Effective teaching practices for students with and without learning difficulties:
Constructivism as a legitimate theory of learning AND of teaching?

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Abstract: Much of what is commonly claimed as 'effective teaching practice' and implemented during the early and middle years of schooling in Australian schools, for either mainstream students or for those experiencing learning difficulties, is not grounded in findings from evidence-based research. Of particular concern is that despite a lack of supporting evidence for its utility, the prevailing educational philosophy of *constructivism* (a theory of *self-directed learning* rather than a theory of *teaching*) continues to have marked influences on shaping teachers' interpretations of how they should teach – aided and abetted by the content emphasis given during pre-service teacher education, as well as in-service teacher professional development programs. However, in contrast to *teacher-directed* methods of teaching there is strong evidence that exclusive emphasis on *constructivist* approaches to teaching are neither initially nor subsequently in the best interests of any group of students, and especially those experiencing learning difficulties.

Following a brief outline of controversies surrounding 'effective teaching practice', this paper focuses on teaching strategies that are demonstrably effective in maximising the achievement progress of students during the early and middle years of schooling. Further, key findings are presented from a recent national project designed to identify effective teaching practices for Year 4-6 students with learning difficulties in *Reading* and *Numeracy*, drawn from government, Catholic and independent schools. These findings indicate that since teachers are the most valuable resource available to schools, an investment in teacher professionalism is vital by ensuring that they are equipped with an evidence-based repertoire of pedagogical skills that **are** effective in meeting the developmental and learning needs of ALL students.

Contemporary understandings of 'effective' teaching practice

Teaching strategies have long generated debate and ideological controversy, especially as to 'best practice'. Two clear orientations have provided the basis for this controversy: *direct* (or *explicit*) *instruction*, and student-centred *constructivist* approaches. Whereas neither of these teaching methods alone (or their variants) is appropriate for engendering all types of learning (see: Purdie & Ellis, 2005; Westwood, 1999, 2006), the widespread and mostly unquestioning adoption of *constructivist* orientations towards teaching in most areas of the curriculum throughout Australian schools and higher education institutions is problematic.

A key reason for this is that despite strong supporting evidence for the superior effects of teacher-directed approaches on student learning (i.e., *direct instruction*),[2] the philosophy of *constructivism* (a cognitive theory of *learning* rather than of *teaching*) has enduring influences on the content of teacher education courses (see: Louden *et al*., 2005a; Rohl & Greaves, 2004; Rowe, 2005a,b), supported by prescribed literature such as: Cambourne (2002); McInerney and McInerney (1998, 2002, 2006), as well as on the content of in-service teacher professional development programs. Moreover, *constructivist* approaches to teaching prevail as predominant

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[2] See, for example: Adams and Engelmann (1996); Center (2005); de Lemos (2004a,b), Ellis (2005); Coltheart (2005b,c); Farkota (2003a,b, 2005); Hattie (2003, 2005), Hempenstall (1996, 1997); Hoad *et al*. (2005); Lindsley (1992); Purdie and Ellis (2005); Rowe (2005a,b, 2006); Stebbins *et al*. (1977); Westwood (1999, 2006); Wheldall (2006).

methods throughout school systems in many western countries, and are given high prominence in the content of curriculum standards (or *essential learning*) documents currently provided by all Australian States and Territory government departments of education and training.

However, there is a strong body of evidence that exclusive emphasis on *constructivist* approaches to teaching are neither initially nor subsequently in the best interests of any group of students, and especially for those experiencing learning difficulties (see: Center, 2005; Farkota, 2003a, 2005; Moats, 2000; Swanson, 1999; Swanson & Deshler, 2003; Westwood, 1999; 2000, 2001, 2003a,b,c, 2004, 2006). For children from disadvantaged backgrounds who often do not have rich phonological knowledge and phonemic awareness upon which to base new learning, being taught under *constructivist* modes has the effect of compounding their disadvantage once they begin school (Munro, 1997, 1998, 1999, 2000a,b).

This is particularly the case for children from non-English speaking backgrounds including Indigenous children, where English may be their second or third language. Indeed, Farkota (2005) argues that many cases of learning difficulty and related under-achievement can be attributed to inappropriate or insufficient teaching, rather than to deficiencies intrinsic to students such as cognitive, affective and behavioural difficulties, as well as their socio-cultural backgrounds and contexts, with *constructivist* approaches being major protagonists. A brief explication of *constructivist* approaches to teaching is warranted here.

The rationale for *constructivism* as a teaching method

Teaching methods that are described as 'student-centred' tend to be aligned with *constructivism* – an established and widely espoused theory of *knowing* and *learning*[3] – can be traced to advocates of active and experimental methods reflected in the work of educational theorists such as Ausubel (1968), Bruner (1961, 1966), Dewey (1933), Piaget (1954), Rousseau (1762, 1979) and Vygotsky (1978). More recently, advocates of *constructivism* have coined various labels for *constructivist* approaches to both learning **and** teaching, including: 'anchored instruction', situated learning', 'discovery learning', 'task-based learning' and 'scaffolding' – each of which share many common features. Further, as noted by Westwood (2006): "'problem-based learning' (PBL) – also known as 'issues-based learning' – has gained popularity in recent years as a method for use in higher education, particularly in the medical, therapeutic and other professional fields where the 'problem' is often in the form of a 'case study'" (p. 36). PBL encompasses many of the 'student-centred' approaches to teaching and learning for which the underlying rationale is essentially twofold:

- students should be intrinsically motivated and actively involved in the learning process; and
- subject matter studied should, as far as possible, be 'authentic', 'interesting' and 'relevant'.

The implicit assumptions underlying such rationale are that 'intrinsically motivated' learners, independent of explicit instruction provision, have acquired sufficient prior knowledge and skills (particularly basic literacy, numeracy and study skills) to engage effectively and productively for generating new learning in a given subject matter domain. The compelling evidence that this is not the case for medical students in the acquisition of differential diagnostic skills, for example, applies equally for children learning to read, write, spell and undertake mathematical computation. In the case of medical students, the necessity of explicit instruction by subject matter experts for efficient knowledge acquisition in the basic sciences of anatomy, physiology, biochemistry and pathology is foundational. Similarly, for children learning to read, write, spell and compute, explicit instruction in the alphabetic principle of letter-sound relationships (especially in English) and the mathematical principles underlying computation in number operations, space and measurement, are also foundational to literacy and numeracy learning.

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[3]   For succinct outlines of the various types of *constructivism*, see: McInerney and McInerney (2006, pp. 3-4); Purdie and Ellis (2005, pp. 9-11).

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Despite strong evidence for the limitations of exclusive *constructivist* methods of teaching, they are widely endorsed and practiced. For example, in their opening chapter titled: *Effective teaching and learning–constructivist perspectives*, McInerney and McInerney (2006, p. 3) write:

> These approaches explicitly emphasise the intrapersonal dimensions of learning and, in particular, posit that knowledge is not transmitted directly from one knower to another, but is actively built up by the learner through child-determined exploration and discovery rather than direct teaching.

These claims are extraordinary on at least two counts: (a) they are not supported by findings from a large body of evidence-based research,[4] and (b) give rise to deleterious effects of educators absolving their professional responsibility to be instructionally effective in teaching foundational knowledge and skills (e.g., Creemers, 1994; Hattie, 2003, 2005; Muijs & Reynolds, 2001; Rowe, 2005b, 2006; Slavin, 1994).

Features of *constructivism* and their limitations for teaching practice

The key element in *constructivism* is that the learner is an active contributor to the learning process, and that teaching methods should focus on what the student can bring to the learning situation as much as on what is received from the environment. This approach is expressed by Ausubel's (1968) contention that "the most important single factor influencing learning is what the learner already knows" (p. 332). Learning that builds effectively on the learner's current knowledge is said to be within the student's *zone of proximal development* (ZPD). The ZPD establishes what the learner already knows, and can do with minimal assistance by a teacher or peer – following which the individual is expected to undertake learning tasks independently.

Hence, the role of the teacher is to be a *facilitator* of learning (rather than a *director* or an *orchestrator*), and to provide opportunities for individual learners to acquire knowledge and construct meaning through their own activities, and through discussion, reflection and the sharing of ideas with other learners with minimal corrective intervention (Cambourne, 2002; Daniels, 2001; McInerney & McInerney, 1998, 2002 2006; Selley, 1999; Von Glasersfeld, 1995). Sasson (2001, p. 189) refers to *constructivism* as "… a mixture of Piagetian stage theory with postmodernist ideology" that is devoid of evidence-based justification for its adoption as an effective method of teaching. Similarly, in highlighting the inappropriateness of *constructivism* as an operational *theory of teaching*, Wilson (2005, pp. 2-3), posits:

> … We largely ignore generations of professional experience and knowledge in favour of a slick postmodern theoretical approach, most often characterised by the misuse of the notion of constructivism.
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> … Australian operational views of constructivism … confuse a theory of knowing with a theory of teaching. We confuse the need for the child to construct her own knowledge with a form of pedagogy which sees it as the child's responsibility to achieve that. We focus on the action of the student in the construction of knowledge rather than the action of the teacher in engaging with the child's current misconceptions and structuring experiences to challenge those misconceptions. … The constructivist theory of knowing has been used to justify a non-interventionist theory of pedagogy, whereas it is a fair interpretation to argue that constructivism requires vigorous interventionist teaching: how, after all, is a student with misconceptions supposed to challenge them unaided? How does she even know they are misconceptions?
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> We need, instead, a view of teaching which emphasises that the role of the teacher is to intervene vigorously and systematically; that is done on the basis of excellent knowledge of a domain and of student conceptions and misconceptions in that domain, assembled from high quality formative assessments; and that the purpose of the intervention is to ensure that the child's construction of knowledge leads her to a more correct understanding of the domain.

These assertions by Wilson are consistent with expressed concerns that most faculties and schools of education in Australian universities currently providing pre-service teacher education

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4   For example, see: Coltheart (2005b); Ellis (2005); Farkota (2003a, 2005); Hattie (2003, 2005); Purdie and Ellis (2005), Rowe (2005b, 2006); Westwood (2004, 2006); Wheldall (2006).

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base their programs on *constructivist* views of both learning *and* teaching.[5] Westwood (1999), for example, highlights the results of a small South Australian study which found that most teachers (79%) had been strongly encouraged to use a *constructivist* approach in their initial teacher education courses and during in-service professional development programs. Even more notably, 67 per cent of the teacher trainees in this study indicated that *constructivism* was the *only* teaching approach to which they had been exposed in their teaching method courses. Commenting on these findings, Westwood (1999, p. 5) declares:

> At the same time as constructivist approaches have been promoted, direct teaching methods have been overtly or covertly criticised and dismissed as inappropriate, with the suggestion that they simply don't work and are dull and boring for learners. The message that most teachers appear to have absorbed is that all direct teaching is old-fashioned and should be abandoned in favour of student-centred enquiry and activity-based learning.

In commenting on what is arguably the most comprehensive report on initial teacher education and professional development compiled to date, *Teachers Matter* (OECD, 2005), Caldwell (2006, p. 112) observes:

> The focus of training programs for teachers has been overwhelmingly on initial teacher education, which includes training on pedagogy, the subject matter that the pre-service teacher aims to teach and, often, subject-specific pedagogy. This report suggest that pre-service education needs to be more focused on the things teachers will be expected to know and do once in the classroom.

This is excellent advice, provided that teacher educators and in-service professional development providers base their curricular for teaching practice on findings from the extensive body of research evidence that clearly indicates *what works* (e.g., see cited references given in footnote 4). The fact that this is most often not the case is alarming (Rowe, 2005a,b, 2006). For example, in highlighting the evidence indicating that failure in student learning is strongly linked to deficiencies in teaching practice, Wheldall (2006, p. 177) notes:

> [A] necessary condition for learning to take place is effective instruction, but we hardly ever seem to employ it in schools! This is particularly evident in the teaching of reading. In spite of the failure of so-called *whole language* in teaching reading [a *constructivist* orientation], this is the approach that most teachers identify with and which dominates practice in our schools. … This frustration with ineffective instruction in reading and related skills led to our development of MULILIT [Wheldall & Beaman, 2000]. By employing a rigorous, intensive, systematic, skills-based program of instruction, we have demonstrated that low progress readers can make extraordinary progress.

These observations correspond with the purpose of the present paper, namely to highlight local and international evidence-based research findings that identify 'best' teaching practice for student learning, especially for those who experience learning difficulties. Compared with *constructivist* pedagogies, the key elements of *Direct Instruction* and the research evidence that support its utility are worth noting here – albeit briefly.[6]

Key features of *Direct Instruction* and its research-base

Direct instruction (DI) – sometimes referred to as *explicit instruction* – "is a systematic method for presenting learning material in small steps, pausing to check for student understanding, and eliciting active and successful participation from all students" (Rosenshine, 1986, p. 60). DI modes of instruction are well grounded in findings from evidence-based research in cognitive science (see references cited in footnote 2), and give little attention to the 'causes' of under-achievement, learning difficulties, or to students' underlying abilities (Casey, 1994). Thus, DI

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[5]　See: de Lemos (2002, 2004a); Fielding-Barnsley and Purdie (2005); Louden *et al.* (2005a-c); Rohl and Greaves (2004); Rowe (2005a, Appendix 2); Westwood (1999, 2004, 2006).

[6]　For recent and more comprehensive accounts of *Direct Instruction*, see: Ellis (2005, pp. 28-33); Farkota (2003b, 2005), Purdie and Ellis (2005, pp. 21-25), McInerney and McInerney (2006, pp. 174-180); Westwood (2006, pp. 16-19).

programs are designed according to **what**, not **who**, is to be taught. Individual differences among students are allowed for through different entry points, reinforcement, amounts of practice, and correction strategies (see: Engelmann, 1980, 1999; Farkota, 2003a,b, 2005; Hempenstall, 1996, 1997).

Direct Instruction is based on both the theory and evidence that learning can be greatly accelerated if instructional presentations are clear, minimise misinterpretations, and facilitate generalizations (Northwest Regional Education Laboratory, 2003). The principles upon which DI approaches are based include:

- all children can learn, regardless of their intrinsic and context characteristics;

- the teaching of basic skills and their application in higher-order skills is essential to intelligent behaviour and should be the main focus of any instructional program, and certainly prior to student-directed learning activities; and

- instruction with students experiencing learning difficulties must be highly structured and permit large amounts of practice (Block, Everson, & Guskey, 1995; Bowey, 2000; Engelmann, 1999).

Evidence for the utility of DI for the acceleration of student learning has been well demonstrated in findings from *Project Follow Through*, the largest and most costly research study in the history of education, in which both *constructivist* 'student-centred' (or 'student-directed') models of teaching and 'teacher-directed' models were evaluated in terms of student learning gains.[7] The project began in 1967 with President Lyndon Johnson's 'war on poverty' and was government-funded until 1995 (Grossen, 1995). This massive government initiative was aimed at breaking poverty cycles by providing disadvantaged students with a 'better education'. Over a period of almost 30 years and at cost of more than one billion US dollars, *Project Follow Through* included over 70,000 students in more than 180 schools.

The project's objective was to identify teaching methods that are demonstrably effective in improving the academic performance of students in America's underprivileged schools – from at and below the 20th percentile level to the 50th percentile levels (Adams & Engelmann, 1996). In the final analysis (Stebbins *et al.*, 1977) students being taught under the *Direct Instruction* model scored close to the 50th percentile in every subject, while for the other student-directed models, students consistently scored beneath the 20th percentile. Analysts of *Project Follow Through* evaluation data were unanimous in their agreement that teacher-directed methods of instruction resulted in consistently stronger student learning gains than those obtained from student-directed methods (Bereiter & Kurland, 1981; Lindsley, 1992; Stebbins *et al.*, 1977). An analysis of the comparison data reported by Engelmann *et al*. (1988) also showed that of all the teaching models evaluated in *Project Follow Through*, the student-directed models consistently obtained the lowest achievements in all subjects.

Meta-analytic syntheses of findings from more than 500,000 evidence-based studies of influences on student learning outcomes, including teaching methods, provide support for these results.[8] For example, from such syntheses, Hattie (2003) has rank-ordered average *effect sizes* of commonly studied influences on student learning, as summarised below in Tables 1a and 1b, from which several features of the data are notable. First, of the 32 'influences' listed, 29 have

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7   For the original report of findings from *Project Follow Through*, see Stebbins *et al.* (1977). Similarly, for more complete descriptions of the curriculum and the philosophies of instruction evaluated in *Project Follow Through*, see Kinder and Carnine (1991).

8   *Meta-analysis* is a statistical method used for summarising findings from many studies that have investigated a similar problem. The method provides a numerical way of assessing and comparing the magnitudes of 'average' results, known as *effect size* (ES) – expressed in standard deviation (SD) units. An *effect size* is calculated as the difference in performance between the average scores of a group in a trial or experimental condition and those in a comparison condition, divided by the SD of the comparison group (or more often, divided by the pooled SD of both groups). An *effect size* ≤ 0.3 is regarded as 'weak'; 0.5 is considered 'moderate'; and 0.8 or larger as 'strong'.

positive effects – 20 of which are related to teachers (i.e., 69%). Second, of the 14 stronger effects given in Table 1a (ES > 0.4 SDs), 11 (~79%) are influenced by teachers. Third, teacher-directed practices that constitute key features of *Direct Instruction* modes of teaching have strong effects on student learning outcomes (i.e., ES > 0.65 SDs), namely: *Instructional & Assessment Feedback*, *Instructional Quality*, *Direct Instruction*, and *Remediation feedback*.

Table 1a Stronger Influences on Student Learning

Influence	Effect Size	Source of Influence
Feedback (instructional & assessment**)**	**1.13**	**Teacher**
Students' prior cognitive ability	1.04	Student
Instructional quality	**1.00**	**Teacher**
Direct instruction	**0.82**	**Teacher**
Remediation feedback	**0.65**	**Teacher**
Students' disposition to learn	0.61	Student
Class environment	**0.56**	**Teacher**
Challenge of Goals	**0.52**	**Teacher**
Peer tutoring	**0.50**	**Teacher**
Mastery learning	**0.50**	**Teacher**
Parent involvement	0.46	Home
Homework	**0.43**	**Teacher**
Teacher Style	**0.42**	**Teacher**
Questioning	**0.41**	**Teacher**

Source: Adapted from Hattie (2003, p. 4).

Table 1b Weaker Influences on Student Learning

Influence	Effect Size	Source of Influence
Peer effects	0.38	Peers
Advance organisers	0.37	**Teacher**
Simulation & games	0.34	**Teacher**
Computer-assisted instruction	0.31	Teacher
Testing	0.30	**Teacher**
Instructional media	0.30	**Teacher**
Aims & policy of the school	0.24	School
Affective attributes of students	0.24	Student
Physical attributes of students	0.21	Student
Programmed instruction	0.18	**Teacher**
Ability groupings	0.18	School
Audio-visual aids	0.16	**Teacher**
Individualisation	0.14	**Teacher**
Finances/money	0.12	School
Behavioural objectives	0.12	**Teacher**
Team teaching	0.06	**Teacher**
Physical attributes (e.g., class size)	-0.05	School
Television	-0.12	Home
Retention	-0.15	School

Source: Adapted from Hattie (2003, p. 4).

In commenting on these findings, Hattie (2003, p. 4) notes:

> … the focus is to have a powerful effect on achievement, and this is where excellent teachers come to the fore – as such, excellence in teaching is the single most powerful influence on achievement. As can be seen from a sample of the possible influences, the major influence near the top of this chart [Table 1a] is in the hands of the teacher. (Although we note some at the bottom, which highlight that it is excellence in teaching that makes the greatest differences, not just teachers).

Given the compelling findings of Hattie's work (as well as that of Swanson, 1999; Swanson & Deshler, 2003), the results of *Project Follow Through* outlined above, together with the syntheses of research on effective methods for the teaching of reading documented in the reports of the *National Reading Panel*,[9] one might well ask why these findings have failed to impact the policies and practices throughout the educational community.

In an analysis of why the results of *Follow Through* were not acted on, Watkins (1995) asserted that: "parochial vested interests that work to either maintain the *status quo* or to advance self-serving models can prevent the implementation of teaching methods, approaches, or practices that clearly have an impact on student learning outcomes" (p. 61). Vested interests can be those of policymakers, faculty staff in higher education institutions, teachers, school district administrators, publishers, and the general public. For instance, Watkins observed that policymakers frequently develop policy that is based on public support, or the ideological views of academic, social and political pressure groups, rather than on empirical evidence. They often rely on inaccurate or incomplete information that others provide. Stakeholders who exert power but ignore the evidence, all too frequently influence them unduly.

From their analyses of findings from *Project Follow Through*, Bereiter and Kurland (1981) also noted competing pedagogical philosophies that prevailed at the time. But, "Philosophies don't teach kids. Events teach kids…" (p. 16). The events that need to happen for students with and without learning difficulties are those devised by teachers for implementation in their classrooms. Above all, these events should be informed by a thorough evidence-based knowledge of *what* works, *why* it works, and *how* it works. To this end, the Australian Council for Educational Research (ACER), with funding support from the Australian Government Department of Education, Science and Training (DEST), has developed a trial teacher professional development (PD) package entitled: *Working-Out What Works* (WOWW) *Training and Resource Manual* (Hoad *et al*., 2005). A brief description of the recent national Project in which the WOWW PD package has been used, together with key findings, are of interest to all stakeholders throughout the educational community.

The 'Third Wave' Project[10]

Beginning in June 2004, the purpose of this Project was to conduct research aimed at improving the literacy and numeracy outcomes of students with learning difficulties who are in Years 4, 5 and 6 in mainstream government, Catholic and independent schools.[11] That is, the Project was primarily designed to identify, implement and evaluate school-based, 'third wave' intervention programs and teaching strategies that improve the literacy and numeracy learning of students

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[9]　In particular, see NRP (2000a,b), and related references including: Camilli, Vargas and Yurecko (2003); Center (2005); Ehri *et al*. (2001); Rowe (2005b, pp. 20-23).

[10]　The DEST contract for the Project has been jointly directed by Ken Rowe (ACER Research Director) and Andrew Stephanou (ACER Senior Research Fellow), and managed by Kerry-Anne Hoad (Manager of ACER's *Centre for Professional Learning*). The final report from the Project is currently being prepared (see: Rowe, Stephanou *et al*., 2006).

[11]　For the purposes of this Project, the 'target group' refers to students with *learning difficulties* located in mainstream schools in Years 4, 5 and 6 (or equivalent years) who do not meet national literacy and/or numeracy benchmark standards. Note that 'first-wave' teaching refers to regular classroom instruction, 'second-wave' refers to initial intervention for students experiencing learning difficulties, and 'third-wave' refers to intervention strategies for students continuing to under-achieve and/or experience learning difficulties during the middle years of schooling.

with learning difficulties. The Project design and methodology to date has consisted of three parts, each of which have occurred in parallel to ensure mutual support:

Part 1: Literature review, and identification of participating government, Catholic and independent schools, and clusters;

Part 2: Development and administration of data gathering tools, including diagnostic/ developmental assessments of student achievement progress in *Reading* and *Numeracy* (calibrated against National Benchmark standards for these domains), based on the principles of *objective measurement* (i.e., *Rasch measurement*).

Part 3: Development, implementation, and evaluation of effective evidence-based 'third-wave' intervention strategies and related professional development programs that are demonstrably effective in supporting school-based interventions for students with learning difficulties. Evaluation methods also included qualitative Case Study visits to selected schools undertaken during March 2006.

The literature review of the available evidence-based research literature was conducted by ACER researchers Drs Nola Purdie and Louise Ellis (Purdie & Ellis, 2005), from which the WOWW PD Manual was produced (i.e., Hoad *et al.*, 2005). The review clearly identified two major strategies that consistently indicate larger positive effects on students' learning and achievement progress than are obtained from any other strategies alone or in combination (i.e., *Direct Instruction* and *Strategy Instruction*).[12] Specific emphasis on these teaching strategies was deemed important on three counts: (a) their 'effectiveness' as teaching methods are firmly grounded in findings from evidence-based research, (b) they are largely unknown to teachers (apart from those familiar with the relevant published research), and (c) with few exceptions, current in-service teacher PD programs in these strategies are not provided by State/Territory education jurisdictions, nor by most Australian higher education institutions.

The project evaluation and data-gathering methodology has been based on a *pre-test/post-test* design among a sample of 56 participating schools: 35 *intervention* schools and 21 *reference schools*, with 694 students in the numeracy component and 653 in the reading component – across Years 4, 5, and 6 (or Years 5, 6 & 7 for QLD, SA and WA schools). *Intervention* schools included those whose teachers were provided with professional development (PD) in effective, evidence-based strategies for 'third wave' students with learning difficulties in *Reading* and *Numeracy* during February/March 2005. For comparative purposes, teachers from participating *reference* schools did not receive this PD during February/March 2005, but were provided with this same PD during May 2006.

In each of the State capital cities: Adelaide, Brisbane, Hobart, Melbourne, Perth and Sydney, the whole-day PD provided to *intervention* school participants during February/March 2005 included training in *Direct Instruction* (DI) and *Strategy Instruction* (SI). The DI PD was presented via a specially prepared DVD demonstrating delivery of lessons using *Elementary Math Mastery* (Farkota, 2003b) and *Corrective Reading* (SRA, 2002). In addition to the specific training provided in these teaching methods, training was provided in *Strategy Instruction*, *How Children Best Learn*, and in *Auditory Processing* (Rowe, Pollard & Rowe, 2005, 2006; Victoria 2001).[13] The training was supplemented by a comprehensive package of related teaching manuals and support materials for use in mainstream classrooms.

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[12] For recent expositions of *Strategy Instruction*, its practical applications and supporting research evidence, see: Ellis (2005, pp. 33-43); Purdie and Ellis (2005, pp. 28-31).

[13] It is interesting to note that **Recommendation 5** from the report of the parliamentary *Enquiry Into the Education of Boys* (Commonwealth of Australia, 2002, pp 107) reads:

The Committee recommends that:

(a) all State and Territory health authorities ensure that kindergarten children are fully tested for hearing and sight problems; and

Pre-test/post-test data from students in both *intervention* and *reference* schools were collected in March 2005 and again in September 2005. In addition to the collection of repeated measures of students' achievements in *Reading* and *Numeracy*, repeated measures of students' externalizing behaviours were obtained for three domains: *Sociable*, *Attentive* and *Settled*, from teacher-ratings on the *Rowe Behavioral Rating Inventories* 12-Item Teacher Form (Rowe & Rowe, 1997, 1999). Repeated measures of students' experiences and attitudes towards school were also collected for three domains: *Enjoyment*, perceived *Curriculum Usefulness* and *Teacher Responsiveness* – employed in earlier longitudinal studies (e.g., Rowe, 1995; Rowe & Hill, 1998). Data analyses and statistical modelling of have taken into account the measurement, distributional and structural properties of the data. The results of key findings are summarised below.

Student achievement growth

Following are key findings arising from the analyses of students' achievements in the March and September 2005 assessments of *Reading* and *Numeracy*, derived from fitting multivariate models to the obtained data, using *STATISTICA* (StatSoft, 2005) – as summarised in Figures 1.1, 1.2 and 2 presented below.

Intervention effect: F(1, 648) = 17.619, *p* = 0.00003
(Adjusted for March 2005 Reading Score)
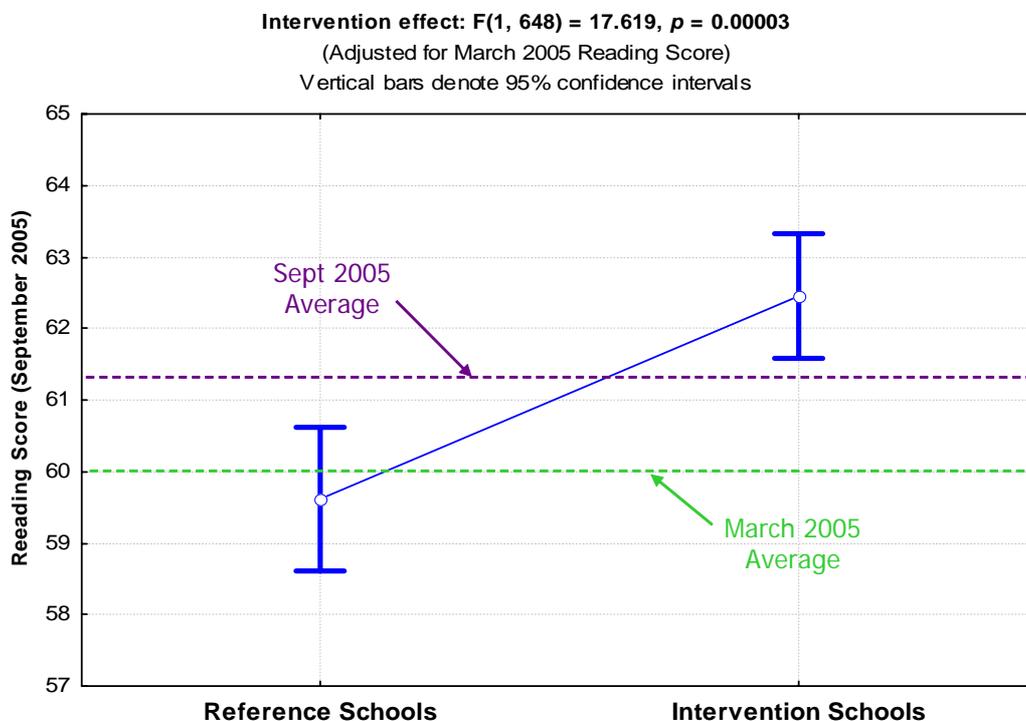Vertical bars denote 95% confidence intervals

Figure 1.1 Plot of mean-point estimates bounded by 95% confidence intervals for students' *Reading* scores in September 2005, adjusted for their March 2005 scores: *Intervention* and *Reference* schools

(b) the Commonwealth and State and Territory governments jointly fund the implementation of the strategies used in the Victorian study on auditory processing in primary schools throughout Australia. Implementation should include:

- professional development for all primary school teachers to raise awareness about the normal development of auditory processing in children;

- the provision of the relevant auditory screening tests and training to equip teachers to administer preliminary tests with referral to specialised support where needed; and

- professional development for teachers in practical classroom management and teaching strategies to address the needs of children with auditory processing difficulties.
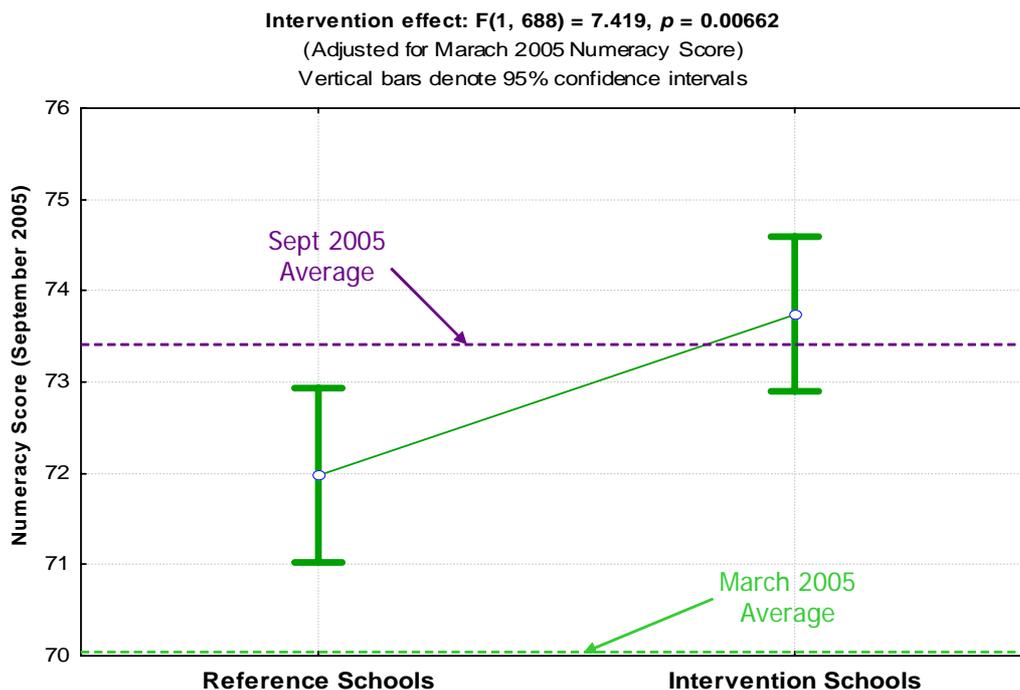
Intervention effect: **F(1, 688) = 7.419, *p* = 0.00662**
(Adjusted for Marach 2005 Numeracy Score)
Vertical bars denote 95% confidence intervals

**Figure 1.2 Plot of mean-point estimates bounded by 95% confidence intervals for
students' *Numeracy* in September 2005, adjusted for their
March 2005 scores: *Intervention* and *Reference* schools**

These summaries provide graphical plots of the adjusted mean-point estimates of students' measured achievements (in *intervention* and *reference* schools) on the constructed *Reading* and *Numeracy* scales, bounded by 95% confidence intervals. That is, a mean-point estimate between its upper and lower intervals is indicates that 'we can be confident' that the computed mean lies somewhere between these intervals. To interpret the graphs, when the confidence intervals for any pair of plots **overlap**, the difference between their mean-point estimates is **not statistically significant** at the 95% level (i.e. *p* > 0.05). Conversely, when the confidence intervals for any pair of plots **do not overlap**, the difference between their means **IS statistically significant**. (i.e., *p* ≤ 0.05).

Initial analyses of the data indicated that in March 2005 there were no significant differences between *intervention* and *reference* school students' average *Reading* and *Numeracy* achievements, at each of the target Year levels. However, the findings summarised in Figures 1.1 and 1.2 indicate that in September 2005 there were significant improvements in the achievements of students in *intervention* schools compared with those in *reference* schools (adjusted for their measured achievements in March 2005).

The findings indicate that (on average), the professional learning, plus its implementation and support provided to *intervention* school teachers during and subsequent to the 2005 *State Training Days*, had significant positive effects on learning difficulties students' achievement progress in *Reading* and *Numeracy*. Given the short duration between the March and September 2005 assessment periods (i.e., ~ 6 months), this result is remarkable.

Student behaviour

In addition to students' achievement progress in *Reading* and *Numeracy*, three measures of their 'behaviours in the classroom' were obtained at the March and September 2005 data-collection stages. The three behaviour scales are: *Antisocial–Sociable*; *Inattentive–Attentive*; and *Restless–Settled*. For specific details of the item content of and related measurement properties of these domains, see Rowe and Rowe (1999). Figure 2 provides a summary of the findings from fitting a multivariate model to the computed behaviour scale score data.

Intervention Effect: F(6, 524) = 5.645, *p* < 0.00001

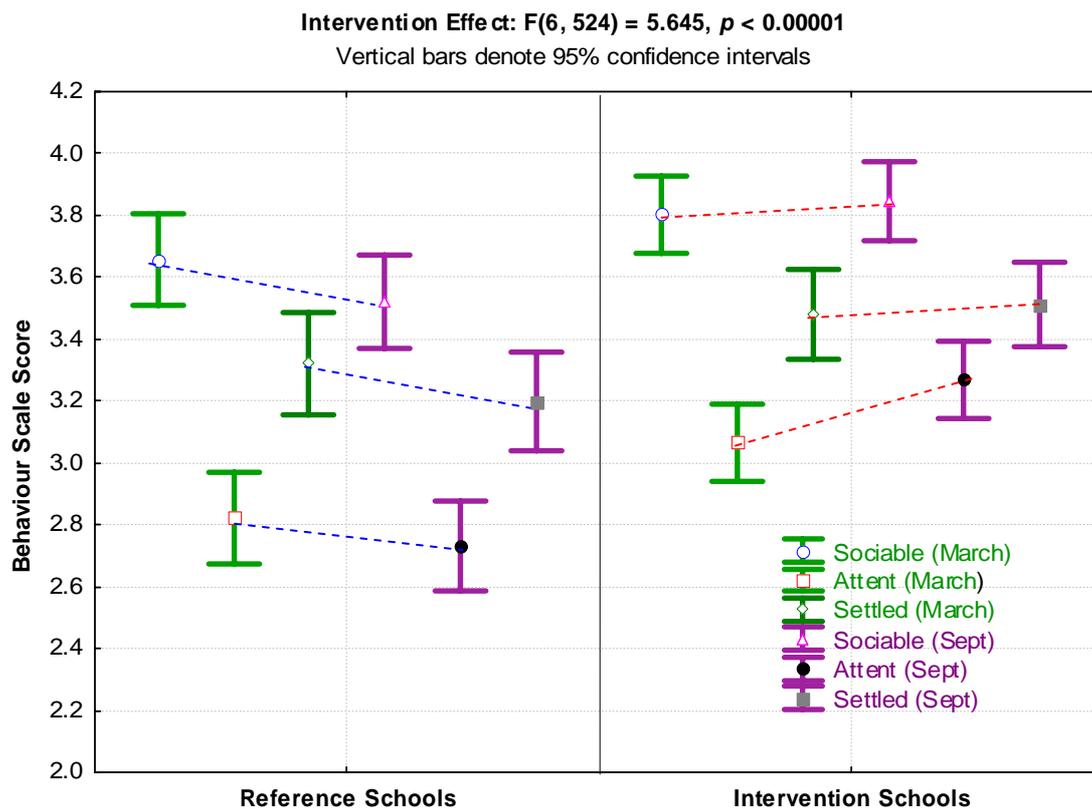Vertical bars denote 95% confidence intervals

Figure 2. Plot of mean-point estimates bounded by 95% confidence intervals for students' behaviour scale scores in September 2005, adjusted for their March 2005 scores: *Intervention* and *Reference* schools

These findings indicate that the behaviours of students in *intervention* schools were significantly more positive compared with the behaviours of students in *reference* schools, especially their *attentive* behaviours in the classroom. Again, given the short duration between the March and September 2005 assessment periods (i.e., ~ 6 months), these results are particularly encouraging.

Of particular interest from Figure 2 are the findings that the behaviours of students in the *intervention* schools improved between March and September 2005, whereas the behaviours of students in the *reference* schools deteriorated – albeit not significantly since the respective confidence intervals overlap. Such findings, however, are consistent with those derived from a large body of both quantitative and qualitative research which indicate a strong overlap between students' academic underachievement and their externalizing behaviour problems (e.g., Cantwell & Baker, 1991; De Watt *et al*., 2004; Hinshaw, 1992a.b; Rowe, 1991, 1995; Purdie, Hattie & Carroll, 2002; Rowe & Rowe, 1992, 1999, 2000, 2002; Sanson *et al*., 1996; Smart *et al*., 2005). That is, the evidence indicates that repeated under-achievement by students (especially in literacy) is strongly related to increasing disengagement at school, low self-esteem, as well as disruptive and dysfunctional externalizing behaviours at school.

In brief, the findings summarised in Figures 1.1, 1.2 and 2 indicate that (on average), the professional learning (together with its implementation and support) provided to *intervention* school teachers during and subsequent to the 2005 *State Training Days* had significant positive effects on learning difficulties students' achievement progress in *Reading* and *Numeracy*, as well as on their attentive behaviours in the classroom. Moreover, these findings were consistent with the qualitative information obtained from Case Study visits to schools.

Key findings from Case Studies

Using systematic Observation and Interview Schedules, Case Study visits to schools were undertaken during March 2006. The selection of schools (including their teachers and students) for these visits, were based on findings arising from analyses of the two data collection phases during 2005. That is, the Case Studies focused on those students (within teachers and schools) whose measured learning achievements had progressed 'better-than-expected' (or 'worse-than-expected'), given their initial achievements, attitudes, behaviours and 'intake/background' characteristics, and to estimate the effects of being in an *intervention* school (compared with being in a *reference* school) on students' achievement progress in *Reading* and Numeracy. These analyses were undertaken by fitting multilevel, 'value-added' models to the relevant data using *MLwiN* (Rasbash *et al.*, 2005).

This rigorous, empirical approach to the selection of students within teachers and schools for Case Study visits was adopted to minimise the risk of selecting locations of 'effective practice' based on mere anecdotal reports in the absence of empirical justification for their selection. A brief summary of findings is given below.

Teacher interviews. Typical of the responses provided by teachers were:

The State Training have been VERY helpful, especially the information about auditory processing. So was the training with Elementary Maths Mastery, Corrective Reading and Strategy Instruction. The WOWW manual has been great for all teachers at our school because the practical teaching strategies in it DO WORK. I only wish this kind of training had been given during my teacher education at university. Also, it's a pity that this PD training is not provided by the Education Department, because ALL teachers need it.

We are very grateful for being able to participate in this project. In only one year, it has turned around our entire school. The teachers are very pleased about the progress we see in all children, not just those with learning difficulties. About 50% of the children at this school come from indigenous backgrounds, and we've seen major improvements in their:

- *Attendance – attendance has improved a lot!;*
- *Listening skills – all children seem to be better listeners because teachers are a lot more aware of the need to slow down their instructions, 'chunk' the information and wait for children to respond;*
- *Engagement – children are better behaved in the classroom and seem to enjoy the structured lessons and de-bugging challenges of EMM (Elementary Math Mastery);*
- *Learning progress – we've seen major improvements in children's learning progress in all areas, especially in numeracy.*

Following are the comments of a Deputy Principal:

*As a school we are very appreciative of the opportunity to participate in your 'Third Wave' research project which also provides additional resources to staff and students. We believe our students have shown **significant** improvements due to the whole-school support approach and the Professional Learning the staff have been able to access. The program is purposefully linked to meet students at the point of need through planning and data analysis as well as the recognition of their social and emotional needs.*

Below are the comments of another Deputy Principal:

Thank you for the follow-up information at the recent State Training Day.

What Worked. Overall, children's reading and numeracy levels have progressed dramatically. We had some students in Grades 5 & 6 who had been negative and reluctant readers. It was a thrill for us (and especially for the students) to witness them take part in a reading segment as part of our whole school assembly at the end of 2005. This would not have happened in Term One. Another student in Grade 4 who was 'benchmark level' in Grade 3, is now only about a year behind the average. She loves

> *reading and reads often. She'll get there in her own time with our continued support. She has increased confidence, and her work in spelling and writing has also improved.*
>
> ***Why we are Continuing.*** *The children who were selected for this program are the children who concern teachers year after year. Other strategies have not worked for them and they have had many teachers try. In our school, many of these students have come to our school from elsewhere, or they might have other 'baggage' from home. This 'Third Wave' program offers great support. The program is predictable, regular and has its built-in rewards where the children can see their progress. The stories are written so that children want to find out what happens in the next instalment.*
>
> *The research findings have supported what we are doing, and the results are evident. We are committed to continuing with the program.*

Student interviews. Following is a brief summary of typical responses arising from the interviews with participating students:

> *I understand what the teacher is saying and I know what I need to do. I feel secure* (Year 5 boy, under treatment for ADHD);
>
> *I used to hate school, but now it's fun. I can read and do maths. I'm learning heaps* (Year 6 Indigenous boy);
>
> *I...feel...so...much...better...about...my...self* (Year 5 girl from a very low SES family);
>
> *I came from another school where the teachers didn't know how to teach, but the teachers at this school DO know how to teach. I love reading and maths is fun* (Year 6 Lebanese girl).

Concluding comments

Whereas the success of the 'Third Wave' Project is welcomed – particularly given its short duration to positively affect student learning outcomes (6 months) – the findings are entirely consistent with those from a large body of evidence-based research that indicates superior effects of initial *direct instruction* and *strategy instruction* approaches on student learning.[14] So what made the difference to students' learning and achievement progress for those in the *intervention* schools? Simply, teachers in the *intervention* schools were **taught how to teach** via *direct/explicit instruction* teaching methods – informed by findings from local and international evidence-based research.

In this context, it is worth noting the outstanding success of the transformational leadership provided by John Fleming, former principal of Bellfield Primary School – one of the most disadvantaged government schools in Victoria.[15] Of particular relevance here is that Fleming, during an initial visit by members of the Committee for the *National Inquiry into the Teaching of Literacy* (Rowe, 2005a,b), made it clear that regardless of teachers' practical experience and the content of training received by the higher education institutions in which they obtained their pre-service education, he and several senior members of staff provided all incoming teachers with professional learning in the demonstrably effective evidence-based teaching strategies of *direct/explicit instruction*.[16]

Nonetheless, despite focus on the relative effectiveness of instructional strategies in the present paper, it is important to stress that pedagogical practices and instructional strategies *per se* are not independent of the teachers who deliver them to students, whether or not those

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[14] See references cited in footnote 2.

[15] For an outline of the demographic intake characteristics of students enrolled at this school, together with a brief account of the outstanding, results achieved since 1998, see Caldwell (2006, pp. 139-142).

[16] This professional learning was supported by Dr John Munro from the University of Melbourne. Dr Munro is an expert in integrated *direct instruction* and *constructivist* teaching approaches for student learning in reading and mathematics.

students experience learning difficulties and externalizing behaviour problems. That is, *educational effectiveness* for all students is crucially dependent on the provision of *quality teaching* by competent teachers who are equipped with effective, evidence-based teaching strategies that *work*, and are supported by capacity-building towards the maintenance of high teaching standards via strategic professional development at all levels of schooling (Darling-Hammond & Bransford, 2005; Hattie, 2003, 2005; Hill & Crèvola, 2003; Kennedy, 2001; OECD, 2001, 2005; Rowe, 2003, 2004a-c).[17]

Nevertheless, tt is important to note that the relative utility of *direct instruction* and *constructivist* approaches to teaching and learning are neither mutually exclusive nor independent. Both approaches have merit in their own right, provided that students have the basic knowledge and skills (best provided initially by *direct instruction*) **before** engagement in 'rich' *constructivist* learning activities. The problem arises when *constructivist* learning activities precede explicit teaching, or replace it, with the assumption that students have adequate knowledge and skills to efficiently and effectively engage with *constructivist* learning activities designed to generate new learning. In many instances, this assumption is not tenable, particularly for those students experiencing learning difficulties, resulting in disengagement, low self-esteem, dysfunctional attitudes, and externalizing behaviour problems at school and at home (see: Purdie, Hattie & Carroll, 2002; Rowe & Rowe, 1992, 1999, 2000). Deleterious outcomes of these kind arise as a direct consequence of 'putting the cart-before-the-horse', such that *educational effectiveness* for both teacher and student is denied.

It is also important to note that the 'myth' of *educational effectiveness* is grounded in a widespread failure to understand the fundamental distinction between *structure* and *function* in school education (e.g., Zvoch & Stevens, 2003). Whereas a key *function* of schooling is the provision of quality teaching and learning experiences that meet the developmental and learning needs of students is dependent on funding and organisational *structures* that support this function, the danger is a typical proclivity on the part of teachers and educational administrators to stress *structure* (e.g., single-sex schooling, class size,[18] etc.) and pedagogical *strategies* at the expense of *function* (quality teaching and learning). Unfortunately, such emphases are indicative

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[17] It should be noted that *teaching quality* and *teacher professional development* constitute major foci of the 2000 US *No Child Left Behind* (NCLB) policy (for specific details, see: Center on Education Policy 2003; LaTrice-Hill, 2002; US Department of Education, 2002). The importance of these elements have been particularly evident in findings from a longitudinal evaluation of the *Restart Initiative* in Victorian government secondary schools undertaken and reported by Rowe and Meiers (2005). Reading pre-assessment was used to identify *Restart* students, who were the lowest achieving group, and a 'control' group, whose performance was slightly higher than the identified *Restart* group. Key findings from the evaluation of the *Restart Initiative* from 2002 to 2004 indicate that significant and sustained gains in reading achievement progress were achieved by students taught by *Restart* teachers, many of whom had been trained in strategic reading instruction techniques, and supported by professional development in explicit reading instruction strategies provided by Dr John Munro – a reading research specialist at the University of Melbourne.

[18] For almost 70 years, the contentious issues surrounding the link between *class size* and students' educational outcomes have been hotly debated and extensively researched – particularly in the US and Britain. Reviews of this research, including rigorous meta-analytic syntheses, consistently indicate negligible improvements to student achievement outcomes, even when class sizes of 30 students are reduced to 15. The weight of evidence suggests that reductions in class size do not yield improvements to student learning independent of changes to teachers' classroom teaching practices, nor to students' behaviours in the classroom (e.g., Rowe, 2004b,c). That is, the personal and professional characteristics of the teacher appear to be key factors associated with notable gains in students' learning outcomes. Slavin (1990) argues that reducing class sizes is a low-yield and expensive policy option. Rather, he suggests that providing additional teachers for one-to-one tutoring in the early years of schooling yields far greater improvements in student achievement and is more cost effective. For relevant reviews of 'class size' issues and research, see: Blatchford and Mortimore (1994); Glass (1992); Glass and Smith (1979); Glass *et al.* (1982); Goldstein and Blatchford (1997); Harder (1990); Hattie (1987); Hill and Holmes-Smith (1997); Prais (1996); Robinson (1990); Slavin (1989, 1990).

of a pervasive ignorance about what **really** matters in school education (i.e., quality teaching and learning), and the location of major sources of variation in students' educational outcomes (i.e., the classroom). It seems we need to be constantly reminded that schools and their structural arrangements are only as effective as the those responsible for making them work (school leaders and teachers) – in cooperation with those for whom they are charged and obligated to provide a professional service (students and parents).

Unfortunately, there continue to be several barriers to reform that: (1) perpetrate prevailing 'myths' of 'school effectiveness' (or 'ineffectiveness'); and (2) generate misinformed and/or misdirected rationalisations of students' differential experiences and outcomes of schooling. Perhaps the most pervasive of these is the widespread tendency to place undue credence on various moribund and outmoded forms of *biological* and *social determinism* which assume that individual children – whether they be boys or girls – do poorly or well at school because of developmental differences, because they are 'dumb' or 'smart' or come from 'disadvantaged' or 'advantaged' backgrounds. In this context, Edmonds long ago made the following comment:

> The belief that family background is the chief cause of the quality of student performance … has the effect of absolving educators of their professional responsibility to be instructionally effective (Edmonds, 1978, p. 33).

The longstanding and widespread acceptance of these beliefs and their expectations at the teacher, school and system levels have little substantive justification in the light of findings from emerging evidence-based research, including those from the 'Third Wave' Project. These findings provide strong support for the proposition that it is the identity of the class/teacher groups to which students are assigned that is a key determinant of their perceptions and experiences of schooling, as well as their achievement progress and attentive-inattentive behaviours in the classroom. For example, Professor David Monk cites a number of studies in support of the observation that:

> One of the recurring and most compelling findings within the corpus of production function research is the demonstration that how much a student learns depends on the identity of the classroom to which that student is assigned (Monk, 1992, p. 320).

More recently, and consistent with the longitudinal research findings reported by Hill and Rowe (1996, 1998) and by Rowe and Hill (1998), Cuttance (1998, pp. 1158-1159) concluded:

> Recent research on the impact of schools on student learning leads to the conclusion that 8-15% of the variation in student learning outcomes lies between schools with a further amount of up to 55% of the variation in individual learning outcomes between classrooms within schools. In total, approximately 60% of the variation in the performance of students lies either between schools or between classrooms, with the remaining 40% being due to either variation associated with students themselves or to random influences.

Likewise, from the related British research, Muijs and Reynolds (2001, p. vii) report:

> All the evidence that has been generated in the school effectiveness research community shows that classrooms are far more important than schools in determining how children perform at school.

In sum, teachers can and do make a difference – regardless of students' social backgrounds and 'intake' characteristics, and whether or not they experience learning difficulties. As Slavin and colleagues' evaluations of the 'Success for All' program among low SES schools in Baltimore and Philadelphia have shown, students who, regardless of their gender, socio-economic or ethnic backgrounds (including 'compositional effects') are taught by well-trained, strategically focused, energetic and enthusiastic teachers, are fortunate indeed (Slavin, 1996, 2005).

So what matters most? Certainly not student compositional characteristics such as *learning difficulties, educational disadvantage*, *disruptive student behaviours*, nor school *structural* arrangements of interest to school effectiveness researchers, but the imperative of ***quality teaching*** and ***learning*** provision, supported by *teaching standards* and ongoing teacher professional development focused on evidence-based practices that are demonstrably effective

in maximising students' learning outcomes and achievement progress. Since the most valuable educational resource available to **any** school is its teachers, the need for a refocus of the prevailing *educational effectiveness* policy and research agenda (e.g., Scheerens, 1993; Scheerens & Bosker, 1997) to one that focuses on ***quality teaching*** and ***learning*** provision is obvious (OECD, 2001, 2005a,b).

While it is not feasible to legislate such *quality teaching* into existence, the fact that teachers and teaching make a difference should provide impetus and encouragement to those concerned with the crucial issues of *educational effectiveness, quality teaching* and *teaching standards*, to at least invest in quality teacher recruitment, pre-service education and professional development. In this regard, the work and contributions of Ingvarson and of Bond *et al.* (2000) are of vital importance. For example, in the Australian context, Ingvarson has long been an advocate for the necessity of establishing *teaching standards*, the *certification of highly accomplished teachers*, as well as strategic *teacher professional development* that are linked to both status and salary recognition (Ingvarson, 1998a,b,c, 1999a,b, 2000, 2001a,b, 2002a,b, 2003, 2005; Kleinhenz & Invarson 2004).

Finally, the summary of findings from evidence-based research for the effects of *quality teaching* on student outcomes provided by Professor Linda Darling-Hammond at Stanford University are pertinent and require emphasis:

> The effect of poor quality teaching on student outcomes is debilitating and cumulative. … The effects of quality teaching on educational outcomes are greater than those that arise from students' backgrounds. … A reliance on curriculum standards and statewide assessment strategies without paying due attention to teacher quality appears to be insufficient to gain the improvements in student outcomes sought. … The quality of teacher education and teaching appear to be more strongly related to student achievement than class sizes, overall spending levels or teacher salaries (Darling-Hammond, 2000, p. 3).

For the sake of Australia's students and teachers, let alone the nation's social and economic future (or those of any nation), the enduring hope is that the importance of *quality teaching* and *teacher quality* will be evident in the reality of major improvements to teacher professionalism and students' learning, behaviour, health and wellbeing outcomes. But such reality will not be realised until teachers are at least in receipt of quality pre-service education and in-service professional development support that are commensurate with their essential status in terms of the invaluable contributions they are able make to the enrichment of students' wellbeing and life chances, as well as to capacity-building for the nation's social and economic future.[19]

The realization must be that since teachers are the most valuable resource available to schools, an investment in teacher professionalism is vital by ensuring that they are equipped with an evidence-based repertoire of pedagogical skills that **are** effective in meeting the developmental and learning needs of ALL students. Perhaps there is a need to be reminded that: 'Ultimately, most of what we do in school education – including our efforts to improve administrative structures and the quality of the teaching-learning environment – can be judged in terms of their implications for enhanced student learning' (Masters, 1994, p. 2).

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[19] For example, see the offerings in: Cochran-Smith and Zeichner (2005); Darling-Hammond and Bransford (2005).

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