Standardising the Mathematics Curriculum: Some Historical and Comparative Perspectives

M. A. ("Ken") Clements *and* **Nerida F. Ellerton**
The University of Newcastle **Edith Cowan University**

This paper provides historical and comparative perspectives on current pressures to standardise mathematics curricula. Two main questions are considered: (a) What are the forces behind the move towards core mathematics curricula? and (b) Are core curricula likely to generate more equitable school mathematics programs? The first question is discussed in terms of accountability, colonialism, and politics. For the second question, evidence on equity considerations is provided from developments in the United Kingdom and in the United States.

Over the past decade Australian mathematicians, mathematics educators, and mathematics teachers—the traditional guardians of Australian mathematics curricula—have been confronted by influential education bureaucrats who believe that the authority and responsibility for making policy decisions on curriculum issues, including decisions on the content, structure and assessment of school mathematics, belongs with them and *not* with the mathematics community (Thomas & Clements, 1994).

This paper seeks to provide historical and comparative perspectives on current moves to standardise mathematics curriculum in the States and Territories of Australia. The following two questions, not entirely independent of each other, will be examined:

1. What are the forces influencing the move towards core mathematics curricula?
2. Is there any evidence to support the view that a legislated core curriculum is a prerequisite for the establishment of more equitable school mathematics programs?

Forces Influencing the Move Towards Core Mathematics Curricula

Four main categories of forces will be identified: (a) the drive towards accountability in Australian education systems (b) colonialist tendencies, (c) political dimensions, and (d) equity and social justice considerations. The first three will be dealt with in this section, and the last in the section of the paper dealing with equity.

The Drive Towards Accountability in Australian Education Systems

Throughout the 1980s, many State and Territory education bureaucrats, especially curriculum directors, believed that standards in literacy and numeracy were falling across Australia (see, for example, Priest, 1981). They were concerned that they had no systematic way of proving that this was the case (Bessant, 1989). Arguments had been put forward in the United Kingdom (Graham, 1993) and in the United States of America (National Commission on Excellence in Education, 1983) that the absence of central control over curricula in these nations had resulted in lower standards, and since Australia also did not have a national curriculum, there were fears that its school programs were not generating the highest possible standards of literacy and numeracy (Marsh, 1994).

The need to specify clear indicators for desired learning outcomes is largely accepted by Australian education bureaucrats (Cuttance, 1995). During the 1990s calls for the development of value-added accountability methods of ranking Australian schools, whereby schools are compared according to relative gains on tests made several years apart, have been regularly heard in all States and Territories. If the performances of schools and school systems were to be compared then a core curriculum was needed from which pencil-and-paper items could be constructed. In the domain of mathematics education, the national *Mathematics Profile* (Curriculum Corporation, 1994) appears to have provided an adequate framework for this purpose (McGaw, 1995).

International comparisons of achievement. Concerns for standards and for the need to provide accountability of schools and school systems, were fuelled by studies which suggested that the mathematics curricula in schools in the United States of America were

inferior to the national curricula in Japan, Korea, and Taiwan (Berliner, 1995; McDonnell, 1995; McKnight et al., 1987; Stevenson & Stigler, 1992).

Australian extrapolations. In the late 1980s Australian politicians and education bureaucrats seemed to accept the view that curricula in the United Kingdom, the United States, and therefore probably Australia too, had been found wanting (Department of Employment, Education and Training, 1988), and that something needed to be done if Australian education systems were to be able to demonstrate appropriate levels of accountability (Bartlett, Knight, Lingard & Porter, 1994). This view was strengthened by the assumption—which was probably without foundation (Berliner, 1995; Ellerton & Clements, 1991; McGaw, 1994, Priest, 1981)—that over the past 20 years there had been significant declines in mathematical performance in schools in the UK, in the USA, and in Australia. Therefore, the Australian educators reasoned, it would be wise to follow the British move towards a more standardised education agenda (Piper, 1989).

Such a move was not entirely logical. Anyone wishing to argue that a national curriculum is likely to be associated with better teaching and learning of mathematics is faced with the problem of explaining why so many nations in the Asia-Pacific region with legislated national mathematics curricula (for example, Malaysia, Papua New Guinea, The Philippines, and Thailand) have never obtained above-average results in international surveys of mathematics achievement.

Colonialist Tendencies

Truran (1994) has disputed Clements, Grimison and Ellerton's (1989) claim that important developments in the history of Australian mathematics education have often occurred because of the strength of "colonial echo" forces. Truran maintained that such colonial echo explanations are "too simplistic and too general" (p. 632). On the basis of his historical analysis of the introduction of probability into school mathematics programs in South Australia, he argued that "muddling through" would provide a better description of curriculum development than either "colonial echo" or "mature development" (p. 638).

The national curriculum framework developed in Australia in the late 1980s and early 1990s was similar to the national curriculum which had been introduced in the United Kingdom in the second half of the 1980s (Ellerton & Clements, 1994; Piper, 1989, 1992). There can also be little doubt that standards-based approaches, deriving largely from the United States of America, are increasingly influential in Australia (McDonnell, 1995; Pascoe, 1995). Given these similarities, it is worth considering whether allegations of colonialism in the Australian education context can be substantiated.

Without resorting to a "colonial echo" interpretation, how can one explain why the structure of the national curriculum framework developed in Australia was so remarkably similar to the outcomes-based education (OBE) structure of the national curriculum in the United Kingdom which had been developed five years earlier (Ellerton & Clements, 1994; Hughes, 1990)? The same five major content Strands (Number, Measurement, Space, Chance and Data, and Algebra) as those incorporated in the UK national mathematics curriculum were to be found in the nationally developed mathematics curricula for Australia. Each curriculum assumed four "bands" of schooling (lower primary, upper primary, lower secondary, and upper secondary), and the notion of a profile based on "levels" (10 in the United Kingdom, and 8 in Australia) was common.

Expressions of colonialism. Colonialist tendencies in education were often expressed through the power of money and association. In 1989, for example, Phillip Hughes, Professor of Education at the University of Tasmania and President of the Australian College of Education, participated in a three-month study, sponsored by the British Council, into the national curriculum in England and Wales. Hughes (1990) subsequently wrote an influential booklet in which he stated that Australia could learn much from the national curriculum in the United Kingdom which permitted "individual schools and clusters of schools to undertake very effective curriculum planning" (p. 17).

During the period 1988–1994 a succession of senior educators from the United Kingdom visited Australia, and delivered invited plenary addresses on national

curriculum issues. In September 1990, for example, Professor David Hargreaves, of the University of Cambridge, addressed a "National Conference of Australian Educators," on how the national testing component of the UK national curriculum provided straightforward answers to three questions asked by parents: (a) What were the achievements of their children relative to other children of the same age? (b) How well were their children progressing in key learning areas? and (c) Has there been a rise or decline in general student achievement in their children's school, and in the nation's schools in general? (Hughes, 1990). When, in January 1994, the recently established Australian Teaching Council conducted a Summer School aimed at helping teachers understand teaching and assessment implications of the nationally developed curriculum statements, profiles and key competencies, two of the four keynote speakers were Professors of Education from the United Kingdom (Cooper, 1994).

There were seven plenary speakers at a conference on "Efficiency and Equity in Education Policy" held in Canberra in September 1995, comprising two senior educators from England, two professors from the United States, and three senior academics from Economics Departments in Australian universities. One of the educators from England, a Dr Geraint Johnes, of the Centre for Research in the Economics of Education at the University of Lancaster, told those at the Conference, that in the United Kingdom "as a means of facilitating parental choice, publication of a series of performance indicators had been introduced." Johnes (1995) continued:

> The examination performance and absenteeism records of pupils at each school are now published annually. These are well publicised; indeed detailed league tables appear in the daily newspapers. Upon their introduction, such performance indicators were controversial, not least because they make no allowance for inter-school differences in the quality of pupil intake. National tests have been introduced for secondary school entrants which will, in a few years time, make possible the development of value-added performance indicators. (p. 129)

Johnes drew attention to how schools could, by selective entry and exclusion, manipulate their position in performance tables. According to Johnes, schools which performed well in the league tables did so partly because they are able to deny access to weaker pupils. He concluded his address by stating that Britain had been to the fore in the development of performance indicators in education, and that "the rest of the world can benefit from both positive and negative aspects of Britain's experience" (p. 139).

One of the American professors who spoke at the Conference, Lorraine McDonnell (Professor of Political Science and Education at the University of California), made many references to policies affecting mathematics education in the United States of America. McDonnell quoted extensively from the National Council of Teachers of Mathematics' (1989) *Standards* document, and argued that research indicated unambiguously that mandated national or statewide testing has a powerful effect on classroom teaching, in that "teachers teach to the test" (McDonnell, 1995, p. 246).

In responding to the paper by McDonnell, Bill Scales (1995), Chair of the Industry Commission in Australia, spoke of the parallels that could be drawn between Australian and United States' experiences with national curricula. He also spoke of the need for Australia to define carefully student learning outcomes and indicators in order that "an overall assessment of school system performance" could be made. Statewide assessments of student learning were needed, Scales said, because the Review of the Commonwealth-State Service Provision, established by the Premiers, Chief Ministers, and Prime Minister, had stipulated that such data would enable comparisons to be made between school systems. Scales (1995) went on to say that although there was no system of national assessment of student learning in Australia, plans were being made to solve the problem:

> The Review is currently examining whether bridges built between the States' test instruments to establish some comparability over time (for example, by embedding similar questions, administering existing tests to samples of students in other education systems) ... Comparisons between systems will ultimately enhance the transparency that will arise from reporting state-specific learning outcomes. (p. 280)

There was not one mathematics educator present at this high-level conference, and the thinking of those who would formulate policies which were likely to influence school mathematics in Australian was being shaped by economists, politicians, and visiting professors from the United Kingdom and the United States of America.

The evidence suggests that although the process of "muddling through" in education policy occurs within Australia, those controlling the direction of the "muddling" still look to the United Kingdom, the United States of America and, increasingly, to the discipline of economics for inspiration. In particular, policies affecting practices in school mathematics have been, and continue to be, based on decisions made by governments in the United Kingdom and the United States of America.

Political Dimensions

Although the national curriculum framework was not approved by the AEC in 1993 (the vote in July 1993 being lost by 5 votes to 4, with voting being along party lines), the Federal Labor Party used tied grants to ensure that the national curriculum statements and profiles became a basis for curriculum development in the States and Territories. As the Deputy Prime Minister, Kim Beazley, was quoted as saying after the July 1993 decision: "The two billion dollars Canberra provides to the States each year provided plenty of ice for the Commonwealth to skate on if it has to," and "schools would get the national curriculum whether through a sensible co-operative arrangement or ... the old way" (quoted in Ellerton & Clements, 1994, pp. 269–270). Subsequently, State and Territory governments were denied adequate funding for the professional development of their teachers unless they participated in a Federally-funded National Professional Development Program (NPDP). The Federal Government also funded the creation of the Australian Teaching Council (ATC) which, among other things, conducted residential workshops at which teachers were familiarised with the national curriculum documents (Ellerton & Clements, 1994). Over the past ten years, political considerations have never been far away from all matters to do with the development of the national curriculum framework in Australia (Ellerton & Clements, 1994; Eltis, 1995; Marsh, 1994).

Less than the most expert advice. It will be useful, here, to provide an example of the kinds of action which resulted from the politicisation of the national curriculum. In August 1995 Faculties of Education in Australian universities received a copy of a report written by Susan Pascoe, entitled "The standards movement in America: A United States/Australia Comparison." An enclosure signed by Alan Ruby, Deputy Secretary of DEET, stated that the writing of the report had been funded by DEET, and Pascoe's (1995) report indicated that the research project had been undertaken by the Victorian Catholic Education Office for DEET. The purpose of Pascoe's project had been to investigate, during a visit to the United States, four important educational issues: (a) the strategies used by federal agencies to achieve the involvement of states and localities; (b) the kinds of assessment procedures being used and their relationship to benchmarks and standards; (c) examples of best practice in standards monitoring; and (d) the impact of international imperatives on moves towards national literacy assessments.

In her comprehensive and balanced report, Pascoe (1995) referred extensively to NCTM's (1989) *Standards* document, and therefore clearly entered the domain of mathematics education. Yet, in August 1993 the Mathematics Education Research Group of Australasia (MERGA) had received a letter from Alan Ruby indicating that DEET was not prepared to accept an offer by MERGA to advise DEET on how mathematics education research findings might inform government policy in respect of contentious mathematics education issues (Ellerton & Clements, 1994). The funding of Pascoe's investigation, and of the preparation and dissemination of her report, indicated, however, that DEET was prepared to place some credence in an investigation which would be carried out by someone unknown in the Australian mathematics education community, into issues which were associated with, among other things, important recent mathematics education developments in the United States.

This episode is consistent with the unwillingness, evident between 1987 and 1995, of most Canberra education bureaucrats to seek guidance from the nation's top

mathematicians and mathematics education researchers on policies affecting mathematics education (Ellerton & Clements, 1994). Much of Federal government policy on the national curriculum and the quality movement in schools and higher education was imported from the UK and the USA. One explanation of why this happened is that, from the mid-1980s, the Departments of Employment, Education and Training in Canberra and in the States and Territories were, increasingly, controlled by economists or Total Quality Management (TQM) experts who had little direct experience in education settings but had large knowledge of overseas trends linking economics and education (Pusey, 1991).

Politics and sincerity. For all the questionable tactics it used in its struggle to achieve a national curriculum, the Australian Labor Party clearly believed that a national curriculum was needed to achieve important education, social, and economic goals. University-based mathematicians and mathematics educators, in particular, were consistently regarded as representing privilege. As one Commonwealth Minister stated in 1993, "with school retention rates at 80%, the idea that schools are nothing more than a source of recruits for high level university study in Maths and Physics is no longer sensible" (quoted in Ellerton & Clements, 1994, p. 270).

The Labor Party gained the cooperation of trade unions, employers, and special interest groups, as well as State and Territory education bureaucrats, in its quest to gain acceptance not only for the national curriculum concept, but also for the development of work-related competencies. This was Labor Party policy, and Marsh's (1994) book makes it clear that the politicians and bureaucrats saw themselves as leading the nation's thinking on educational matters. That is why they adopted what Marsh has called an "Authority Model" in their efforts to achieve a national curriculum. They saw it as appropriate for them to use their political clout to develop and implement curriculum policy. After all, they had been elected to provide strong and decisive leadership.

Core Curriculum and Equity in School Mathematics

Equity and Social Justice in Mathematics Education

In the 1970s and 1980s those who advocated school-based curriculum development believed that the closer those developing curricula were to the "action" in schools the more likely it was that the curricula would meet the needs of individual students (Hannan, 1985). The kind of data reported by Bourke and Parkin (1977), in which the mean performance of Aboriginal children on tests of basic literacy and numeracy skills was shown to be well below the mean performance of other Australian children, was taken as proof that equity in education was unlikely to be achieved by a core curriculum approach.

However, towards the end of the 1980s and into the 1990s some influential educators who had previously argued against core curricula began to shift ground. Hannan (1993), in an obituary for Garth Boomer, stated that Boomer had been accurate when he recognised that the progressive ideas and methods of the 1970s and early 1980s—which had been needed to free a cramped system in Australian education—"became soft" (p. 8). Too often, Hannan said, school-based curricula had resulted in working-class children and other potentially disadvantaged children taking the "soft options," which effectively made it impossible for them to gain entry to prestigious tertiary courses.

The notion of a "core" or "entitlements" mathematics curriculum has become a *cause celebre* of the NCTM in the United States of America. The NCTM's (1995a) position statement on "mathematics for language minority students" is explicit:

> Every student is entitled to a mathematics education that provides preparation for a full range of careers having mathematical prerequisites and to be an informed citizen. Cultural background and language must not be a barrier to full participation in mathematics programs. Therefore ... all students, regardless of their language background and language must study a core curriculum in mathematics based on the NCTM standards. (p. 20)

This viewpoint is consistent with "Goals 2000," a Clinton administration initiative passed by Congress in 1994, which called for states to develop voluntary content and performance standards to be applied to *all* students (McDonnell, 1995).

The December 1995 NCTM News Bulletin. The political dimensions associated with the three *Standards* documents (NCTM, 1989, 1991, 1995a) in the United States need to be understood in Australia. NCTM, its affiliated organisations, and US academic mathematics educators have been in a privileged position in that they have been well supported by governments and education authorities in providing quality professional development programs aimed at assisting the implementation of the *Standards.*

The politics of the *Standards* could be recognised in a recent (December 1995) NCTM *News Bulletin,* in which Richard Long, the NCTM's "government relations specialist," warned members that there were proposals to take all of the funds away from "Goals 2000," or to turn it into a block grant. According to Long, such a change would "have a significant impact on the mathematics education community," in that Federal support for the professional development of teachers of mathematics would become more difficult to obtain. NCTM members were advised to lobby their local members of Congress, and if they wanted advice on what to say they could contact NCTM headquarters.

The same NCTM *News Bulletin* reported that, from an equity perspective, positive changes were taking place in American science and mathematics education. Nevertheless, the *News Bulletin* said, cuts in Washington threatened to slow down the changes (NCTM, 1995b). American students, as a whole, were doing better at elementary mathematics, yet "26% of black students scored at or above the basic level in mathematics on the NAEP in 1992, whereas 73% of white students scored at or above this level." Enrolments in Algebra 2 classes were up, and this was especially true for Hispanic and American Indian students. By contrast, the national percentage of high-school students taking general, remedial, or consumer mathematics had declined by one-third since 1990.

In another section of the *News Bulletin*, a "roving reporter" quoted answers given by five mathematics educators to the question: "Has there been a downside to expecting students to take higher-level mathematics courses? If so, what is it?" The five respondents found very few negative effects, although one made the ominous comment that many teachers were feeling challenged, because they had "to work with a more diverse student population and that causes more work for them."

None of the "advances" mentioned in the *News Bulletin* could be directly attributed to the *Standards* documents, and no convincing data were provided on the issue of whether most teachers were coping with the diversity. Interestingly, it was precisely this "coping-with-diversity" issue on which the national curriculum in the United Kingdom, and the nationally developed curriculum in Australia has foundered (Cooper, 1994; Ellerton & Clements, 1994; Groundwater-Smith, 1993; Kelly, 1990; Lanyon, 1995; Truran, 1993).

"The Burden." Some evidence is available related to the "coping-with-diversity" issue with respect to the implementation of the *Standards* in the United States. An evaluation study, directed by Robert Stake, into the effectiveness of a Mathematics and Science teacher professional development program in Chicago in the early 1990s, provides commentary on the implementation of NCTM's (1989, 1991) *Standards* documents (see Stake et al. 1994). Questions such as "Were the schools and teachers most needing help the ones participating?" and "How has teacher knowledge, pedagogy, and belief been affected by participation in professional development activities?" were investigated.

The evaluation team's report, a 120-page document titled *The Burden,* provided a powerful commentary on the negative effects of the extra work imposed on teachers by the volume of mandatory external projects including standardised testing programs, and detailed prescription of curriculum outcomes (Stake et al., 1994). The report indicated that the load schools could bear had not adequately been assessed, and that unrealistically, the State, the reform movement, and those organisations providing assistance contributed to the burden. The following quotation illustrates the tenor of the evaluation:

> They are not helping school people decide, given the resources available, what responsibilities to diminish. Part of the burden is those long lists of state, national, community, and professional goals and standards, idealistic views of what ought to be. Voltaire's words were "The best is the enemy of the good." Some schools like Westlake have been getting better gradually but far, far too slowly. Long term failure is almost certain, partly because the outsiders, as well as the Westlake LSC [Local School Council], have too grand a view of what they should be. The vision of democracy-in-action to effect school reform is not possible until committees are setting the goals as well as the programs. (pp. 84-85)

Although the report is about schools and a professional development program in a district in Chicago, the reader is almost compelled to reflect on the health of mathematics education in the United States, even under a *Standards* régime.

Lessons for Australia? It is too early to know whether the NCTM's belief that a core mathematics curriculum will result in more students being empowered to use and enjoy the mathematics they study at school. In Australia, there is certainly a belief that the *Standards* have had "a powerful effect on classroom teaching in the United States," and that a similar approach in Australia, based on a core curriculum with "a complete set of rigorous indicators" and associated statewide tests, would have a strong and positive impact on teachers in schools (Scales, 1995). Those in high places in Australia also seem to believe that standards setting can play a role in raising the expectations that teachers hold for the achievement of students in potentially disadvantaged target groups, thereby "removing the risk of institutionalised underperformance" (Scales, 1995, p. 281).

A National Statement on Mathematics for Australian Schools (Australian Education Council, 1991) stated that in Australia we need to "be vigilant that mathematical interest and talent are able to flourish regardless of geographic location, gender, social class or ethnic origins" (p. 10). Although there is no evidence that the OBE approach adopted in the *Mathematics Profile* (Curriculum Corporation, 1994) offers a suitable framework for the variety of different curriculum provisions and teaching strategies "needed in order to accommodate a diversity of individual needs" (Australian Education Council, 1991, p. 10), the *Profile* has constituted an excellent base for statewide testing and the implementation of value-added accountability schemes (McGaw, 1995; Scales 1995).

The balance of evidence from the United States, the United Kingdom, and from Australia, does not support the view that core mathematics curriculum approaches will assist the introduction of fairer, more equitable, school mathematics programs.

References

Australian Education Council (1991). *A national statement on mathematics for Australian schools.* Melbourne: Curriculum Corporation.

Bartlett, L., Knight, Lingard, B., & Porter, P. (1994). Redefining a "national agenda" in education: The states fight back. *Australian Educational Researcher, 21*(2), 29-44.

Berliner, D. (1995). Education reform in an era of disinformation. *Virginia Journal of Education, 88,* 6–11.

Bessant, B. (1989). The role of corporate management in the reassertion of Government control over the curriculum of Victorian schools. In D. Stockley (Ed.), *Melbourne Studies in Education 1987–88* (pp. 35–52). Bundoora, Vic: La Trobe University Press.

Bourke, S. F., & Parkin, B. (1977). The performance of Aboriginal Students. In S. F. Bourke & J. P. Keeves (Eds.), *Australian studies in school performance: Volume 3, The mastery of literacy and numeracy* (pp. 131–155). Canberra: Australian Government Printing Service.

Clements, M. A., Grimison, L. A., & Ellerton, N. F. (1989). Colonialism and school mathematics in Australia 1788–1988. In N. F. Ellerton & M. A. Clements (Eds.), *School mathematics: The challenge to change* (pp. 50–78). Geelong: Deakin University.

Cooper, S. (1994, April 4). National agenda in Australian schools. *Education* (pp. 12–13).

Curriculum Corporation. (1994). *Mathematics—a curriculum profile for Australian schools.* Carlton, Vic: Author.

Cuttance, P. (1995). Benchmarking in the NSW school system. *Unicorn, 21*(2), 60-69.

Department of Employment, Education and Training (1988). *Strengthening Australia's Schools: A consideration of the focus and content of schooling.* Canberra: Author.

Ellerton, N. F., & Clements, M. A. (1991, October). *Have standards fallen in school mathematics in Victoria? Some historical perspectives.* Paper presented at the second Australian History of Mathematics Conference, Monash University.

Ellerton, N. F., & Clements, M. A. (1994). *The national curriculum debacle.* Perth: Meridian Press.

Eltis, K. (Chair) (1995). *Focusing on learning: Report of the review of outcomes and profiles in New South Wales Schooling.* Sydney: NSW Department of Training and Education Co-ordination.

Graham, D. (1993). Reflections on the first four years. In M. Barber & D. Graham (Eds.), *Sense and nonsense and the national curriculum* (pp. 2–9). London: The Falmer Press.

Groundwater-Smith, S. (1993). "We can't do that today Maria." *Education, 74*(14), p. 11, & *74*(15), p. 6.

Hannan, B. (1985). *Democratic curriculum. Essays on schooling and society.* Sydney: Allen & Unwin.

Hannan, B. (1993). Garth Boomer. *EQ Australia, 1*(1), 8.

Hughes, P. W. (1990). *A national curriculum: Promise or warning?* Deakin, ACT: The Australian College of Education.

Johnes, G. (1995, September). Reform of organisational structure in systems of education: British experience. In *Papers presented at a Conference on "Efficiency and equity in education policy"* (pp. 123-142). Canberra: National Board of Employment, Education and Training.

Kelly, A. V. (1990). *The national curriculum: A critical review.* London: Paul Chapman Publishing.

Lanyon, P. (1995). The downside of outcomes. *Education,* May 8, pp. 16, 17, 19.

Marsh, C. J. (1994). *Producing a national curriculum: Plans and paranoia.* Sydney: Allen & Unwin.

McDonnell, L. M. (1995, September). Defining curriculum standards: The promise and the limitations of performance assessment in schooling. In *Papers presented at a Conference on "Efficiency and equity in education policy"* (pp. 231-276). Canberra: National Board of Employment, Education and Training.

McGaw, B. (1994, March). Effectiveness or economy. *ACER Newsletter Supplement.*

McGaw, B. (1995). Benchmarking for accountability or improvement. *Unicorn, 21*(2), 7-12.

McKnight, C. C., Crosswhite, F. J., Dossey, J. A., Kifer, E., Swafford, J. O., Travers, K. J., & Cooney, T. J. (1987). *The underachieving curriculum: Assessing school mathematics from an international perspective.* Champaign, IL: Stipes.

National Commission on Excellence in Education (1983). *A nation at risk: The imperative for educational reform.* Washington, DC: US Government Printing Office.

NCTM. (1989). *Curriculum and evaluation standards for school mathematics.* Reston, VA: Author.

NCTM. (1991). *Professional standards for teaching mathematics.* Reston, VA: Author.

NCTM. (1995a). *Assessment standards for school mathematics.* Reston, VA: Author.

NCTM. (1995b). *News Bulletin (Dec., 1995).* Reston, VA: Author.

Pascoe, S. (1995). *The standards movement in America: A United States/Australia comparison.* Canberra: Department of Employment, Education and Training.

Piper, K. (1989). National curriculum: Prospects and possibilities. *Curriculum Perspectives, 9*(3), 3–7.

Piper, K. (1992). National curriculum: An historical perspective. *Unicorn, 18*(3), 20–24.

Priest, T. A. (Chair). (1981). *Review of educational standards in lower-secondary schools in Western Australia.* Perth: The Education Department of Western Australia.

Pusey, M. (1991). *Economic rationalism in Canberra. A nation building state changes its mind.* Cambridge: Cambridge University Press.

Scales, B. (1995, September). Comment on: "Defining curriculum standards: The promise and the limitations of performance assessment in schooling." In *Papers presented at a Conference on "Efficiency and equity in education policy"* (pp. 277-283). Canberra: National Board of Employment, Education and Training.

Stake, R., Cole, C., Sloane, F., Migotsky, C., Flores, C., Merchant, B., Miron, M., & Medley, C. (1994). *The Burden: Teacher professional development in Chicago school reform.* Urbana-Champaign: University of Illinois.

Stevenson, H. W., & Stigler, J. W. (1992). *The learning gap.* New York: Summit Books.

Thomas, J., & Clements, M. A. (1994). Where can teachers' voices be heard? In C. Beesey & D. Rasmussen (Eds.), *Mathematics without limits* (pp. 120-125). Melbourne: MAV.

Truran, J. (1994). Curriculum innovation and the teaching of probability in South Australia—Colonial echo, mature development or muddling through? In G. Bell, B. Wright, N. Leeson, & J. Geake (Eds.), *Challenges in mathematics education: Constraints on construction* (Vol. 2, pp. 631-640). Lismore: Mathematics Education Research Group of Australasia.

Truran, K. (1993). Mathematics in the English national curriculum—Implications for Australian educators. In M. Carss (Ed.), *Report of the MELA 11 Conference* (pp. 133–144). Brisbane: Mathematics Education Lecturers Association.