadvantaged high school in a coastal community on the Mid-North Coast of New South Wales. Of the 650 students enrolled at this school approximately 15% come from unemployed family backgrounds. Eleven percent of the school population identifies as Aboriginal or Torres Strait Islander. The school also includes a number of refugee students from Sudan and neighbouring African countries. The school employs one full-time Learning Support teacher.

This school's state-wide test results from the Years 7 and 8 English Language and Literacy Assessment (ELLA) and Secondary Numeracy Assessment Program (SNAP) have consistently been significantly below the state and regional average. The implication here is that at least half of the students in Year 7 are below National Benchmarks in literacy and numeracy.

In 2005, when the school was first funded through the Priority Schools Program, the decision was made to target the literacy problems of Year 7 students. As part of this decision the *QuickSmart* program was implemented in the school from July 2005. Sixty-seven students undertook the program in numeracy and 47 students were enrolled in the literacy strand. This article describes the progress of a cohort of students who were selected on the basis of low literacy scores on the standardised Progressive Achievement Tests (1986; 1997; 2002) and teacher recommendation. The group of students who completed the *QuickSmart* Program during 20006 includes nine Indigenous students who were selected specifically to take part.

**Procedures**

The *QuickSmart* program ran for 32 weeks with Year 7 students over three consecutive school terms. Three teachers' aides delivered the instruction after attending professional development sessions focused on practical and theoretical aspects of the instructional approach. The school's learning assistance teacher supervised the *QuickSmart* program. The students attended

lessons in pairs for three half-hour sessions each week with the same instructor. Where possible the pairings matched students with similar learning obstacles in either reading or numeracy. A mnemonic, PATH, was developed to guide instruction during the intervention. PATH encapsulates the *QuickSmart* program's concentration on Practice, Attention to understanding, Time, and How to (strategies).

Participants in the *QuickSmart* intervention learned to develop effective strategy use that flowed from understandings developed as they participated in enjoyable, focused practice activities. The program provided students with opportunities to monitor their own learning and to receive and generate immediate, informative feedback. Instructional methods used in the *QuickSmart* intervention focused on a variety of practice and recall strategies to develop understanding and fluency with the basic reading skills of word recognition, vocabulary knowledge, fluent reading and comprehension strategy use. Each lesson followed a sequence of learning activities that involved revision of current content, automatic word recognition, deliberate practice activities featuring overt self talk, repeated reading of texts, discussion and practice of memory and retrieval strategies, games and worksheet activities, timed independent practice activities, and a CAAS assessment (see Figure 1).

**Dependent measures and assessments**

Data on individual students' automaticity, operationalised here as response time and accuracy, were collected using the CAAS. On three occasions, at the beginning, middle and end of the program all participating students were assessed on a wide range of CAAS tasks.

A standardised test (Progressive Achievement Tests, ACER, 2000) of reading comprehension was used to assess students' abilities to use higher-order thinking. This test was used before and after the intervention. For the purposes of this research, higher-order thinking in reading was conceptualised as word and text comprehension. Therefore, for the purposes of this research, students' improvement in higher-order thinking processes, such as problem solving and comprehension, was demonstrated by their improved performance on standardised tests containing a variety of literal, inferential and evaluative comprehension questions.

In addition to these measures, during the intervention a brief CAAS assessment on a particular sub-test skill was administered at the end of most lessons. Other on-going assessment information was derived from many of the activities included in the program such as flashcards and other timed activities, repeated reading, worksheets and reading books. This information was useful in the teaching and learning cycle and also became a powerful motivational feature for the students.

**QuickSmart Reading Lesson Format**

**1. Understanding / Vocabulary Check (5 minutes)**
To begin the lesson, review and discuss the current Focus Word List. Take turns in reading the list of words. Talk about the meaning of the words and how the words are used in the text.

**2. Automatic Recall of Focus Words (5 minutes)**
Using flashcards of the current Focus Word List challenge the students to see how many flashcard words they can read in 1 minute. Graph results and discuss improvements and errors.

**3. Passages – Repeated Reading (5 minutes)**
Using the selected reading passage that accompanies the Focus Word List, establish how many words each student can read in one minute. Always read for meaning. Graph results and discuss improvements and errors.

**4. Comprehension Strategies and Passages (5 minutes)**
Use the strategies contained in the Literacy Resource Folder to scaffold responses to a variety of comprehension passages across curriculum areas.

**5. Assessment (5 minutes) (One student per QuickSmart session)**
A student completes a CAAS assessment and graphs the results. Students discuss their results with the instructor and set goals for next time.

**6. Games (5–10 minutes)**
Play some literacy games to help students become fast and clever at automatically recognising words or demonstrating word meaning. Games include Memory, QuickSmart Bingo and the Word Meaning Game. These games provide opportunities for application of the literacy skills being developed during QuickSmart sessions.

Figure 1. The QuickSmart reading lesson format.

## *Results and discussion*

At the conclusion of the *QuickSmart* program a range of data was collected, including final CAAS assessments, standardised test scores, interviews with participants and their teachers and surveys of parent views, as well as opportunistic data available from state-wide testing. This article presents results from the standardised tests and two qualitative sources of information that were independent of the authors, an extract from the NSW DET publication *Side-by-Side* (Cotton, 2006) and example comments from two parents of participants in *QuickSmart*.

**Standardised test scores**

The Progressive Achievement Test (1986; 2000) of reading comprehension was administered to students participating in the *QuickSmart* program. Although it is accepted that improvement on standardised measures is hard to achieve through intervention research, all but one of the Year 7 students increased their post-test percentile rank scores. The average percentile score for *QuickSmart* students at pre-test was 34.42 (*21.9*) compared to 52.7 (*25.5*) percentile points at post-test. Statistical analysis using a one-way analysis of variance indicated that this was a was a highly significant increase in test performance ($F_{(1, 46)} = 16.37$, $p <. 001$, $d = .77$). This result supports the proposition that increased accuracy and automaticity in basic academic skills results in improvements on more challenging literacy activities.

**Data from the Computer-Based Academic Assessment System (CAAS)**

The data presented in Table 1 shows group average response times and accuracy for CAAS sub-tests in reading measured before and after the intervention. All individual participants showed speed improvements and accuracy maintenance or improvement in most of the sub-tests. These results indicate the efficacy of *QuickSmart* as an intervention that supports students to improve automaticity in basic academic skills such as word recognition and sentence-level cloze tests.

**Table 1.** Group average improvements in speed and accuracy.

| CAAS subtest | Ave response latency pre-test (secs) | Ave response latency post-test (secs) | Ave Accuracy pre (%) | Ave Accuracy post (%) |
|---|---|---|---|---|
| Word Recognition | 1.3 (.71) | .63 (.23) | 98.2 (9.0) | 97.5 (2.1) |
| Sentence Comprehension | 6.92 (1.3) | 2.42 (1.3) | 87.16(4.7) | 96.1 (5.5) |

There is no doubt that this intervention made a difference to those students involved. *QuickSmart* strategies and resources have been effective in assisting the low-achieving middle-school students who are difficult to support in class by even the most accomplished teachers. Of major importance in this research is the finding that when placed in a motivational and supportive environment, low-achieving middle-school students will, over time, replace ineffective and resource-draining strategies with more appropriate and more efficient mental processing. Unless long-term intense and targeted instruction is provided and its effectiveness monitored, students struggling in their middle years of school may not adopt appropriate strate-

gies, or may fail to adapt their own inefficient strategies to become more effective.

Opportunistic data in the form of value-added scores from the New South Wales state wide testing program, English Language and Literacy Assessment (ELLA) were also positive for participants in the *QuickSmart* program. After years of trailing other schools in their region, this school was placed first in its grouping of four schools in 2007. Average value added growth scores for the school were 3.3 for reading compared to the state average of 2.6 and 2.4 points for language compared to 2.2 for the state. Only the value added growth score for writing (which is not a component of the current *QuickSmart* intervention) of 0.7 for the school was lower than the state average of 2.1.

These results were summarised by Cotton (2006, p. 5)

> It's not often that a school records a meteoric rise in student performance over a single year. So when … School recorded the highest growth in its history for Year 8 literacy and numeracy, the principal, summed it up in three words: 'We were thrilled!'
> Last year almost half of the school's Year 7 cohort was under the national benchmark for literacy and numeracy. But in 2006, all of the students, now in Year 8, performed above the benchmarks – almost doubling the state average growth in their English Language and Literacy Assessment results, and more than doubling the state average growth in writing. Similar results were brought home for the Secondary Numeracy Assessment Program.
> 'Anecdotally, we'd been told things were really improving, but it was good to get some data that confirmed that was the case', the Principal said.
> … one of the school's deputy principals, attributed the strong growth to the schools participation in a trial of an intervention program, *QuickSmart*, coupled with a TAFE-accredited in-school peer tutoring program and an intensive writing initiative.
> 'Students are coming back into class a lot more enthusiastic and willing to take risks with their classroom activities' the Deputy Principal said. 'They're showing a lot more confidence within themselves, sharing ideas with other students in the class, enjoying their learning and have a lot of success.'

In addition, parents commented not only on their child's improved academic performance but on how the program impacted on wider issues in their child's life.

> Mother: Since my daughter started QS we have seen a change in her attitude, from being, from thinking she was dumb, to thinking that probably she could achieve something. There has been a boost in her confidence, not just in maths and or English, but in every subject area at school.

> Father: Also socially there has been a more confidence, greater confidence with her socially. In fitting with other people, and just feeling really confident that she can do something now and that she is not dumb and that has been the biggest thing … and she just loved competing against herself.

## *Conclusion*

*QuickSmart* is an example of a rigorous and effective teaching intervention designed for students with learning difficulties in the middle years of schooling. The program of instruction:

- is designed to improve students' information retrieval times
- frees working-memory capacity from an excessive focus on routine tasks
- fosters automaticity in basic tasks
- utilises explicit teaching based on understanding, not rote learning, and deliberate practice
- has time (as well as accuracy) as a dimension of learning
- integrates assessment tasks into each lesson with a focus on individual improvement and
- maximises student on-task time in a structured but flexible lesson format.

*QuickSmart* is a carefully structured program that focuses on improving reading proficiency. However, this work is not easy. There are no quick fixes for middle-school students who have significant difficulties in reading and comprehension. It takes considerable financial and human resources to run the *QuickSmart* program and it is difficult to obtain sufficient funds to provide a robust intervention in a sample population sufficiently large so that empirical evaluations can be employed. The importance of control and/or comparison groups adds further to the cost and complexity of intervention research. However, despite the difficulties of such work it is a critical avenue of help for low-achieving students and those facing learning obstacles.

Because the *QuickSmart* intervention has a strategy orientation to students' basic academic skill performance, it offers an approach that is individualised, responsive and carefully monitored. The achievements recorded of the students who participated in the *QuickSmart* program underscore the importance of research-based interventions, especially for low-achieving students in the middle years of schooling. Australia needs validated programs of instruction that offer these most educationally vulnerable students another chance to become active and valued class members. Such interventions, when adapted to local contexts and particular curriculum demands, have the potential to make a positive difference to students' academic performance, and their lives inside and outside school.

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