

It's hardly a revelation to argue that the adoption of evidence-based practice (EBP) in some other professions is far advanced in comparison to its use in education. That's not to say that the resistance displayed by some teacher organizations towards the adoption of EBP has not been evident in the early stages of its acceptance by those professions, such as medicine and psychology. However, as these principles have been espoused in medicine and psychology since the early nineties, a new generation of practitioners have been exposed to EBP as the normal standard for practice. This has occurred among young practitioners because their training has emphasized the centrality of evidence in competent practice.

In education, unfortunately, there are few signs of this sequence occurring. Most teachers-in-training are not exposed to either the principles of EBP (unless in a dismissive aside) or to the practices that have been shown to be beneficial to student learning, such as the principles of instructional design and effective teaching, explicit phonological instruction, and student management approaches that might be loosely grouped under a cognitive-behavioural banner.

In my view, until educational practice includes EBP as a major determinant of practice, then it will continue to be viewed as an immature profession. It is likely that the low status of teachers in many western countries will continue to be the norm unless and until significant change occurs.

Evidence-based practice in education: Why not?

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Abstract

Teaching has suffered both as a profession in search of community respect and as a force for improving a nation's social capital, because of its failure to adopt the results of empirical research as the major determinant of its practice. There are a number of reasons why this has occurred, among them a science-averse culture endemic among education policymakers and teacher education faculties. There are signs that major shifts are occurring. There have been strong moves in Great Britain and the USA towards evidence-based practice in education in recent years. Indeed, the movement is likely to be further advanced by the recent edict from the US government's Office of Management and Budget (Zient, 2012) that requests the entire Executive Branch to use every available means to promote the use of rigorous evidence in decision-making, program administration, and planning". Evidence-based practice has influenced many professions in recent years. A

simple Google search produces over 73,000,000 hits. Among them, in varying degrees of implementation, are professions as diverse as agriculture, speech pathology, occupational therapy, transport, library and information practice, management, nursing, pharmacy, dentistry, and health care.

Several problems do require attention. The generally low quality of much educational research in the past has made the process of evaluating the evidence difficult, particularly for those teachers who have not the training to discriminate sound from unsound research designs. Teacher training itself has not empowered teachers with the capacity and motivation to explore how evidence could enhance their effectiveness. Until teachers become more skilled at doing so, it was hoped that bodies such as the What Works Clearing house could perform the sifting process to simplify judgements on what practices have been demonstrated to be effective. However, the strong criteria usually employed in this process have unearthed very few well designed studies from which to make these judgements.

What does evidence-based practice in education mean?

Teachers are coming under increasing media fire lately: Too many students are failing. Current teachers are not sufficiently well trained. Our brightest young people are not entering the teaching profession. What does that imply about those who are teachers? Are current teachers inadequate to the task entrusted to them? A nation's future is dependent upon the next generation of students. So, how should we respond as a nation?

Education has a history of regularly adopting new ideas, but it has done so without the wide-scale assessment and scientific research that is necessary to distinguish effective from ineffective reforms. "More typically, someone comes across an idea she or he likes and urges its adoption... often the changes proposed are both single and simple – more testing of students, loosening

certification requirements for teachers, or a particular school improvement model” (Levin, p.740).

This absence of a scientific perspective has precluded systematic improvement in the education system, and it has impeded growth in the teaching profession for a long time (Carnine, 1995a; Hempenstall, 1996; Marshall, 1993; Stone, 1996). Some years ago in Australia, Maggs and White (1982) wrote despairingly "Few professionals are more steeped in mythology and less open to empirical findings than are teachers" (p. 131).

Since that time, a consensus has developed among empirical researchers about a number of effectiveness issues in education, and a great deal of attention (Gersten, Chard, & Baker, 2000) is being directed at means by which these research findings can reach fruition in improved outcomes for students in classrooms. Carnine (2000) noted that education continues to be impervious to research on effective practices, and he explored differences between education and other professions, such as medicine, that are strongly wedded to research as the major practice informant.

Evidence-based medicine became well known during the 1990s. It enables practitioners to gain access to knowledge of the effectiveness and risks of different interventions, using reliable estimates of benefit and harm as a guide to practice. There is strong support within the medical profession for this direction, because it offers a constantly improving system that provides better health outcomes for their patients. Thus, increased attention is being paid to research findings by medical practitioners in their dealing with patients and their medical conditions. Practitioners have organisations, such as Medline (<http://medline.cos.com>) and the Cochrane Collaboration (www.cochrane.org), that perform the role of examining research, employing criteria for what constitutes methodologically acceptable studies. They then interpret the findings and provide a

summary of the current status of various treatments for various medical conditions. Thus, practitioners have the option of accepting pre-digested interpretations of the research or of performing their own examinations. This latter option presumes that they have the time and expertise to discern high quality from lesser research. Their training becomes a determinant whether this latter is likely to occur.

Despite these changes in medicine, there remain problems of acceptance among practitioners. The first wide-scale audit of Australian healthcare found that 43% of patients do not receive treatments based upon the best available evidence (Runciman et al., 2012). Director of the Whitlam Orthopaedic Research Centre, Professor Ian Harris noted that fewer than half of the operations performed in Australia had been properly evaluated. "We often know something doesn't work, but out there are thousands and thousands of doctors who have been taught certain procedures and that's all they do ... changing of clinician beliefs and behaviour, even in the face of credible evidence, remains highly challenging (p.5)" (Medew, 2012).

Funding for research is also a critical element in evidence-based practice. Whilst health and education consume a similar amount of the federal budget, research funding for health much greater than that for educational research. The US D.O.E. spends about \$80 million annually in educational research; whereas, the Department of Health and Human Services provides about \$33 billion for health research (The Haan Foundation, 2012).

In an initiative similar to that of medicine, during the 1990's the American Psychological Association (Chambless & Ollendick, 2001) introduced the term *empirically supported treatments* as a means of highlighting differential psychotherapy effectiveness. Prior to that time, many psychologists saw themselves as developing a craft in which competence arises through a combination of personal qualities, intuition, and experience. The result was extreme variability of effect among practitioners.

The idea was to devise a means of rating therapies for various psychological problems, and for practitioners to use these ratings as a guide to practice. The criteria for a treatment to be considered *well established* included efficacy through two controlled clinical outcomes studies or a large series of controlled single case design studies, the availability of treatment manuals to ensure treatment fidelity, and the provision of clearly specified client characteristics. A second level involved criteria for *probably efficacious* treatments. These criteria required fewer studies, and/or a lesser standard of rigor. The third category comprised *experimental* treatments, those without sufficient evidence to achieve *probably efficacious* status.

The American Psychological Association's approach to empirically supported treatments could provide a model adaptable to the needs of education. There are great potential advantages to the education system when perennial questions are answered. What reading approach is most likely to evoke strong reading growth? Should "social promotion" be used or should retentions be increased? Would smaller class sizes make a difference? Should summer school programs be provided to struggling students? Should kindergarten be full day? What are the most effective means of providing remediation to children who are falling behind? Even in psychology and medicine, however, it should be noted that 15 years later there remain pockets of voluble opposition to the evidence-based practice initiatives.

The first significant indication of a similar movement in education occurred with the Reading Excellence Act (The 1999 Omnibus Appropriations Bill, 1998) that was introduced as a response to the unsatisfactory state of reading attainment in the USA. It acknowledged that part of the cause was the prevailing method of reading instruction, and that literacy policies had been insensitive to developments in the understanding of the reading process. The Act, and its successors, attempted to bridge the gulf between research and classroom practice by mandating

that only programs in reading that had been shown to be effective according to strict research criteria would receive federal funding. This reversed a trend in which the criterion for adoption of a model was that it met preconceived notions of “rightness” rather than that it was demonstrably effective for students. Federal funding is now intended only for programs with demonstrated effectiveness evidenced by reliable replicable research.

Reliable replicable research was defined as objective, valid, scientific studies that: (a) include rigorously defined samples of subjects that are sufficiently large and representative to support the general conclusions drawn; (b) rely on measurements that meet established standards of reliability and validity; (c) test competing theories, where multiple theories exist; (d) are subjected to peer review before their results are published; and (e) discover effective strategies for improving reading skills (The 1999 Omnibus Appropriations Bill, 1998).

In Great Britain, similar concerns produced the National Literacy Strategy (Department for Education and Employment, 1998) that mandated teaching approaches based upon research findings. In practice, this edict suffered from strong resistance from within education, and did not achieve its objectives. Following the influential Rose Report (2006), a new even more directive approach was instituted as the Primary National Strategy (2006).

In Australia, The National Enquiry into the Teaching of Literacy (2005) also reached similar conclusions about the proper role of educational research. The Australian Government’s Review of Funding for Schooling Panel (2011) bemoaned the current lack of evidence-basis for educational programs and the absence of evaluation of the programs’ effects on learning (Nous Group, 2011).

Slavin (2002) argued that requiring evidence prior to program adoption will reduce the pendulum swings that have characterized education thus far, and could produce revolutionary consequences in redressing educational achievement differences within our community.

The National Research Council's Center for Education (Towne, 2002) suggests that educators should attend to research that (a) poses significant questions that can be investigated empirically; (b) links research to theory; (c) uses methods that permit direct investigation of the question; (d) provides a coherent chain of rigorous reasoning; (e) replicates and generalizes; and (f) ensures transparency and scholarly debate. The Council's message is clearly to improve the quality of educational research, and reaffirm the link between scientific research and educational practice. Ultimately, the outcomes of sound research should inform educational policy decisions, just as a similar set of principles have been espoused for the medical profession. The fields that have displayed unprecedented development over the last century, such as medicine, technology, transportation, and agriculture have been those embracing research as the prime determinant of practice (Shavelson & Towne, 2002).

Similarly, in Australia in 2005, the National Inquiry into the Teaching of Literacy asserted that "teaching, learning, curriculum and assessment need to be more firmly linked to findings from evidence-based research indicating effective practices, including those that are demonstrably effective for the particular learning needs of individual children" (p.9). It recommends a national program to produce evidence-based guides for effective teaching practice, the first of which is to be on reading. In all, the Report used the term *evidence-based* 48 times.

So, the implication is that education and research are not adequately linked in this country. Why has education been so slow to attend to research as a source of practice knowledge? Carnine (1991) argued that the leadership has been the first line of resistance. He described educational

policy-makers as lacking a scientific framework, and thereby inclined to accept proposals based on good intentions and unsupported opinions. Professor Cuttance, director of the Melbourne University's Centre for Applied Educational Research was equally blunt: "Policy makers generally take little notice of most of the research that is produced, and teachers take even less notice of it." (Cuttance, 2005, p.5).

Carnine (1995b) also points to teachers' lack of training in seeking out and evaluating research for themselves. Their training institutions have not developed a research culture, and tend to view teaching as an art form, in which experience, personality, intuition, or creativity are the sole determinants of practice. For example, he estimates that fewer than one in two hundred teachers are experienced users of the ERIC educational database.

Taking a different perspective, Meyer (1991, cited in Gable & Warren, 1993) blames the research community for being too remote from classrooms. She argued that teachers will not become interested in research until its credibility is improved. Research is often difficult to understand, and the careful scientific language and cautious claims may not have the same impact as the wondrous claims of ideologues and faddists unconstrained by scientific ethics.

Fister and Kemp (1993) considered several obstacles to research-driven teaching, important among them being the absence of an accountability link between decision-makers and student achievement. Such a link was unlikely until recently, when regular mandated state or national test programs results became associated with funding. They also apportion some responsibility to the research community for failing to appreciate the necessity of adequately connecting research with teachers' concerns. The specific criticisms included a failure to take responsibility for communicating findings clearly, and with the end-users in mind. Researchers have often validated practices over too brief a time-frame, and in too limited a range of settings to excite

general program adoption across settings. Without considering the organizational ramifications (such as staff and personnel costs) adequately, the viability of even the very best intervention cannot be guaranteed. The methods of introduction and staff training in innovative practices can have a marked bearing on their adoption and continuation.

Woodward (1993) pointed out that there is often a culture gulf between researchers and teachers. Researchers may view teachers as unnecessarily conservative and resistant to change; whereas, teachers may consider researchers as unrealistic in their expectations and lacking in understanding of the school system and culture. Teachers may also respond defensively to calls for change because of the implied criticism of their past practices, and the perceived devaluation of the professionalism of teachers. Leach (1987) argued that collaboration between change-agents and teachers is a necessary element in the acceptance of novel practice. In his view, teachers need to be invited to make a contribution that extends beyond solely the implementation of the ideas of others. There are some signs that such a culture may be in the early stages of development. Viadero (2002) reported on a number of initiatives in which teachers have become reflective of their own work, employing both quantitative and qualitative tools. She also noted that the American Educational Research Association has a subdivision devoted to the practice.

Some have argued that science has little to offer education, and that teacher initiative, creativity, and intuition provide the best means of meeting the needs of students. For example, Weaver considers scientific research offers little of value to education (Weaver et al., 1997). “It seems futile to try to demonstrate superiority of one teaching method over another by empirical research” (Weaver, 1988, p.220). These writers often emphasise the uniqueness of every child as an argument against instructional designs that presume there is sufficient commonality among children to enable group instruction with the same materials and techniques. Others have argued that teaching itself is ineffectual when compared with the impact of socioeconomic status and

social disadvantage (Coleman et al., 1966; Jencks et al., 1972). Smith (1992) argued that only the relationship between a teacher and a child was important in evoking learning. Further, he downplayed instruction in favour of a naturalist perspective “Learning is continuous, spontaneous, and effortless, requiring no particular attention, conscious motivation, or specific reinforcement” (p.432). Still others view research as reductionist, and unable to encompass the wholistic nature of the learning process (Cimbricz, 2002; Poplin, 1988).

What sorts of consequences have arisen in other fields from failure to incorporate the results of scientific enquiry?

Galileo observed moons around Jupiter in 1610. Francesco Sizi’s armchair refutation of such planets was: There are seven windows in the head, two nostrils, two ears, two eyes and a mouth. So in the heavens there are seven - two favourable stars, two unpropitious, two luminaries, and Mercury alone undecided and indifferent. From which and many other similar phenomena of nature such as the seven metals, etc we gather that the number of planets is necessarily seven...We divide the week into seven days, and have named them from the seven planets. Now if we increase the number of planets, this whole system falls to the ground...Moreover, the satellites are invisible to the naked eye and therefore can have no influence on the earth and therefore would be useless and therefore do not exist (Holton & Roller, 1958, as cited in Stanovich, 1996, p.9).

Galileo taught us the value of controlled observation, whilst Sizi highlighted the limitations of armchair theorising. The failure to incorporate empirical findings into practice can have far-reaching consequences. Even medicine has had only a brief history of attending to research. Early in the 20th century, medical practice was at a similar stage to that of education currently. For example, it was well known that bacteria played a critical role in infection, and 50 years

earlier Lister had shown the imperative of antiseptic procedures in surgery. Yet, in this early period of the century, surgeons were still wiping instruments on whatever unsterilised cloth that was handy, with dire outcomes for their patients.

More recently, advice from paediatrician Doctor Benjamin Spock to have infants sleep face down in their cots caused approximately 60 thousand deaths from Sudden Infant Death Syndrome in the USA, Great Britain and Australia between 1974 and 1991 according to researchers from the Institute of Child Health in London (Dobson & Elliott, 2005). His advice was not based upon any empirical evidence, but rather armchair analysis. The book, *Baby and Child Care* (Spock, 1946), was extraordinarily influential, selling more than 50 million copies. Yet, while the book continued to espouse this practice, reviews of risk factors for SIDS by 1970 had noted the risks of infants sleeping face down. In the 1990's, when public campaigns altered this practice, the incidence of SIDS death halved within one year. In recent times, more and more traditional medical practices are being subjected to empirical test as the profession increasingly established credibility.

Are there examples in education in which practices based solely upon belief, unfettered by research support, have been shown to be incorrect, but have led to unhelpful teaching?

- Learning to read is as natural as learning to speak (National Council of Teachers of English, 1999).
- Children do not learn to read in order to be able to read a book, they learn to read by reading books (NZ Ministry of Education, as cited in Mooney, 1988).
- Parents reading to children is sufficient to evoke reading (Fox, 2005).
- Good readers skim over words rather than attending to detail (Goodman, 1985).
- Fluent readers identify words as ideograms (Smith, 1973).
- Skilled reading involves prediction from context (Emmitt, 1996).

- English is too irregular for phonics to be helpful (Smith, 1999).
- Accuracy is not necessary for effective reading (Goodman, 1974).
- Good spelling derives simply from the act of writing (Goodman, 1989).
- Attending to students' learning styles improves educational outcomes (Carbo, & Hodges, 1988; DEECD, 2012b; Dunn & Dunn, 1987).

These assertions have influenced educational practice for more than 20 years, yet they have each been shown by research to be either incorrect or unsupported (Hempenstall, 1999). The consequence has been an unnecessary burden upon struggling students to manage the task of learning to read. Not only have they been denied helpful strategies, but they have been encouraged to employ moribund strategies. Consider this poor advice from a newsletter to parents at a local school:

If your child has difficulty with a word: Ask your child to look for clues in the pictures. Ask your child to read on or reread the passage and try to fit in a word that makes sense. Ask your child to look at the first letter to help guess what the word might be.

When unsupported belief guides practice, we risk inconsistency at the individual teacher level and disaster at the education system level.

There are three groups with whom researchers need to be able to communicate if their innovations are to be adopted. At the classroom level, teachers are the focal point of such innovations and their competent and enthusiastic participation is required if success is to be achieved. At the school administration level, principals are being given increasing discretion as to how funds are to be disbursed; therefore, time spent in discussing educational priorities, and cost-effective means of achieving them may be time well-spent, bearing in mind Gersten and

Guskey's (1985) comment on the importance of strong instructional leadership. At the broader system level, decision makers presumably require different information, and assurances about the viability of change of practice.

Perhaps because of frustration at the problems experienced in ensuring effective practices are employed across the nation, we are beginning to see a top-down approach, in which research-based educational practices are either mandated, as in Great Britain (Department for Education and Employment, 1998) or made a pre-requisite for funding, as in the 2001 *No Child Left Behind Act* (U.S. Department of Education, 2002). Whether this approach will be successful in changing teachers' practice remains to be seen. In any case, there remains a desperate need to address teachers' and parents' concerns regarding classroom practice in a cooperative and constructive manner.

In Australia, pressure for change is building, and the view of teaching as a purely artisan activity is being challenged. Reports such as that by the National Inquiry into the Teaching of Literacy (2005) have urged education to adopt the demeanour and practice of a research-based profession. State and national testing has led to greater transparency of student progress, and, thereby, to increased public awareness. Government budgetary vigilance is greater than in the past, and measurable outcomes are the expectation from a profession that has not previously appeared enthused by formal testing. A further possible spur occurred when a Melbourne parent successfully sued a private school for a breach of the Trade Practices Act (Rood & Leung, 2006). She argued that it had failed to deliver on its promise to address her son's reading problems. Reacting to these various pressures, in 2005 the National Institute for Quality Teaching and School Leadership began a process for establishing national accreditation of pre-service teacher education. The Australian Council for Educational Research is currently evaluating policies and

practices in pre-service teacher education programs in Australia. The intention is to raise and monitor the quality of teacher education programs around the nation.

There is another stumbling block to the adoption of evidence-based practice. Is the standard of educational research generally high enough to enable sufficient confidence in its findings? Broadly speaking, some areas (such as reading) invite confidence; whereas, the quality of research in other areas cannot dispel uncertainty. Partly, this is due to a preponderance of short-term, inadequately designed studies. When Slavin (2004) examined the American Educational Research Journal over the period 2000-2003, only 3 out of 112 articles reported experimental/control comparisons in randomized studies with reasonably extended treatments. The National Reading Panel (2000) selected research from the approximately 100,000 reading research studies that have been published since 1966, and another 15,000 that had been published before that time. The Panel selected only experimental and quasi-experimental studies, and among those considered only studies meeting rigorous scientific standards in reaching its conclusions. Phonemic Awareness: Of 1962 studies, 52 met the research methodology criteria; Phonics: Of 1,373 studies, 38 met the criteria; Guided Oral Reading: Of 364 studies, 16 met the criteria; Vocabulary Instruction: Of 20,000 studies, 50 met the criteria; Comprehension: Of 453 studies, 205 met the criteria. So, there is certainly a need for educational research to become more rigorous in future.

In the areas in which confidence is justified, how might we weigh the outcomes of empirical research? Stanovich and Stanovich (2003) propose that competing claims to knowledge should be evaluated according to three criteria. First, findings should be published in refereed journals. Second, the findings have been replicated by independent researchers with no particular stake in the outcome. Third, there is a consensus within the appropriate research community about the reliability and validity of the various findings – the converging evidence criterion. Although the

use of these criteria does not produce infallibility it does offer better consumer protection against spurious claims to knowledge. Without research as a guide, education systems are prey to all manner of gurus, publishing house promotions, and ideologically-driven zealots. Gersten (2001) laments that teachers are "deluged with misinformation" (p. 45).

Unfortunately, education courses have not provided teachers with sufficient understanding of research design to enable the critical examination of research. In fact, several whole language luminaries (prominent influences in education faculties over the past 20 years) argued that research was unhelpful in determining practice (Hempenstall, 1999). Teachers-in-training need to be provided with a solid understanding of research design to adapt to the changing policy emphasis (National Inquiry into the Teaching of Literacy, 2005). For example, in medicine, psychology, and numerous other disciplines, randomized controlled trials are considered the gold standard for evaluating an intervention's effectiveness. Training courses in these professions include a strong emphasis on empirical research design. There is much to learn about interpreting other forms of research too (U.S. Department of Education, 2003). In education, however, there is evidence that the level of quantitative research preparation has diminished in teacher education programs over the past twenty years (Lomax, 2004).

Are there any immediate shortcuts to discerning the gold from the dross? If so, where can one find the information about any areas of consensus? Those governments that have moved toward a pivotal role for research in education policy have usually formed panels of prestigious researchers to peruse the evidence in particular areas, and report their findings widely (e.g., National Reading Panel, 2000). They assemble all the methodologically acceptable research, and synthesise the results, using statistical processes such as meta-analysis, to enable judgements about effectiveness to be made. It involves clumping together the results from many studies to

produce a large data set that reduces the statistical uncertainty that inevitably accompanies single studies.

So, there are recommendations for practice produced by these bodies that are valuable resources in answering the question *what works?* These groups include the National Reading Panel, American Institutes for Research, National Institute for Child Health and Human Development, The What Works Clearinghouse, Coalition for Evidence-Based Policy. A fuller list with web addresses can be found in the appendix. As an example, Lloyd (2006) summarises a number of such meta-analyses for some approaches. In this method an effect size of 0.2 is considered small, 0.5 is a medium effect, and 0.8 is a large effect (Cohen, 1988). For early intervention programs, there were 74 studies, 215 effect sizes, and an overall effect size (ES) = 0.6. For Direct Instruction (DI), there were 25 studies, 100+ effect sizes, and an overall ES = 0.82. For behavioural treatment of classroom problems of students with behaviour disorder, there were 10 studies, 26 effect sizes, and an overall ES = 0.93. For Whole language, there were 180 studies, 637 effect sizes, and an overall ES = 0.09. For perceptual/motor training, there were 180 studies, 117 effect sizes, and an overall ES = 0.08. For learning styles, there were 39 studies, 205 effect sizes, and an overall ES = 0.14.

These sources can provide great assistance, but can also be confusing as they do not all agree on which studies should be included in their meta-analyses. For example, Hattie's analysis of Direct Instruction studies revealed strong effects for regular ($d=0.99$), and special education and lower ability students ($d=0.86$), higher for reading ($d=0.89$) than for mathematics ($d=0.50$), similar for the more low-level word attack ($d=0.64$) and also for high-level comprehension ($d=0.54$), and similar for elementary and high school students. In contrast, the Coalition for Evidence-Based Policy does not include Direct Instruction among its list of evidence-based approaches because of their perception of a lack of long term effect studies. The What Works Clearinghouse rejects

most of the Direct Instruction studies as not meeting their criteria for methodological soundness, and ignores those older than 20 years or so. There has also been criticism (Briggs, 2008; Slavin, 2008) of some of the WWC decisions, in particular, inconsistency in applying standards for what constitutes acceptable research. Thus, the large scale reviews have their own issues to deal with before they can be unquestioningly accepted. It may also be quite some time before gold-standard research reaches critical mass to make decisions about practice easier. It is also arguable whether education can ever have randomised control trials as standard.

Of course, it is not only the large scale, methodologically sophisticated studies that are worthwhile. A single study involving a small number of schools or classes may not be conclusive in itself, but many such studies, preferably done by many researchers in a variety of locations, can add some confidence that a program's effects are valid (Slavin, 2003). If one obtains similar positive benefits from an intervention across different settings and personnel, there is added reason to prioritise the intervention for a large gold-standard study.

Taking an overview, there are a number of options available to create educational reform. One involves the use of mandate, as with education policy in England. Another option involves inveigling schools with extra money, as in the USA beginning with the No Child Left Behind Act (U.S. Department of Education, 2002). Still another is to inculcate skills and attitudes during teacher training. Whilst these are not mutually exclusive options, the third appears to be a likely component of any reform movement in Australia, given the establishment and objectives of the National Institute for Quality Teaching and School Leadership (2005).

A prediction for the future, perhaps 15 years hence? Instructional approaches will need to produce evidence of measurable gains before being allowed within the school curriculum system. Education faculties will have changed dramatically as a new generation takes control.

Education courses will include units devoted to evidence-based practice, perhaps through an increased liaison with educational and cognitive psychology. Young teachers will routinely seek out and collect data regarding their instructional activities. They will become scientist-practitioners in their classrooms. Student progress will be regularly monitored, problems in learning will be noticed early, and addressed systematically. Overall rates of student failure will fall. Optimistic? Of course!

More so than any generation before them, the child born today should benefit from rapid advances in the understanding of human development, and of how that development may be optimised. There has been an explosion of scientific knowledge about the individual in genetics and the neurosciences, but also about the role of environmental influences, such as socio-economic status, early child rearing practices, effective teaching, and nutrition. However, to this point, there is little evidence that these knowledge sources form a major influence on policy and practice in education. There is a serious disconnect between the accretion of knowledge and its acceptance and systematic implementation for the benefit of this growing generation. Acceptance of a pivotal role for empiricism is actively discouraged by advisors to policymakers, whose ideological position decries any influence of science. There are unprecedented demands on young people to cope with an increasingly complex world. It is one in which the sheer volume of information, and the sophisticated persuasion techniques, to which they will be subjected may overwhelm the capacities that currently fad-dominated educational systems can provide for young people. A recognition of the proper role of science in informing policy is a major challenge for us in aiding the new generation. This perspective does not involve a diminution of the role of the teacher, but rather the integration of professional wisdom with the best available *empirical evidence* in making decisions about how to deliver instruction (Whitehurst, 2002).

Evidence-based policies have great potential to transform the practice of education, as well as research in education. Evidence based policies could finally set education on the path toward the kind of progressive improvement that most successful parts of our economy and society embarked upon a century ago. With a robust research and development enterprise and government policies demanding solid evidence of effectiveness behind programs and practices in our schools, we could see genuine, generational progress instead of the usual pendulum swings of opinion and fashion. This is an exciting time for educational research and reform. We have an unprecedented opportunity to make research matter and to then establish once and for all the importance of consistent and liberal support for high-quality research. Whatever their methodological or political orientations, educational researchers should support the movement toward evidence-based policies and then set to work generating the evidence that will be needed to create the schools our children deserve (Slavin, 2002, p.20).

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Appendix_

A great place to start is The National Early Childhood Technical Assistance Center (NECTAC). NECTAC has compiled a list of selected resources on defining, understanding, and implementing evidence-based practice. Links are provided for those materials that are freely available full-text online. <http://www.nectac.org/topics/evbased/evbased.asp>

Eric Digests (<http://www.ericdigests.org/>) Short reports (1,000 - 1,500 words) on topics of prime current interest in education. A large variety of topics are covered, including teaching, learning, charter schools, special education, higher education, home schooling, and many more.

The Promising Practices Network (<http://www.promisingpractices.net/>) web site highlights programs and practices that credible research indicates are effective in improving outcomes for children, youth, and families.

Visible Learning. Hattie, J. A.C. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. London and New York: Routledge.

Blueprints for Violence Prevention (<http://www.colorado.edu/cspv/blueprints/index.html>) is a national violence prevention initiative to identify programs that are effective in reducing adolescent violent crime, aggression, delinquency, and substance abuse.

The International Campbell Collaboration

(<http://www.campbellcollaboration.org/Fralibrary.html>) offers a registry of systematic reviews of evidence on the effects of interventions in the social, behavioral, and educational arenas.

Social Programs That Work

(<http://www.excelgov.org/displayContent.asp?Keyword=prppcSocial>) offers a series of papers

developed by the Coalition for Evidence-Based Policy on social programs that are backed by rigorous evidence of effectiveness.

Coalition for Evidence-Based Policy. (2003). Identifying and implementing educational practices supported by rigorous evidence: A user friendly guide. Washington, DC: U.S. Department of Education. Retrieved May 13, 2004, from <http://toptierevidence.org/wordpress/>

Comprehensive School Reform Program Office. (2002). Scientifically based research and the Comprehensive School Reform (CSR) Program. Washington, DC: U.S. Department of Education. Retrieved May 13, 2004, from <http://www.ed.gov/programs/compreform/guidance/appendc.pdf>

Florida Center for Reading Research aims to disseminate information about research-based practices related to literacy instruction and assessment for children in pre-school through to Year 12 (www.fcrr.org/)

The U.S. Department of Education's American Institutes for Research has a new 2005 guide, using strict scientific criteria to evaluate the quality and effectiveness of 22 primary school teaching models. AIR researchers conducted extensive reviews of about 800 studies. See at <http://www.air.org/news/documents/Release200511csr.htm>

Major reviews of the primary research can provide additional surety of program value. In a Department of US Education meta-analysis, Comprehensive School Reform and Student Achievement (2002, Nov), Direct Instruction was assigned the highest classification: *Strongest Evidence of Effectiveness*, as ascertained by *Quality* of the evidence *Quantity* of the evidence, and *Statistically significant and positive* results. Its effects are relatively robust and the model

can be expected to improve students' test scores. The model certainly deserves continued dissemination and federal support.

Borman, G.D., Hewes, G.M., Overman, L.T., & Brown, S. (2002). *Comprehensive school reform and student achievement: A meta-analysis*. Report No. 59. Washington, DC: Center for Research on the Education of Students Placed At Risk (CRESPAR), U.S. Department of Education.

Retrieved 12/2/03 from <http://www.csos.jhu.edu/crespar/techReports/report59.pdf>

The Council for Exceptional Children provides informed judgements regarding professional practices in the field. See what its *Alert* series says about Phonological Awareness Social Skills Instruction Class-wide Peer Tutoring Reading Recovery Mnemonic Instruction Co-Teaching Formative Evaluation High-Stakes Assessment Direct Instruction Cooperative Learning. Found at <http://dldcec.org/ld%5Fresources/alerts/>.

In the Oregon Reading First Center reviewed and rated 9 comprehensive reading programs. To be considered comprehensive, a program had to (a) include materials for all grades from Prep to Year 3; and (b) comprehensively address the five essential components of reading. They were Reading Mastery Plus 2002, Houghton Mifflin The Nation's Choice 2003, Open Court 2002, Harcourt School Publishers Trophies 2003, Macmillan/McGraw-Hill Reading 2003, Scott Foresman Reading 2004, Success For All Foundation Success for All, Wright Group Literacy 2002, Rigby Literacy 2000. Found at

Curriculum Review Panel. (2004). *Review of Comprehensive Programs*. Oregon Reading First Center. Retrieved 16/1/2005 from [http://reading.uoregon.edu/curricula/core_report_amended_3-](http://reading.uoregon.edu/curricula/core_report_amended_3-04.pdf)

[04.pdfhttp://www.peri.org.au/page/email_newsletter.html](http://www.peri.org.au/page/email_newsletter.html)

The What Works Clearinghouse (<http://www.w-w-c.org/>) established by the U.S. Department of Education's Institute of Education Sciences to provide educators, policymakers, and the public with a central, independent, and trusted source of scientific evidence of what works in education.