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What We Learned from a Comparison of Mathematics Assessment in Australian and Chinese Primary Schools

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This paper compares mathematics assessment between Australian and Chinese primary schools to investigate assessment factors accounting for the mathematics achievement. The paper shows that there are considerable differences in assessment practice, but also many similarities in assessment policy. It found a gap existed between the assessment policy and practice in both Australian and Chinese primary schools, partly because teachers are not given training in mathematics assessment. To bridge this gap between intended and implemented assessment, it argued that explicit professional training in mathematics assessment is essential for both pre-service and in-service teachers in both countries.

Key words: assessment, Australia, China, comparative study, mathematics achievement

International comparison of mathematics achievement has become one of the 'hot topics' for mathematics educators around the world (Leung, Graf & Lopez-Real, 2006; Liang, 2010; Lim, 2007; Mullis, Martin & Foy, 2008; OECD, 2000). In this paper I present the results of a comparative study of mathematics assessment in Australian and Chinese primary schools and discuss what we can learn from this comparative study. The background to the study including international comparison of mathematics achievement and the relationship between achievement and assessment is introduced in the first part of the paper. It is followed by the brief description of the research framework and research methods. Then the main findings of the study are discussed and the implications of the study are presented.

Mathematics Achievement and Assessment

To keep up with developments of the 'knowledge economy', students all over the world need to increase their mathematical understanding and competency. The link between students' mathematics achievement and a nation's competency in the future is widely acknowledged (OECD, 2001; United Nations Children's Fund, 2000; Yore, Anderson & Chiu, 2010). Consequently mathematics educators are interested in knowing how the status of their mathematics education compares with that of other countries. Therefore the focus of international education has been on international comparisons of mathematics achievement and on exploring factors that account for differences in achievement (Akiba, Greaney & Kellaghan, 2008; LeTendre & Scribner, 2007; Wang, 2007; Zhao & Singh, 2011).

There have been a number of large-scale comparisons of mathematics achievement among countries for more than four decades, and these studies have found that students from China (including Mainland China, Hong Kong and Taiwan) consistently outperformed their Western counterparts (including Australia) (Lapointe, Mead & Askew, 1992; Lokan Ford & Greenwood, 1997; Mullis et al., 1997; Mullis et al., 2008). For example, in 1990-91, the Centre for the Assessment of Educational Progress surveyed the mathematics and science performance of 13-year-old students (Second International Assessment of Educational Progress) from twenty education systems, and mainland China outperformed all others in terms of mathematics achievement (Lapointe et al., 1992). TIMSS (Trends in International Mathematics and Science Study) 2007 provides the most recent and most compelling implicit data. It shows that, at the fourth grade, among 36 countries or education systems, Hong Kong had the highest achievement in mathematics. Among the eighth grades from 49 countries or education systems, the students from Chinese Taipei (Taiwan) had the highest mathematics achievement (Mullis et al., 2008).

To explain the achievement gap, researchers have identified differences in cultural attitudes to education (Leung, et al., 2006; Stevenson & Stigler, 1992), quality of mathematics teaching (Akiba, LeTendre, & Scribner, 2007; Stigler & Hiebert, 1999), teachers' mathematics pedagogy knowledge (Ma, 1999), content and standards of mathematics curricula (Lindquist, 2001) and out-of-school curricula (Lin, 2001).

However, some researchers also recognize the inherent limitation of mathematics assessment, and have suggested that the superior performance of

Chinese students might be a reflection of the specific form and content of tests used by large-scale comparative studies. For example, by using both process-constrained and process-opened problems to test Chinese and American students, Cai (2000) indicated that, in comparison with American students, Chinese students' superiority was limited to certain aspects of mathematics achievement, including basic skills of computation and solving routine problems. Conversely American students performed better than their Chinese counterparts in aspects such as using visual and graphical representations and solving open-ended problems. However, considerable differences existed between Cai's study and other comparative studies. For example, when both typical mathematics problems (routine questions) and novel problems (open-ended questions) were used to assess students through a Michigan studies, American students nearly always scored lower than Chinese students, suggesting that Chinese students' superiority was not restricted to a narrow range of well-rehearsed, automatic computational skills, but was manifest across all the tasks including open-ended tasks (Stevenson & Stigler, 1992).

This contradictory data raises an interesting question about the assessments used in assessing students' achievement in comparative studies, and assessment itself seems to be a largely neglected aspect of comparative education (Eckstein & Noah, 1992; Hodgson, 2010). In particular, there is a lack of comparative studies that incorporate a descriptive knowledge of assessment practices, and examine similarities and differences of assessment in 'authentic' settings (Zhao et al., 2006). To raise education standards, assessment practices have played an increasingly important role in education both in China and Australia (Zhao, 2000; 1999). It is widely acknowledged that student's mathematics achievement is affected not only by officially prescribed mathematics standards, but also by the mathematics teaching and assessment (Black & Wiliam, 1998; Clarke, 2000; Leder & Forgasz, 1992).

On the one hand, contemporary mathematics assessment is claimed to reflect an international consensus regarding the nature of mathematics learning, and should be recognized, not as a neutral element in the mathematics curriculum, but as a powerful mechanism for the social construction of mathematics competence (Clarke, 2000). On the other hand, there have been different views and approaches to assessment of students' achievement in Mathematics and that the East Asian education systems, including those of mainland China, Hong Kong and Taiwan, are characterized

by highly competitive examinations (Leung et al., 2006). In these systems, teachers and parents attach great importance to education, and there is a high expectation for their students and children to succeed, not the least of which is because academic achievement has been considered a means of bringing honour to one's family. This high expectation on students to succeed provides an important motivation for students to learn. In addition, the differences in social and economic status between the academically highly qualified and the less qualified are much greater in East Asia than in the West (Zhao, 1999).

In summary, the current literature indicates that mathematics assessment has a strong influence on teaching, on learning and on the students' achievement. In order to understand the mathematics achievement gap between China and Australia, the focus of this investigation is upon the influence of assessment on achievement.

Research Framework and Methodology Notes

The main purpose of this comparative study is to investigate assessment factors that may account for the achievement gap between students at Australian and Chinese primary schools. The conceptual framework of this comparative study is adopted from the theory of three levels of curriculum (Robitaille, 1980; Robitaille & Garden, 1989):

- The intended curriculum: the requirements of curriculum as specified at the national or system level in terms of standards and syllabus.
- The implemented curriculum: the practices of curriculum as interpreted and delivered by classroom teachers.
- The attained curriculum: the curriculum that is learned by students, as demonstrated by their attitudes and achievements.

Based on the above framework, this study uses the terms, intended assessment (the assessment policy at national or system level) and implemented assessment (the practices of assessment as delivered by classroom teachers), as key elements of intended and implemented curriculum. The main research question guiding this comparative study is: what are the key differences and similarities in mathematics assessment policies and practices between Australian and Chinese primary schools, and what factors can account for these?

To answer this research question, a case study is regarded as the most appropriate research approach (Merriam, 1998; Yin, 1994; 2009). It is argued that interpretation of data in a large-scale quantitative study is difficult,

because it is difficult to measure precisely by using questionnaires, especially since much of the information is retrospective. Therefore, it was decided to use a case study as a supplement to large-scale studies involving international comparison of mathematics achievement. This allowed the researcher to interact with the respondents, to probe details, and to elaborate on answers (Stevenson & Nerison-Low, 2002).

In this comparative study, three primary schools (two from Australia and one from China) were selected for case studies. The two Australian schools were chosen from the Sydney metropolitan region and the Chinese school was chosen from the Guangzhou metropolitan region. The selection of these schools involved purposive sampling (Bogden & Biklen, 1998), and the three schools were chosen to illuminate particular differences and similarities between educational settings relevant for investigation of the mathematics assessment policies and practices in Australian and Chinese schools (Maxwell, 1998; Merriam, 1998). In the three schools, classroom practices were observed, policy documents, student work samples and examination papers were examined, and teachers and parents were interviewed.

The purpose of classroom observations was to investigate the pattern of mathematics assessment at the three schools, and to find the general approach to assessment adopted in the schools. Most indicators on the Classroom Observation Record were adopted from the mathematics classroom observation protocols used by Stigler and Hiebert (1999) for their TIMSS video studies, but the items relevant to assessment practice were designed by the researcher. The mathematics classroom observation focused on teacher and student behaviour and their interactions through the process of teaching and learning in sequence from the beginning to the end of the lesson. The key information sought from the observations was focused on activities related to assessment, such as the teacher's analysis of students' responses and adjustment of the lesson according to students' responses. In each school, five mathematics lessons by each teacher were observed.

After the observation of classes, a post-observation interview was conducted where teachers were asked to explain the rationale underlying their classroom assessment practices. Six mathematics teachers (one teacher per grade) were recommended from each school by the principal to be interviewees. The teacher interviews consisted of twelve open-ended questions, covering topics including interviewees' teaching experience,

knowledge related to mathematics assessment, and perspectives on mathematics assessment. The key information sought from teachers was related to the 'what', 'how' and 'why' of assessment.

The analysis of government educational policy documents enabled the researcher to gain more insights into the intended assessment at the system level (Merriam, 1998). Other documents, including the school websites and newsletters, policy statements, mathematics programs and resources, students' mathematics work samples, examination papers, homework and students' portfolios or school reports were also analyzed. The analysis of work samples and examination papers was based on the intended assessment standards drawn from government policy documents. During the study, data collection and data analysis were produced simultaneously. Content analysis (Denzin & Lincoln, 2003) started from the first transcript of an interview, the first classroom observation sheet, and the review of the first document. For each case, emerging insights, categories and themes were formed over the data collection period for each case. When all the tapes were transcribed and the classroom observation sheets and documents were collated, a more holistic approach to data analysis based on the three levels of curriculum and the assessment was used to uncover emerging themes. In the last stage, cross-case analysis was used to analyze the key differences and similarities among assessment policies and practices.

Results

Differences in Mathematics Assessment

Classroom observations showed that Australian teachers prefer to use individual assessment and usually checked students' classroom assignments individually during classroom time. Because portfolios were used as the major approach to assessment in the Australian schools, teachers paid close attention to collecting students' work samples regularly. In contrast, Chinese teachers preferred group assessment and checked students' classroom assignments collectively at the end of the class. They relied more on written examinations distributed by the local pedagogical office than did their Australian counterparts. Because of the large classes (around 50 students) at the Chinese School, students had few opportunities to answer questions, to demonstrate their work, or to receive immediate teacher feedback during their mathematics classes compared to the Australian students (the average class size was less

than 30 students). However, the Chinese students were better prepared for their classes (most of them were able to follow teacher's instructions and did their seat-work very well) than were the Australian students.

The formal assessment documents reviewed considerable differences in the representation of the problems and content standards of assessment. Most test items from Australian schools were presented as pictures or drawings, whereas the Chinese school used words or mathematical symbols, even in Years 1 and 2. The Chinese examination papers contained more items to test students' memory of basic mathematics facts and computing skills, and also contained more abstract items to test students' understanding of advanced mathematics concepts and relationships between different mathematics concepts.

The interviews with the teachers revealed considerable differences in the teachers' views on the purpose of assessment. Most Australian teachers indicated that the main purpose of assessment was to gather information about students' learning and use it to improve their teaching. Although most Chinese teachers recognized the importance of assessment for their teaching, they believed that the main purpose of assessment was to motivate students to higher achievement. Two teachers explained that, according to Chinese tradition, teachers attributed students' achievement (or lack thereof), to their motivation, and parents deeply respected and supported the teachers. Therefore, the focus of assessment was on improving teaching practices in Australia, but was more focused on 'pushing students' to achieve at the Chinese schools.

Last but not the least, the interviews with parents showed large differences between the beliefs of Chinese parents (whether living in China or in Australia) and Australian parents (native English speakers) in terms of mathematics assessment and attitudes towards mathematics achievement. Chinese parents attached a high value to their children's mathematics achievement, since it is one of the key subjects tested by the National College Entrance Examination. All the Chinese parents had high expectations for their children's mathematics achievement and they all encouraged their children to work hard in mathematics to gain entry to key schools (selective schools). They paid great attention to their children's mathematics work or progress and had regular contact with their mathematics teacher to check their children's progress. This attitude extended to their children's after-school time, either

sending children to coaching schools or coaching their children themselves. Chinese parents reported that the average after-school time that their children spent on mathematics was about four hours per week. In contrast, the Australian parents attached a higher value to English than to mathematics and indicated that they did not push their children to study hard in mathematics. They viewed after-school time as play time. They did not favor sending their children to coaching schools. Their children spent only half an hour per week on after-school mathematics learning.

Similarities in Mathematics Assessment

Despite considerable differences in mathematics assessment between Australian and Chinese schools, many similarities were found in policy documents, classroom practices, students' examination papers and teachers' interviews.

Curriculum policy documents indicated that the intended mathematics curriculum and assessment in both systems shared similar views on the nature and purpose of assessment. Both systems recommended that the main purpose of assessment should be to improve students' learning by integrating assessment with teaching and learning, and should support the curriculum rather than drive it (Chinese Ministry of Education, 2000; DETYA, 2000). The mathematics curricula of both systems suggested similar assessment strategies. For example, Australian numeracy policy (DETYA, 2000) recommendations included teacher-observation and questioning; structured interviews with students; paper-and-pencil tests; oral tests; practical skills tests; work- or project-based assessment; collected samples of students' independent work; individual homework assignment; group reports; anecdotal records; self-assessment and peer assessment. Similarly the Chinese Ministry of Education (2000) advocated various approaches, such as paper-and-pencil examination, thematic activities, writing essays, group activities, self-assessment and daily observations by teachers to be synthesized to form a scientific and reasoned method of assessment.

Classroom observation showed that few teachers used authentic assessment in which mathematics was presented to students through real-life problems, including open-ended investigation or projects or integrated activities to explore within or after school. All teachers emphasized routine test tasks, which were drawn from textbooks. It seems that the intended assessment policy (e.g. using alternative assessment) recommended by both

Chinese and Australian policy-makers is not to be broadly implemented into classrooms, because there is a clear mismatch between intended and implemented assessment in both Australian and Chinese primary schools.

The analysis of examination papers and students' work-samples showed that the formal approaches to assessment and reporting at the three schools were still dominated by paper-and-pen tests. Although portfolios were used at the two Australian schools, they were really used as a collection of examination papers.

All teachers shared some similar views on the mismatch between intended and implemented assessment. The Australian teachers interviewed indicated that there was a need to use a variety of assessment strategies to make portfolios representative of all aspects of students' learning, but a lack of time and resources, inadequate professional training and lack of parental support hindered them. Similarly, the Chinese teachers suggested that mathematics achievement could not be assessed solely by written examinations, although paper-and-pen examinations were highly valued by parents and Chinese culture. They indicated that most information related to students' mathematics learning was gleaned from classroom observation, checking students' seat work and homework. They also reported that large class sizes, constraints of the current examination system, traditional cultural views, and lack of resources and professional training were the main reasons for the mismatch between intended and implemented assessment.

In summary, the study reveals a gap between the intended and implemented mathematics assessment both in Australian and Chinese primary schools. The interview data shows that teachers in both countries lacked sufficient professional training in mathematics assessment despite attending in-service training courses. It was also apparent that pedagogical knowledge alone did not ensure that the teachers implemented intended assessment practices into their classroom routine.

Discussion

This study confirmed the findings from the TIMSS study (Lokan et al., 1997; Mullis et al., 2008) in which Chinese students outperformed Australian students in mathematics. Main factors that are believed to contribute to this gap include differences in cultural attitudes towards mathematics education

(Leung et al, 2006), the quality of mathematics instruction (Stigler & Hiebert, 1999) and teacher's mathematics knowledge (Ma, 1999). This study showed that factors related to mathematics assessment should be included in the list.

The interviews showed that assessment strongly influenced Chinese parents' attitudes towards their children's learning. As a Year 5 parent at the Chinese school said:

> *I think mathematics plays an important role in developing a human being's thinking capabilities. It is one of the three core subjects assessed by selective exams for entrance to high schools and universities in China. It is also one of my son's favourite courses, so we have focused more on cultivating and developing his ability in this subject, expecting him to be a specialist in the future. We have paid much attention on encouraging his interest since he was in Year 1. It is the tradition in China that parents encourage their children to study hard only those courses that are examined.*

This statement reflects the influence of traditional Chinese examination culture on parents' attitudes towards mathematics (Zhao, 2000; Leung, 2006). A Year 6 mathematics teacher at the Chinese school explained further that:

In China, the examination system is called 'the baton' (Zhi hui bang), directing the teaching and learning at which it points. The National Unified Entrance Examination for Institutions of Higher Education is the most powerful assessment in students' lives. It affects even those students at primary schools and their parents. The form and content of this sort of examination has a powerful influence on what mathematics is taught and how it should be assessed.

In contrast, Australian parents said that their implicit views were not influenced by assessment practices because they did not expect their children to go to a Selective High School or good universities with poor achievement in mathematics. As stated by a Year 6 parent:

> *I do not think my children need a Selective School. I think the Selective School is not for my children. They cannot get there because they are not good at math. I just generally hope they learn enough to prepare them for the future. They can get their job, work in the community.*

This statement shows that the Australian parents believed that mathematics assessment would determine their children's place in society and that they had

little influence on this process, which differed dramatically from Chinese parents' attitudes towards mathematics assessment and learning.

The mathematics assessment practices also seem to influence Chinese and Australian teachers' perspective about the primary purpose of assessment. Chinese teachers indicated that they believed that the major purpose of assessment was to stimulate students' motivation to improve achievement levels. As a Year 1 teacher at the Chinese school explained:

> *The assessment of mathematics is mainly an inspection of students' learning. It has two purposes: one is to assess their understanding of content studied by students in the previous stage and give feedback about what they have learned and what are the key issues; the other is to motivate students to study hard to achieve high scores.*

The above statement suggests that Chinese teachers perceive the pressure from mathematics assessment as an appropriate means to motivate students to learn, (Leung, 2006). Chinese students were expected to work hard to achieve success in mathematics. As a Year 6 parent at the Chinese school argued:

> *Of course, I wish that she could study in a good high school and a renowned university in the future. My perception is that the importance of individual diligence in study is above all in comparison with school teaching, her future mainly depends on her own efforts.*

In contrast, Australian teachers used mathematics assessment as a tool to assist them in their teaching and they relied on students' intrinsic motivation in learning mathematics. As a Year 1 teacher explained:

> *By assessing, you see whether the students have learned the content you tried to teach them or not. You will also know if they have achieved the outcomes or not. If they have grasped your teaching, they can learn more; if not, we should go back to teach them again.*

Similarly, Australian parents relied on their children's intrinsic motivation in learning mathematics and did not push their children to study hard for high achievement or to gain entry to selective schools. They emphasised the students' inner ability more than other factors, such as personal effort. It was accepted that their children were either very able or not,

and they did not expect less able children to do well academically. As a Year 4 parent at an Australian school indicated:

> *I suppose the selective school is good. If your children are gifted and you know they really like English and Math, you can encourage them to attend a selective school rather than stay in a normal school, held back by others in the majority of the class. Like my children, if they go to a selective school, there would be too much to learn. It is very hard for them.*

The above perspective is shared by other Australian parents, which suggests that Australian parents value intrinsic motivation and the ability to learn mathematics more highly than do Chinese parents.

Implications and Conclusion

This study has linked assessment with achievement. Classroom observation revealed a broad mismatch between intended and implemented assessment in both Australian and Chinese primary schools. Paper-and-pencil tests still dominate assessment practices, although alternative assessments are advocated by the intended curriculum and assessment in both systems. Therefore, it is recommended that teachers should use assessment as a tool to diagnose students' learning and also include authentic items in their assessment, so that mathematics is presented to students through real-life problems.

A lack of professional training in assessment practices was one of the key reasons that teachers did not use assessment strategies recommended at the system level. The classroom observations and interview data suggest that both pre-service and in-service professional development is needed. For pre-service training, it is recommended that a course related to assessment should be included in teacher education programs. This assessment course should contain specific content related to mathematics assessment for primary schools. For in-service training, it is recommended that teachers need more time and resources to improve their assessment practices and skills. They need time to communicate with their colleagues and to reflect on their own mathematics teaching. However, the findings from this study are based on just three particular schools so some caution should be exercised in generalising the results.

In conclusion, this study highlights the need to bridge the gap between assessments as it is intended to be implemented and assessment as it really is implemented.

References

Akiba, M., LeTendre, & Scribner, J. (2007). Teacher quality, opportunity gap, and national achievement in 46 countries. *Educational Research, 36 (7),* 369-387.

Black, P., & Wiliam, D. (1998). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan, 80(2),* 139-148.

Bogden, R., & Biklen, S. (1998). *Qualitative research for education: An introduction to theory and methods.* Boston: Allyn and Bacon.

Cai, J.F. (2000). Mathematical thinking involved in US and Chinese students' solving process-constrained and process-open problems. *Mathematical Thinking and Learning, 2(4),* 309-340.

Chinese Ministry of Education. (2000). *National Mathematics Curriculum Standards for Nine-year Compulsory Education.* Beijing: Beijing Normal University Press.

Clarke, D. (2000). Assessment for teaching and learning. *Learning Matters, 5(3),* 2-5.

Denzin, N., & Lincoln, Y. (2003). *Collecting and interpreting qualitative materials.* Thousand Oaks, CA: Sage.

DETYA (Department of Education Training and Youth Affairs. (2000). *Numeracy, a priority for all: Challenges for Australian schools.* Canberra: DETYA.

Eckstein, M. A., & Noah, H. J. (Eds). (1992). *Examination: Comparative and international studies.* New York: Pergamon Press.

Greaney, V., & Kellaghan, T. (2008). *Assessing National Achievement Levels in Education.* Washington DC: The International Bank for Reconstruction and Development/The World Bank.

Hodgson, B. (2010). The socio-cultural approach to mathematics education: A fundamental and timely challenge for China. *Paper presented to the International Conference on the Social-Cultural approach to Mathematics Education.* Zhejiang Normal University, China, June 28-30, 2010.

Lapointe, A. E., Mead, N. A. & Askew, J. M. (1992). *Learning mathematics.* Princeton: Educational Testing Service.

Leder, G., & Forgasz, H. (Eds.). (1992). *Assessment and learning of mathematics.* Melbourne: Australia Council for Educational Research.

Leung, F. K. S., Graf, K. D. & Lopez-Real. (Eds). (2006). *Mathematics education in different cultural traditions: A comparative study of East Asian and the West.* New York: Springer.

Liang, X. (2010). Assessment use, self-efficacy and mathematics achievement: comparative analysis of PISA 2003 data of Finland, Canada and the USA. *Evaluation & Research in Education, 23(3),* 213-229.

Lim, C. (2007). Characteristics of mathematics teaching in Shanghai, China: Through the lens of a Malaysian. *Mathematics Education Research Journal, 19(1),* 77-89.

Lindquist, M. (2001). NAEP, TIMSS, and PSSM: Entangled influences. *School Science and Mathematics, 101(6),* 289-191.

Lin, F. L. (2001). The pressure for high achievement in Taiwanese education. *Dialogues, 2001 (11). Http://www.nctm.org/dialogues/2001/20022213.htm.* Accessed on 16/12/2002.

Lokan, J., Ford, P., & Greenwood, L. (1997). *Maths and science on the line: Australian middle primary students' performance in the third international mathematics and science study.* Melbourne: Australian Council for Educational Research.

Ma, L.P. (1999). *Knowing and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States.* Mahwah, NJ: Erlbaum.

Maxwell, J. (1998). Designing qualitative research. In L. Bickman & D. Gog (Eds.), *Handbook of applied social research methods, pp. 69-100.* Thousand Oaks, CA: Sage.

McConney, A., & Perry, L. B. (2010). Science and mathematics achievement in Australia: the role of school socioeconomic composition in educational equity and effectiveness. *Journal of Science and Mathematics Education, 8(3),* 429-452.

Merriam, S. B. (1998). *Qualitative research and case study approach in education.* San Francisco: Jossey-Bass Publishers.

Mullis, I., Martin, M., Beaton, A., Gonzalez, E., Kell, D., & Smith, T. (1997). *Mathematics achievement in the primary school years: IEA's Third International Mathematics and Science Study.* Boston: Centre for the Study of Testing, Evaluation and Education Policy, Boston College.

Mullis, I., Martin, M., & Foy, P. (2008). *TIMSS 2007 International Mathematics Report: Findings from IEA's international mathematics and science study at the fourth and eighth grades.* Boston: Centre for the Study of Testing, Evaluation and Educational Policy, Boston College.

OECD (Organisation for Economic Co-operation and Development). (2001). *Competencies for the knowledge economy: Education policy analysis 2001*. Paris: OECD.

OECD. (2000). *Knowledge and skills for life: First results for PISA 2000*. Paris: OECD.

Robitaille, D. F. (1980). Intention, implementation, realization: Case studies of the impact of curriculum reform. In H. G. Steiner (Ed.), *Comparative studies of mathematics curricula: Chang and stability 1960-1980,* pp. 90-107. Bielefeld, Germany: University Bielefeld.

Robitaille, D.F. & Garden, R.A. (1989). *The IEA study of mathematics II: Contexts and outcomes of school mathematics.* Oxford: Pergamon.

Stevenson, H. W., & Nerison-Low, R. (2002). *To sum it up: Case studies of education in Germany, Japan and the United States.* Washington DC: US Department of Education.

Stevenson, H. W., & Stigler, J. W. (1992). *The learning gap: Why our schools are failing and what we can learn from Japanese and Chinese education.* New York: Free Press.

Stigler, J. W., & Hiebert, J. (1999). *The teaching gap: Best ideas from the world's teachers for improving education in the classroom.* New York: Free Press.

United Nations Children's Fund (UNICEF). (2000). *Education for all: No excuses.* New York: UNICEF.

Wang, J. (2007). A trend study of self-concept and mathematics achievement in a cross-cultural context. *Mathematics Education Research Journal, 19(3),* 33-47.

Yin, R. K. (2009). *Case study research: Design and methods (4th Ed).* Thousand Oaks, CA: Sage.

Yin, R. K. (1994). *Case study research: Design and methods (2nd Ed.).* Thousand Oaks, CA: Sage.

Yore, L., Anderson, J., & Chiu, M. (2010). Moving PISA results into the policy arena: perspectives on knowledge transfer for future considerations and preparations. *International Journal of Science and Mathematics Education, 8(3),* 593-609.

Zhao, D. (2000). Establishing an assessment system suitable for quality education: A review of the assessment system of primary school students in Australia. *Studies in Foreign Education, 27(1),* 39-43.

Zhao, D. (1999). For the students' future: A review of the reform on high school

assessment in New South Wales. *Studies in Foreign Education, 26(4),* 18-22.

Zhao, D., & Singh, M. (2011). Why do Chinese-Australian students outperform their Australian peers in mathematics: A comparative case study. *International Journal of Science and Mathematics Education, 9*, 69-87.

Zhao, D., Mulligan, J., & Mitchelmore, M. (2006). Case studies on mathematics assessment practices in Australian and Chinese primary schools. In F.K.S. Leung, K. D., Graf & Lopez, F. J. – (Eds), *Mathematics education in different cultural traditions: A comparative study of East Asia and the West* (pp. 261-276). New York: Springer.

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