journal für lehrerInnenbildung
jlb
no.4
2023

Erfolg der Lehrpersonenbildung in Ostasien

Bibliografie:
Ban Heng Choy:
Teacher Education in Singapore:
An Insider View.
journal für lehrerInnenbildung, 23 (4), 66-77.
https://doi.org/10.35468/jlb-04-2023-05

Gesamtausgabe online unter:
http://www.jlb-journallehrerinnenbildung.net
https://doi.org/10.35468/jlb-04-2023

ISSN 2629-4982

klinkhardt

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Teacher Education in Singapore: An Insider View

jlb no. 4/2023 https://doi.org/10.35468/jlb-04-2023-05

What is the secret behind Singapore's stellar performance in international education assessments? The country's teacher education ecosystem is certainly one of the driving forces behind its success. In this paper, I present insights into Singapore's teacher education from four perspectives: as a preservice teacher, a teacher, a curriculum policy officer, and as a mathematics educator. By presenting a narrative of my participation in mathematics teacher education from different perspectives, I hope to highlight how excellence in mathematics education may lie at the confluence of three important factors related to teacher education: theory-practice nexus, collaborative partnerships, and productive dispositions. I conclude by drawing lessons from my own journey and suggest how these lessons can be applied to other countries as they embark on their own journeys in teacher education.

"Teachers are nation builders"

Singapore has consistently achieved outstanding performance in international educational assessments, such as TIMSS, PISA, and PIRLS. For TIMSS, Singapore's Grade 4 and Grade 8 students have consistently achieved top rankings and Singapore is the top achiever for both mathematics and science in TIMSS 2019. Similarly, Singapore has maintained at least a top 3 ranking in 2009, 2012, 2015, and 2018 in PISA. And more recently, Singapore has the highest average reading achievement in PIRLS 2021. What is the secret behind Singapore's success in these educational achievements? It is said that "the quality of an education system cannot exceed the quality of its teachers" (Barber & Mourshed, 2007, p. 16). Articulating the same idea, Tan, Low, Tay and Yan (2021) emphasized that "Singapore teachers and the Singapore curriculum" are the two key factors behind Singapore's consistent performance and "teachers are nation builders", responsible for nurturing our students (p. 7).

Several factors related to the quality of teacher education have been attributed to the success of Singapore's education system. First, there is a strong emphasis to get the "right people to become teachers" (Barber & Mourshed, 2007, p. 13). In Singapore, teachers come from the top 30% of their age cohort in terms of their academic achievements (Barber & Mourshed, 2007; Mourshed et al., 2010), and this is similar to other top performing school systems such as Finland,

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Hong Kong, and South Korea (Barber & Mourshed, 2007). Next, these pre-service teachers are developed into effective instructors through rigorous pre-service programmes specially designed by the National Institute of Education (NIE), the only teacher-training institution in Singapore (Barber & Mourshed, 2007; Gopinathan & Loh, 2023; Loh & Hu, 2019; Tay, Ho, Cheng & Shutler, 2019). Third, teacher education does not stop at the completion of teacher preparation programmes. Instead, beginning teachers continue their teacher learning by honing their skills through continuous professional development after they graduate from these teacher preparation programmes (Choy & Dindyal, 2021; Kaur, Cheng, Wong & Seto, 2019; Ng et al., 2019).

In this paper, I do not intend to provide a description of teacher education in Singapore because these descriptions can be found in the works as listed in the preceding paragraph. Instead, I will leverage on my experiences as a pre-service teacher (1995 to 2000), a mathematics teacher (2000 to 2009), a curriculum policy officer at the Ministry of Education (MOE) (2009 to 2011), and as a mathematics educator (2015 onwards) to provide an insider view of how teachers learn to become "nation builders" from these four perspectives. As suggested by Bullough and Pinnegar (2001), I attempt to provide "nodal moments" – those associated with issues related to my journey of learning to teach (p. 16) – as part of my self-study narrative for the purpose of drawing out lessons against the backdrop of teacher education development in Singapore over the last three decades. Two key questions guide my inquiry process:

1. What are some nodal moments in my journey as a pre-service teacher, a mathematics teacher, a curriculum policy officer, and a mathematics educator?
2. What can we learn from these nodal moments?

Learning to be a teacher

I started my pre-service teacher training at NIE in 1995 as an undergraduate enrolled in the Bachelor of Science with Diploma in Education (BSc. Dip. Ed.) programme. This programme was first offered when NIE was established as an independent institute, specialising in teacher education, as part of the Nanyang Technological University (NTU) in July 1991. I majored in both Mathematics and Chemistry for the first four

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years and did my Honours in Mathematics in Year 5. Besides the standard courses in Mathematics and Chemistry, I also took courses on educational psychology, pedagogy, and assessment for primary English, Mathematics, and Science in Year 1 and 2 as well as a few additional pedagogy courses for secondary Mathematics and Chemistry in Year 3 and 4, which were inserted into our teacher training curriculum to meet the demands for secondary teachers (Lim-Teo, 2009).

As part of my pre-service teacher training, I had four practicums lasting from 4 to 10 weeks in the first four years of my course. During practicums, I was assigned an NIE supervisor (NIES) and a Cooperating Teacher (CT) from the school to mentor me. Besides writing lesson plans for all the lessons I was teaching, I had opportunities to discuss with my CT and NIES *before* and *after* my observed lessons about my teaching in relation to the theory I had learned in my courses and practical issues faced by teachers in schools. It was during my practicums when I was confronted with the tensions of practicality due to time pressures and the need to teach for relational understanding. Upon reflection, I realised that these "confrontations" are opportunities for me, as a pre-service teacher, to think about these tensions and see the complexity of teaching beyond simply delivering content to pupils. Such conversations were helpful in my formative years as a pre-service teacher.

As highlighted by Loh and Hu (2019), this four-year programme was introduced to raise the quality of teacher education for primary school teachers by providing opportunities for them to gain mastery in both subject matter knowledge and pedagogical content knowledge (Shulman, 1987; Tay et al., 2019). This was the first step towards universitising teacher education. This "universitisation" of teacher education has enabled the teaching profession to "attract a better calibre of teacher-students, develop rigorous graduate and postgraduate programmes in education, recruit faculty with postgraduate qualifications, and invest in Singapore-centric education research" (Gopinathan & Loh, 2023, p. 1). Although the four-year university programme for pre-service teacher education has undergone several changes through the years (Lim-Teo, 2009; Loh & Hu, 2019; Tay et al., 2019), the changes followed the key guiding principle of ensuring "a balance between academic rigour and training teachers' professional capabilities" (Gopinathan & Loh, 2023, p. 5), alluding to the importance of teachers working at the theory-practice nexus.

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Learning to make sense of new educational initiatives

I was posted to a secondary school as a mathematics teacher in 2000. Although my NIE learning experience provided me with the foundational knowledge necessary for a beginning teacher, I realised quite soon that I needed to grapple with the challenges of being a beginning teacher, which included teaching specific topics, classroom management, working with parents, and dealing with new national educational initiatives. I started my career during the initial years of the *Thinking School Learning Nation (TSLN)* movement (Goh, 1997; Natarajan, Lim & Cheah, 2018), which positioned teacher education as a continuous process – a "continuum of three seamless stages according to the teaching career progression" of "pre-service, induction, and teacher professional development" (Ng et al., 2019, p. 407) – to prepare teachers to meet the challenges of preparing our students for the future. Part of the *TSLN* movement involved the introduction of Information and Communication Technologies (ICT) tools for enhancing teaching and learning in the late 90s and early 2000s (Natarajan et al., 2018). The ICT Masterplan, first introduced in 1997, initiated a "buffet" of professional learning opportunities for teachers to pick up new competencies. As a teacher, I had opportunities to attend a variety of in-service courses offered by NIE or MOE, as part of my 100 hours of professional development entitlement (Lim-Teo, 2009; Ng et al., 2019), to stay updated and relevant to the curriculum revisions and new initiatives.

The start of the *Teach Less Learn More (TLLM)* movement in 2004 signalled another fundamental shift from quantity to quality and from efficiency to choice in learning (Shanmugaratnam, 2004). The TLLM movement, first mentioned by our prime minister in 2004 (Lee, 2004), focused on a qualitative shift towards enacting more student-centric pedagogies and enabling teachers to engage students in learning. Space and time were given for us, as teachers, to envision, plan, implement, and review curriculum innovations in schools (Ministry of Education-Singapore, 2005). In line with these initiatives and my school's move towards a more integrated approach to learning, I had opportunities to go overseas to attend summer school programmes at the Centre for Gifted Education at the William & Mary School of Education in Virginia in 2005 and the Project Zero Institute at the Harvard Graduate School of Education in 2008.

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Beyond these one-time courses, teachers were also encouraged to take up higher degrees and certification courses to deepen their professional and research knowledge (Choy & Dindyal, 2021; Lim-Teo, 2009; Ng et al., 2019). Many of these courses were offered to prepare teachers for the different career pathways which are available to them. In Singapore, there are three career pathways for a teacher: Teaching Track, Leadership Track, and the Specialist Track (Barber & Mourshed, 2007). All teachers begin with the Teaching Track where they can aspire to become Senior Teachers, Lead Teachers, and Master Teachers. These roles empower competent teachers to lead and inspire less experienced teachers to grow in their profession. Some of the teachers may aspire to become leaders in the education fraternity (e. g., Heads of Department and Principals) and they may go into the Leadership Track if they are assessed to have the necessary competencies and potential. Others may want to take on a more researcher-stance to conduct research that inform educational policies and practices and these teachers can aspire to go into the Specialist Tracks. Whatever the case may be, teachers have opportunities to prepare and deepen their competencies for the roles they are taking.

At the school level, teachers had opportunities and time set aside to discuss issues about teaching and learning with each other and formulate school-based interventions to address these issues (Ministry of Education-Singapore, 2005). These opportunities marked the beginning of professional learning models such as lesson study (Fernandez & Yoshida, 2004; Jiang, Choy & Kim, 2022; Jiang, Choy & Lee, 2019; Ng et al., 2019), action research, and other collaborative professional development activities (Kaur et al., 2019) that formed the bulk of professional learning beyond the initial teacher preparation. Since 2005, the idea of professional learning networks has now been expanded to provide opportunities for schools across Singapore to collaborate in reviewing and improving their teaching practices. There are also opportunities for Singapore teachers to collaborate with teachers from other countries to learn together (Sakai et al., 2022). As highlighted by Barber and Mourshed (2007), teachers are seen as "professionals who had good judgment, knew their students well, and who could make their own decisions" (p. 52). Hence, the Singapore teacher education landscape focuses on teacher learning throughout their career along different pathways, beyond the initial teacher education.

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Learning to be a teacher-researcher

In the middle of 2009, I was posted to MOE as a curriculum policy officer, which can lead to a role in the Specialist Track. There, I was one of the curriculum partners for other schools working on their curriculum innovations. My work as a curriculum policy officer involved supporting schools in the design, planning, implementation, and reviewing of their school-based curriculum innovations as part of the TLLM *Ignite!* Programme (Lui, 2008). The TLLM *Ignite!* Programme provided schools the resources necessary to deploy one of their teachers as a Research Activist (RA), who was attached to MOE for 2 full days per week over a period of 40 weeks (Choy & Dindyal, 2021; Lui, 2008). This arrangement ensured that these RAs had the time to adopt an inquiry stance towards their teaching as they worked with their colleagues at school on their proposed school-based curriculum innovations. These RAs were also trained in curriculum design and research methodologies so that they could engage with curriculum innovations using an action research approach (Creswell & Guetterman, 2019).

As a curriculum policy officer, I managed the curriculum discussions within a group of RAs working on similar topics and within the schools' professional learning teams working on their projects. Having a keen interest to develop my research skills I took up a Master of Arts (Mathematics Education by Research) to engage in practitioner inquiry. I was one of the many teachers who were supported by MOE to do post-graduate degrees related to education. This move towards getting a higher degree has resulted in an ecosystem of teachers-as-researchers, who provided the necessary expertise for schools to embark on their own investigations of teaching and learning issues (Choy & Dindyal, 2021). The move towards equipping our teachers with the necessary research skills has also influenced the re-design of our initial teacher preparation programmes, in which all student-teachers in the BSc/BA programmes have opportunities to develop their research competencies as they engage with educational research in one of the courses.

In many ways, the move from teacher to teacher as researcher provides a way for teacher professional development to be more sustainable. Coupled with the teachers' placement within the three career tracks, there is a build-up of distributed of different expertise and competencies over the entire education system. Beyond learning from

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best practices in other parts of the world, Singapore teachers are beginning to adopt a more inquiry stance in their teaching to develop research-informed teaching approaches that are more tailored to their specific contexts. This ecosystem of teachers, leaders, and specialists forms the bedrock of teacher learning in Singapore.

Learning to be a teacher educator

By the end of 2010, I found my passion to be a teacher educator and decided to pursue my PhD study in mathematics education in 2012. Following my interest in developing teaching expertise, I worked in the field of mathematics teacher noticing (Choy, 2015) to support teachers in their professional growth through pedagogical reasoning and action (Shulman, 1987). I was appointed as an assistant professor in mathematics education at NIE from 2015. As a teacher educator, I was not only involved in pre-service teacher education at the university, but I was also working with teachers in schools, education officers in MOE, and other stakeholders in the community to deepen and strengthen the competencies of our teachers. Doing this requires me to make sense of the different priorities of various partners and find opportunities to work together despite our differences. Working with different partners to negotiate around the *paradoxes of education* (Ng, 2017) is really challenging at times. On reflection, I realised that I am only a small part of a bigger ecosystem that drives the continual professional learning of our teachers, which is critical for the success of our teacher education in Singapore.

As highlighted by Choy (2021), the perceived excellence in Singapore mathematics education lies at the confluence of "big things of education, such as societal expectations, policy formulation and implementation", and "the small things of classroom practices – scheme of work, tasks, and examinations" (p. 56). It is not the features of our education system that makes it excellent but rather, it is the generation of a supportive environment that empowers teachers to enhance the learning experiences for all their students that matters. In many ways, the current state of teacher education reflects the ecosystem approach to improving teaching and learning, one that adopts a multiple nested system view of the complexity of education (OECD, 2020).

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Lessons Learned

An excellent system of teacher education clearly goes beyond the universitisation of teacher education. As I described the nodal moments in my own journey through the different roles, it becomes clear that teacher education is a *continual* process throughout a teacher's career (Choy & Dindyal, 2021; Loh & Hu, 2019; Ng et al., 2019; Tay et al., 2019). But what lessons can we draw from these moments?

Here, I suggest three key takeaways from my own journey. First, effective teacher education always works at the theory-practice nexus. As a teacher, I needed to grapple with how the theories I learned in my courses could be applied in real-world classroom situations. As a curriculum officer, I needed to see how the curriculum theories and research findings could support the bottom-up efforts from schools to improve their teaching and learning. As a teacher-educator, I needed to see my own understanding of research in teacher learning can be adapted in light of the multiple partnerships and complexities of our education ecosystem.

Second, the complexities of working in the theory-practice nexus can be mitigated through collaborative partnerships that are focused on the same goals. In my own journey, there is a synergistic working relationship between MOE, NIE, and other stakeholders that has empowered me to learn – from others, from self, and from theory/observations (Mason, 2002). This synergy cannot and should not be taken for granted, as evidenced by the different mathematics wars fought in different countries (Chernoff, 2019; Yoon et al., 2021). To overcome these tensions, it may be necessary to adopt a more productive stance – one that is foundationally different from a winner-takes-all notion of mathematics education (Choy, 2021). Such a productive disposition requires us, as mathematics educators, to see possibilities (rather than impossibilities) to ensure that "the actions of the policy makers, school leaders, teachers, students, parents, and mathematics educators should flow together towards a clearly articulated vision of mathematics education" (Choy, 2021, p. 54). This calls for us to be more inclusive and balanced in our mindsets as we consider how the different curricular, pedagogical, and political positions can come together.

Third, teacher education should focus on growth instead of adopting a deficit-model of teacher competencies. As seen from nodal mo-

ments described teachers in Singapore have opportunities to grow as a professional through different career pathways. There are teachers who are really experts in their teaching craft; there are teachers who have the leadership competencies to lead and inspire teachers; there are teachers who want to deepen their knowledge base to design research-informed teaching policies and practices for the purpose of advancing the state of education in the country. Every teacher has a role to play in this ecosystem of teachers-leaders-specialists and the role of teacher educators is to design and support professional learning opportunities for all teachers, whatever roles, and stages of growth they are in. How this can be done will be an important area of research and development moving forward in this highly volatile and uncertain world.

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jlb no. 4/2023 https://doi.org/10.35468/jlb-04-2023-05