Publication Summary

Standards in Literacy and Numeracy: Contributing Factors

In research in which Australia was compared to the top performing countries on international tests of literacy and numeracy, the factors that might potentially contribute to literacy and numeracy achievement, were investigated. These included factors relating to educational systems, teachers and students. You may be surprised to learn what the researchers found.

It has been ten years since the publication of this article and the rankings for the Programme for International Student Assessment (PISA) have changed since that time, with more countries taking part in the program. However, even though Australia has maintained a mean performance a little above the OECD average, its performance has decreased from 2000 when the first measures were taken (De Bortoli, 2022).

Australian students first participated in the Progress in International Reading Literacy Study (PIRLS) in 2011. Although the percentage of Australian students reaching proficiency on this assessment increased from 2011 to 2016, there was no change in performance from 2016 to 2021 (Hillman et. al, 2023). Of interest, Hillman et al. reported a decline in the percentage of Australian teachers rating satisfaction with their profession with 10% indicating that they were less than satisfied, an increase from the 2% recorded in 2016.

The results for the Trends in International Mathematics and Science Study (TIMMS) 2023 have yet to be released. The 2019 results indicated that 70% of students achieved proficiency in Year 4 mathematics and 68% in Year 8 mathematics. Of note, the percentage of very low performers in mathematics was 10%, with the percentage of low performing Year 4 students above the international median.

Meeks, L., Kemp, C, & Stephenson, J. (2014). Standards in literacy and numeracy: Contributing factors. *Australian Journal of Teacher Education, 39,* 106-139.

The Progress in International Reading Literacy Study (PIRLS) defines two major purposes of reading and four processes of comprehension. In 2011, when this investigation was conducted, Australia ranked 27th in the list of 45 countries, and was ranked lower than all other English-speaking countries.

The 2011 results from the Trends in International Mathematics and Science Study (TIMSS) placed Australia 19th in the list of 50 countries which was lower than all other English-speaking countries apart from New Zealand.

Australia's Programme for International Student Assessment (PISA) ranking over time shows that, although the reading and mathematics scores for Australian students were both still above the OECD average, the performance of Australian students was declining. However, the number of countries participating in PISA has risen by 33 countries between 2000 and 2012 and this factor may partly account for Australia's lower rankings.

To determine the factors that contributed to the comparatively larger percentage of Australian students included at the minimal or low performing levels in PISA, PIRLS, and TIMSS, consideration was given to those factors that potentially influence student literacy and numeracy achievement.

National Educational System Factors

Investment in Education

Two of the top performing countries in PISA, PIRLS and TIMSS at that time (Finland and Korea) spent less per capita on education than Australia and the United States. Also, when comparing the percentage of GDP spent on schooling, Finland allocated the least amount and Hong Kong (China) allocated the most; suggesting that, although a minimum investment might be required, *student achievement is not necessarily dependent on financial investment.*

Teacher Salary

A comparison of the 2005 salaries of physicians, engineers, accountants, nurses, and teachers in Finland, Hong Kong (China), Korea, Shanghai (China), the United States, the United Kingdom, and Australia showed that teacher salaries fitted in the middle of the range. *When comparing teacher salaries across these same countries, high student achievement does not appear to be related to high teacher salaries.*

Curriculum

A national curriculum is provided in Finland, Korea, Shanghai (China), Hong Kong (China), and the United Kingdom. In the United States, most states follow a common core curriculum; however, a national curriculum is not provided. The Australian Curriculum Assessment and Reporting Authority (ACARA) had recently developed a National Australian Curriculum for implementation in 2013. *As the provision of a national curriculum and the amount of autonomy that teachers and schools enjoyed in the implementation process varied across all systems considered in this paper, it was not possible to determine whether either factor was associated with student achievement.*

Assessment Programs

All countries included for discussion in this paper have both formative and summative national assessment programs. A comparison of the number of students in PISA Bands 1 and 2 for reading literacy and mathematics literacy and those in the Low benchmark and below categories for PIRLS and TIMSS for each country *provides no evidence that the use of national assessments influence student achievement.*

Minimum Academic Requirements for Teachers

The range of minimum academic requirements for entry into teaching is wide: a master's degree in Finland to a diploma in Shanghai (China). In Australia, teachers must have either a bachelor's degree in education, a bachelor's degree and a postgraduate qualification in education, or a master's degree. *It appears, therefore, that level of minimum academic requirement for employment in the teaching profession does not make a critical contribution to student achievement.*

Compulsory Instructional Time Prior to the PISA Assessments

Between the ages of 7 and 15, Finnish students would have received 6323 hours of compulsory instruction, Korean students would have received 6930 hours and Australian students would have received 8889 hours. *Whilst it would appear that fewer instructional hours were related to better student results, the data did not provide information regarding the number of hours of literacy instruction included in this total, nor the effectiveness of the instruction. There was no evidence,*

therefore, to indicate that the number of compulsory instructional hours accounts for variations in student achievement.

Class Size

A recurrent theme in the literature has been the effect of class size on student achievement, suggesting that smaller class sizes lead to continued improvement over time in student performance. The average lower secondary class sizes for five of the seven countries compared in this paper ranged from 19.6 to 35.1 students, with average student-teacher ratios ranging from 9.9:1 to 20.5:1. *Comparing class size with the PISA ranking for reading literacy would indicate that there was not a strong relationship between these variables.*

Teacher Factors

Research has consistently linked teacher quality to student achievement. Measures of teacher quality have included subject-matter knowledge, evidence-based pedagogical skills, teacher preparation, and qualifications.

Choice of Undergraduates for Teaching Programs

In 2010 in Finland over 6,600 applicants applied for 660 primary school teacher training places even though the application and selection procedures were onerous. In Korea, only an estimated 5% of applicants are accepted into undergraduate degrees in primary education. Entry into undergraduate teacher training programs in Australia is less selective and shows a decline in the prior education achievement of applicants since 1980. *If less able students choose to train as teachers, the impact on student performance in schools may well be significant. A comparison of the percentage of students performing at Level 1 in the 2009 PISA reading and mathematics literacy assessments and at the Low benchmark in the 2011 PIRLS and TIMSS for Finland, Korea, and Australia would appear to support this view.*

Teacher Preparation

The content of tertiary programs offered to teacher trainees requires some scrutiny. Although examination of the content of pre-service teacher training has increased over the last decade, there still appears to be a lack of consensus of what constitutes quality teacher preparation.

Supporting Teachers Once They Are in the System

Retaining quality teachers is thought to be critical for improving student outcomes. In the United States, up to 50% of beginning teachers were reported to leave the profession in their first five years, and in the United Kingdom 30-50% of teachers were reported to leave within the first three to five years. By comparison, the attrition rates for Korea was estimated to be 1% per annum and 10% per annum in Finland. Attrition rates in the first five years of teaching for Australian teachers had been estimated at between 20% and 25%.

In-class Support, Induction and Mentoring

Observations and feedback concerning actual classroom teaching was found to have positive impact on the quality of teaching. In addition, a review of several studies on induction and mentoring programs for beginning teachers found that students taught by beginning teachers who had participated in some kind of induction program had higher scores, or gains, on academic achievement tests.

Continuing Professional Development

It has been suggested that a coherent framework for the provision of quality professional development should be based on two requirements: the needs of individual teachers/schools, and the ability of a system to sustain the professional development program over time. Part of a Teaching and Learning International Survey (TALIS) survey in 2008 *indicated a need for support in three main areas: teaching students with special learning needs, student discipline and behaviour management, and ICT teaching skills.*

Student Factors

Home Environment

The physical home environment includes socio-economic status influences, family structure, and cultural influences (second-language learners, cultural values and beliefs). *The Australian PISA results for 2009 indicated that the higher the level of socioeconomic background, the higher student performance is in all three domains.*

Student Ability, Dispositions, and Academic Experiences

Research has shown that student ability and disposition towards learning is related to academic success. Hornstra's study (2013) found that *motivation is positively related to school success beyond what can be explained by cognitive ability.*

Academic Experiences

Attendance at an early childhood program is associated with better school performance. Attendance at out-of-school tutorial centres, however, does not appear to guarantee later success.

Conclusion

The comparative data provided by PISA, PIRLS, and TIMSS did not indicate a clear relationship between the following factors and the percentage of students who fell in the lower levels of student achievement: (a) investment in education, (b) teacher salary, (c) curriculum, (d) assessment programs, (e) minimum academic requirements for entry into teacher education programs, (f) compulsory instruction time, and (g) class size. What was clear from international assessment data and the available research evidence, however, is that both teachers and the students themselves make the biggest contributions towards student achievement. *As it is not possible to control the abilities, prior experiences, and attitudes that a student brings to the learning environment, the teacher must be considered the principal contributor to student achievement*

It is our teachers who make the difference, and it is the responsibility of governments and teacher training institutions to select and prepare teachers accordingly.

Dr Lin Meeks PhD

Dr Lin Meeks, Director of Ants in the Apple Pty Ltd. has been involved in the field of special education for over 30 years. During this time, she established and taught in two special education units (an early intervention unit and a class for primary-aged students with mild intellectual disability) and spent a total of 17 years, part-time, teaching special education subjects in two universities. Currently Lin continues to provide consultancy to support teachers in their use of evidence-based teaching practices. Lin's research interests focus on three aspects of beginning literacy instruction: the role of phonemic awareness, phonics and explicit instruction in early reading and spelling; newly-graduated teachers' subject-specific content knowledge of early reading and spelling; and the extent to which the content of literacy units offered to preservice teachers in Australian undergraduate and graduate early childhood and primary degrees reflects current scientific research.

Reference

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