QuickSmart: a numeracy and literacy program

Summary

QuickSmart is a Literacy and Numeracy program for Indigenous and non-Indigenous students who are at or below the National Minimum Standard in Literacy and Numeracy in years 4–8. It was initially developed to help these students 'close the gap' in their learning. It focuses on developing fast and accurate basic academic skills by providing 30-minute lessons, three times a week, over a period of 30 weeks.

The program has operated since 2001 in clusters of schools in metropolitan, regional, rural, remote and very remote locations and with diverse student populations. To sustain innovations over a long period, the *program team works* with schools that are part of a cluster (or network) of geographically close 'like-minded' schools.

Results indicate that *QuickSmart* has been successful in closing the gap between low-and average-achieving students in the areas of Numeracy and Literacy and in building student confidence.

Target student group

QuickSmart programs have been implemented with low-achieving students in Australian government, Catholic and independent schools in metropolitan, regional, rural, remote and very remote locations. Programs have included substantial numbers of Indigenous students in the Northern Territory, New England and western Sydney over a number of consecutive years.

Method

QuickSmart programs have been implemented with low-achieving students in Australian government, Catholic and independent schools in metropolitan, regional, rural, remote and very remote locations. Programs have included substantial numbers of Indigenous students in the Northern Territory, New England and western Sydney over a number of consecutive years.

How it works

Students are identified as being at-risk of academic failure through their NAPLAN test scores and through teacher knowledge of students' learning difficulties. The standardised Progressive Achievement Tests (PAT tests) and Cognitive Aptitude Assessment System (OZCAAS) assessments are also used as pre- and post-test measures.

The pre-test data from these tests also helps to identify students at risk of learning failure before the intervention begins.

Primary school students who participate in the *QuickSmart* programs are students who:
• experience persistent difficulty in Literacy or Numeracy (or sometimes both)
• display a good attitude to working in small groups
• have average cognitive potential without major attention difficulties.

Secondary school students selected for the *QuickSmart* program are students who:
• experience learning difficulties in Literacy or Numeracy (or sometimes both)
• perform in the lowest two bands on the statewide year 7 screening tests
• have a regular school attendance pattern.

These students are withdrawn from class for 30 minutes on three occasions a week for 30 weeks.

Feedback from parents and tutors:
• My students' attitudes have improved and their self-confidence increased.
• It is time consuming, but the results are worth it.
• I believe this will benefit the Indigenous students greatly.
• Students' attitudes have improved because they are more confident and now enjoy maths.

Two intervention programs

At the core of the *QuickSmart* program are two intervention programs: one for Numeracy and one for Literacy. The intervention programs are intensive and require pairs of students to be withdrawn from the classroom to work with an adult. Where possible, the pairings match up students with similar learning obstacles in either Numeracy or reading.

The *QuickSmart* program follows a structured lesson sequence that provides students with regular and predictable learning sequences.

Instructional time is made available for students to practise and improve on what they already know, to focus on learning and to practise new knowledge.

QuickSmart Numeracy program

The *QuickSmart* Numeracy program focuses on problem solving and improving students' recall of basic number facts. The sessions are structured to include the following short, focused activities:

- Timed recall of basic number facts from a targeted set of focus number facts, using flashcards.
- 'Speed Sheets' that relate to the same set of basic focus number facts involving operations on numbers 0–12, and extension number facts involving operations on numbers in the tens and hundreds.
- Independent work sheets completed while students take turns with OZCAAS.
- Regular testing on tasks from the OZCAAS bank of mathematical tasks.
- Games that consolidate recall of number facts or the use of strategies for calculating number facts.

QuickSmart Numeracy lessons begin with a review of the focus facts, starting with those already known, and moving on to those yet to be remembered. Instructor-led discussion and questioning about the relationship between number facts and ways to recall them merge into simple mathematics fact-practice activities, such as 'Speed Sheets', and games that involve numbers and number operations, such as 'Three in a Row' and 'Same Sums'. These games complement each set of focus facts and allow students to review and consolidate their learning in a motivating way.

Towards the end of the Numeracy lesson, students practise their skills independently on worksheets that are closely related to the lesson content. Numeracy lessons usually conclude with a brief OZCAAS assessment; this allows learners to monitor their progress and motivates them to improve their performance.

Both structured and incidental strategy instruction are important features of Numeracy lessons, with the aim of overcoming students' reliance on slow and error-prone strategies – such as the 'count by one' strategy – to the use of more sophisticated and efficient strategies, including automatic recall.

Once the program is established, at least one lesson a week focuses on problem-solving strategies and activities.

QuickSmart Literacy program

The *QuickSmart* Literacy program focuses on improving the automaticity of students' word recognition and fluency in reading connected texts. (Automaticity is the ability to perform a skill fluently with minimal conscious effort.) Each week, the three reading-intervention sessions include:

- timed flashcard activities based on a set of focus words selected from a target text
- vocabulary and word-study activities
- repeated readings of the target text to improve students' reading fluency
- scaffolded use of comprehension strategies
- reading games designed to consolidate students' work.

QuickSmart Literacy-intervention sessions are structured to include several short, focused activities aimed at improving student's word-recognition speed, reading fluency and comprehension skills. Instruction is organised into units covering three to four weeks – nine to 12 lessons – that centre on sets of focus words. Sets of around 30 focus words link the components of the lesson. These words range in difficulty from high-usage three- and four-letter words to more complex and demanding sets of words. The focus words are linked either to a curriculum learning area, a quality literary text, or a theme of interest to the students. The focus words are included in passages of connected text relevant to the topic.

Both programs enable instructors to plan instruction that meets students' learning needs, raises expectations of student performance, and provides students with opportunities to self-monitor and receive immediate formative feedback.

Costs

The costs associated with the program are for personnel, materials, professional learning and administration. As a guide, the total cost of establishing and implementing a *QuickSmart* program for 24 students was about $47,010 in 2012.

Teacher feedback has been positive:

- Improved attitude towards his work. He is having a go and trusting himself.
- It has built a safe environment for particular students.
- IT REALLY WORKS!!!!
- Very positive. Students have improved not only in maths but are willing to challenge themselves in other areas of learning.

Results

During the initial development of the *QuickSmart* program in 2001–2005, students, classroom teachers, instructors, principals, parents and learning support teachers were all involved in developing the qualitative questionnaires currently used. In addition, when working with a small sample of schools, information was canvassed through parent gatherings, sessions at school staff meetings and consultation. Rigorous statistical testing showed that *QuickSmart* programs have had a major effect on students' Numeracy or Literacy outcomes.

Analyses of *QuickSmart* since 2001 have identified statistically significant end-of-program and longitudinal gains using probability measures and effect sizes that confirm verbal and written reports by principals, teachers, teacher aides and parents. Independent assessments (federal, statewide or standardised tests) gathered from *QuickSmart* and comparison students over ten years consistently show that all *QuickSmart* students – Indigenous and non-indigenous – have made substantial academic improvement.

Before-and-after comparisons, comparisons between participants and average-achieving non-participants, and comparisons between different categories of participants formed part of the research data. Other qualitative data were collected from the instructors, teachers, students, coordinators, parents, learning-assistance staff and principals involved with the *QuickSmart* program.

Recent results are described in detail on the *QuickSmart* 🔗 website. Research data collected from across Australia show the following:

- The average effect size results (of 0.60 to 0.94) for several thousands of *QuickSmart* Indigenous and non-Indigenous students translate into growth of two to three years in one year, compared with the gains made by average-achieving students. (An effect size of 0.3 represents an expected yearly average growth for non-*QuickSmart* students.)
- Growth on standardised tests in the first year of implementation is increased and sometimes doubled for new students in the second year, as schools and instructors become more experienced.
- Learning continues to deepen after students exit the program, with academic gains maintained or enhanced in subsequent years.
- Indigenous students results mirror those of non-Indigenous students; they also show increased engagement in class and many schools showed improved student attendance.

At post-test, students routinely show improved information-retrieval times on OZCAAS tasks, with many also achieving better results on standardised tests of reading comprehension, vocabulary and mathematics. This finding indicates that improved automaticity in basic skills can lead to improvements in more generic skills, such as comprehension and problem solving; these are higher-order skills that are important to all learning areas.

The *QuickSmart* programs have contributed to increased levels of student confidence and resilience, as attested by the students, their parents and teachers. Instructors have also reported that over time the students tend to become more willing to take risks in their learning, and show the increased confidence necessary to participate in other learning areas. Many schools have also reported students as demonstrating persistence in learning to read, in class discussions, and in attempting maths problems. In general, qualitative data – including the 2009 report *QuickSmart* Intervention Research Program: Using Data 2001–2008 – indicates that students demonstrate greater resilience at the end of the program and have an increased sense of self-worth. Many students also challenge themselves by taking ownership of their goals for improving basic academic skills.

During the development of *QuickSmart* programs, longitudinal data were collected one, three and five years after students completed the programs. In general, the data showed that students maintained their levels of fast and accurate basic skills.

In summary, research findings indicate that the instructional design of the *QuickSmart* Numeracy and Literacy programs has been successful in helping students overcome many of their learning obstacles.

Conclusions

Maintenance data collected since 2001 indicate that the positive educational effects of the *QuickSmart* programs last up to five years after students have left the program. There is also research evidence to suggest that there are general positive effects on students' levels of self-confidence as learners, as well as improvements in their ability to learn more independently.

Another outcome of the program is the reportedly increased skill base among coordinators and instructors resulting from the professional learning involved and from what they learned through implementing the program.

Similarly, principals have commented how the program has had an influence on whole-school improvement. For example, while there is strong evidence of growth in students in the first year of implementation (about 10 per cent on average), evidence exists that this increase can be expected to improve in the second and subsequent years. Improving the basic skills of low-achieving students can make it possible for teachers to improve the performance of all members of the class.

The *QuickSmart* team was awarded the inaugural University of New England Vice-Chancellor's Award for Excellence in Research in 2009. They also received a 2011 North-West Innovation Award in the Education category.

Lessons learned

The success of *QuickSmart* programs highlights the important role of efficient working-memory use in students' successful engagement with academic tasks related to Numeracy and Literacy. The construct of working memory is fundamental to information-processing conceptualisations of learning. Typically, students involved in *QuickSmart* programs initially demonstrate slow information-processing times, as measured on the OZCAAS pre-test assessments, indicating that they use their limited working-memory resources to laboriously decode or calculate. In ongoing observations of students' learning, it was consistently noted that inefficient strategies – such as slow decoding of previously known words or using the count-by-one strategy to solve simple algorithms – negatively affected knowledge, speed of recall and students' ability to engage with higher-order tasks such as comprehension and problem solving.

The use of the computer-based academic assessment system (OZCAAS) facilitates the ongoing collection of data targeting students' information-retrieval times and levels of accuracy during *QuickSmart* lessons. Both of these measures are related to working memory: improved information-retrieval times free up working memory from an excessive focus on routine tasks.

The success of the programs demonstrates that the use of explicit strategy and content instruction – and the systematic use of focused and timed practice activities – may overcome students' learning obstacles. Attempts to overcome deficits in basic skills require consistent long-term intervention. Such interventions should be designed to maintain interest and promote students' motivation and belief in their own ability through repeated success.

Some very useful procedures for overcoming learning obstacles are features of *QuickSmart* programs. Many of these procedures are identified in the research literature relating to effective instruction for students with learning difficulties.

These features include:

- a structured and predictable lesson sequence
- content based on topics of high interest to students
- repeated opportunities for students to succeed and to know they were improving, eg recording and graphing of results
- graduated prompting responsive to student's needs
- externalising time in a low-key yet focused and consistent way, eg through the use of stopwatches, egg-timers and repeated tasks
- timed, focused, deliberate practice activities
- explicit strategy instruction
- explicit instruction focused on developing metacognitive awareness by asking students to become aware of and explain their thinking processes.

Following is a selection of students' comments about the QuickSmart programs:

- *QuickSmart* has helped me with my maths. I am getting better at my times tables and subtraction questions.
- It helps you read better and spell words, and helps us figure out words and how to read better. It is good to make our brains focus on words properly and read.
- *QuickSmart* has helped me outside in the cattle yards by adding cows together.
- I enjoy it!
- I'm the king of this!
- I can do this!

Next steps

To implement a QuickSmart program a *QuickSmart* coordinator needs to be appointed to work alongside a senior staff 'champion' (usually the principal). *QuickSmart* Instructors are either reassigned paraprofessional staff or are employed specifically to work with pairs of students. Open communication between staff and the school community supports a focused approach to improving students' basic academic skills. It is important to maintain quality control of training and implementation for positive substantial learning outcomes to be evident.

Research base

QuickSmart is informed by relevant literature associated with learning difficulties or disabilities (Baker, Gersten & Lee 2003; McMaster, Fuchs, Fuchs & Compton 2005), effective instruction (Rowe, Stephanou & Urbach 2006), mathematics education (Fuchs & Fuchs 2001; Westwood 2011), reading (Bhat, Griffin & Sindelar 2003; Harris, Schumaker & Deshler 2011; Pikulski & Chard 2005; Royer, Tronsky & Chan 1999), reading comprehension (Archer, Gleason & Vachon 2003; Graham & Bellert 2007; Graham & Wong 1993; Edmonds et al. 2009) and educational interventions (Deshler, Mellard, Tollefson & Byrd 2005; Marston 2005; Resnick 2010). Underpinning the *QuickSmart* intervention program is the establishment of a motivational learning environment that emphasises fluent recall of basic facts, performance of basic skills, the use of strategies, and timed and strategic practice.

Bratina and Krudwig (2003, p.47) cite findings that comprehension is a necessary but insufficient condition for mathematical proficiency and discuss the importance of automaticity to skilled performance. According to Hasselbring, Goin & Bransford (1988), 'the ability to succeed in higher-order skills appears to be directly related to the efficiency at which lower-order processes are executed'. In accordance with these and similar research findings (Keeler & Swanson 2001; Mabbott & Bisanz 2008; National Mathematics Advisory Panel 2008; Woodward 2006), the aim of the *QuickSmart* program is to improve students' information-retrieval times to levels that free working-memory capacity from an excessive focus on mundane or routine tasks. In this way, students become better resourced to undertake higher-order mental processing and develop age-appropriate basic reading, comprehension and mathematics skills.

Further reading and links

Archer, AL, Gleason, MM & Vachon, VL 2003, 'Decoding and fluency: foundation skills for struggling older readers', *Learning disability quarterly,* no. 26*,* pp. 89–101.

Australian Teacher Magazine, '[Aiding literacy and numeracy *QuickSmart*](#)' 🔗.

Baker, S, Gersten, R & Lee, DS 2002, 'A synthesis of empirical research on teaching mathematics to low-achieving students', *The elementary school journal,* vol. 103, no. 1, pp. 5–73.

Bhat, P, Griffin, CC & Sindelar, PT 2003, 'Phonological awareness instruction for middle school students with learning disabilities', *Learning disability quarterly,* vol. 26, no. 2, pp. 73–88.

Bratina, TA & Krudwig, KM 2003, 'Get it right and get it fast! Building automaticity to strengthen mathematical proficiency', *Focus on learning problems in mathematics*, vol. 25, no. 3, pp. 47–63.

Department for Education and Child Development, *QuickSmart* maths, *Bridgewater Primary School* .

Deshler, DD, Mellard, DF, Tollefson, JM & Byrd, SE 2005, 'Research topics in responsiveness to intervention: introduction to a special series', *Journal of learning disabilities*, vol. 38, no. 6, pp. 483–484.

Earl, L, Levin, B, Leithwood, K, Fullan, M & Watson, N 2001, *Watching and learning 2: OISE/UT evaluation of the implementation of the national literacy and numeracy strategies in England*, Department of Education and Employment, London.

Edmonds, MS, Vaughn, S, Wexler, J, Reutebuch, CK, Cable, A, Tackett KK, Schnakenberg, JW 2009, 'A synthesis of reading interventions and effects on reading comprehension outcomes for older struggling readers', *Review of educational research*, no. 79, pp. 262–300.

Fuchs, D & Fuchs, L 2001, 'Responsiveness to intervention: a blueprint for practitioners, policymakers and parents', *Teaching exceptional children,* vol. 38, no. 1, pp. 57–61.

Graham, L & Bellert, A 2007, 'Effective reading comprehension instruction for students with learning disabilities', *Australian journal of dyslexia and specific learning disabilities*, no. 2*, pp. 7–15.

Graham L, Pegg J, Bellert A, Thomas J 2004, *The QuickSmart program: allowing students to undertake higher order mental processing by providing a learning environment to improve their information retrieval times* , Centre for Cognitive Research in Learning.

Graham, L & Wong, BYL 1993, 'Comparing two modes in teaching a question-answering strategy for enhancing reading comprehension: didactic and self-instructional training', *Journal of learning disabilities*, vol. 26, no. 4, pp. 270–279.

Hargreaves, A 2007, *The long and short of educational change*, accessed April 2009,

Harris, ML, Schumaker, JB & Deshler, DD 2011, 'The effects of strategic morphological analysis instruction on the vocabulary performance of secondary students with and without disabilities', *Learning disability quarterly,* vol. 34, no. 1, pp. 17–33.

Hasselbring, TS, Goin, L & Bransford, JD 1988, 'Developing math automaticity in learning handicapped children: the role of computerized drill and practice', *Focus on exceptional children*, no. 20, pp. 1–7.

Huberman M & Miles, MB , 2001, *The qualitative researcher's companion*, Sage, Thousand Oaks, California.

Keeler, ML & Swanson, HL 2001, 'Does strategy knowledge influence working memory in children with mathematical disabilities?' *Journal of learning disabilities*, vol. 34, no. 5, pp. 418–434.

Mabbott, DJ & Bisanz, J 2008, 'Computational skills, working memory, and conceptual knowledge in older children with mathematics learning disabilities', *Journal of learning disabilities*, vol. 41, no. 1, pp. 15–29.

McMaster, KL, Fuchs, D, Fuchs, LS & Compton, DL 2005, 'Responding to nonresponders: an experimental field trial of identification and intervention methods', *Exceptional children*, vol. 71, no. 4, pp. 445–463.

Marston, D 2005, 'Tiers of intervention in responsiveness to intervention: prevention outcomes and learning disabilities identification patterns', *Journal of learning disabilities*, no. 38, pp. 539–544.

National Mathematics Advisory Panel 2008, *Foundations for success: the final report of the national mathematics advisory panel*, US Department of Education, Washington, DC.

Neems, M 2010, *Team gains Federal kudos,* Armidale Express.

Northern Territory Government of Australia 2009, search results, *QuickSmart*, [Department of Education and Training](#) .

Pikulski, JJ & Chard, DJ 2005, 'Fluency: bridge between decoding and reading comprehension', *The reading teacher*, no. 58, pp. 510–519.

Resnick, LB 2010, 'Nested learning systems for the thinking curriculum', *Educational researcher*, vol. 39, no. 5, pp. 183–197.

Rowe, KJ, Stephanou, A & Urbach, D 2006, *Effective teaching and learning practices initiative for students with learning difficulties,* report to Australian Government Department of Education, Science and Training, the Department of Education and Training Victoria,

Catholic Education Office of Victoria, and the Association of Independent Schools of Victoria, ACER, Camberwell, Victoria.

Royer, JM, Tronsky, LN & Chan, Y 1999, 'Math-fact retrieval as the cognitive mechanism underlying gender differences in math test performance', *Contemporary educational psychology,* no. 24, pp. 181–266.

SiMERR Australia 2011, *QuickSmart group interview* .

— 2009, *Lorraine Graham mathematics summer school* .

— 2011, *Ali Donaldson interview* .

— 2011, *Anne Bellert interview* .

— 2011, *Bernadette Lacey interview* .

— 2011, *Jo-Anne Jefferson interview* .

— 2011, *Literacy QuickSmart* .

— 2011, *Lyn Donaghue interview* .

— 2011, *Mary Walsh interview* .

— 2011, *Numeracy: QuickSmart.mpg* .

— 2011, *Rob Presswell interview* .

— 2011, *Roslyn Shepherd interview* .

— 2011, *Steph Hickey* .

— 2011, *Treena Hogan interview* .

SiMERR National Research Centre, *QuickSmart publications* , University of New England.

— *QuickSmart research evidence* , University of New England.

— *QuickSmart videos* , University of New England.

St Barbara's Parish School, *QuickSmart* .

Westwood, P 2011, 'The problem with problems: potential difficulties in implementing problem-based learning as the core method in primary school mathematics', *Australian journal of learning disabilities,* vol. 16, no. 1, pp. 5–18.

Woodward, J 2006, 'Developing automaticity in multiplication facts: integrating strategy instruction with timed practice drills', *Learning disability quarterly,* no. 29, pp. 269–289.

Contacts

For more details about the program, contact *QuickSmart* via the website.