

# Integrating Higher-Order Thinking Skills (HOTS) in Teaching and Learning: Malaysia and Singapore in Retrospection

Jill Ling Pei Wah, Fetylyana Nor Binti Pazilah and Ong Sing Ling

## Abstract

Despite being neighbouring countries, Malaysia and Singapore differ greatly in terms of educational performance, evident in international comparative tests like TIMMS (Trends in International Mathematics and Science Study) and PISA (Programme for International Student Assessment). In PISA 2022, a decline in Malaysia's performance in all three literacy measures assessing Reading, Mathematics and Science compared to the scores back in 2018 is rather perturbing. Hence, this inter-country comparative study explores the integration of higher-order thinking skills (HOTS) in the teaching and learning with the aim for Malaysia to learn from the best educational policy and practices employed by Singapore in educational planning, implementation and innovation. Through document analysis, as the primary method utilised in this study, it was revealed that there are differences in the academic strategies and activities in Singapore compared to Malaysia due to education system, curricula and assessments, budget allocation and language policy. Based on the interesting commonalities of both countries, it is indicative that the Malaysian education quality can improve by overcoming the challenges in integrating HOTS. Other than promoting international understanding, it is hoped that Malaysian educators will continue to expand, upgrade and reform education by adopting ways to integrate HOTS effectively in teaching and learning.

**Keywords:** 21<sup>st</sup>-Century Skills, Higher-Order Thinking Skills (HOTS), Malaysia, Singapore, Teaching and Learning

## Introduction

Higher-order thinking skills (HOTS) is an education reform based on learning taxonomies, particularly Bloom's Taxonomy (1956), developed by Benjamin Bloom with his associates. Bloom et al. (1956) classified the learning objectives or outcomes into three learning domains: cognitive, affective and psychomotor. As one of the most recognised taxonomies of educational objectives, it comprises three hierarchical models used to classify educational learning objectives into levels of complexity and specificity. The three learning domains addressed are cognitive, affective and psychomotor. The cognitive domain concerns intellectual or mental skills and abilities. As for the affective domain, emotions, values and attitudes are classified. The third domain, psychomotor, is used for physical skills. The three dimensions categorise different goals for learning based on the assumption that learning objectives are accomplished using different mental processes.

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Bloom's cognitive domain is widely used in education with its list of a person's observable and unobservable intellectual abilities. There are six cognitive levels. The first three levels (knowledge, comprehension, and application) are considered lower cognitive levels. The latter three levels (analysis, evaluation, and creation) are considered higher thinking skills. In the old Bloom's taxonomy (1956), synthesis is the fifth level that comes before evaluation, the sixth level. However, in the revised taxonomy by Anderson and Krathwohl (2001), evaluation comes before creating as it is often a necessary part of the precursory behaviour before creating or synthesising something. Bloom's taxonomy is the backbone of teaching philosophies, a teaching tool for teachers to develop new strategies and balance evaluative and standards-based questions in texts, in-class engagements, and assignments. In line with the developing global focus on multiple literacies and modalities in learning and the emerging field of integrated disciplines, all orders of thinking are exercised in students' learning.

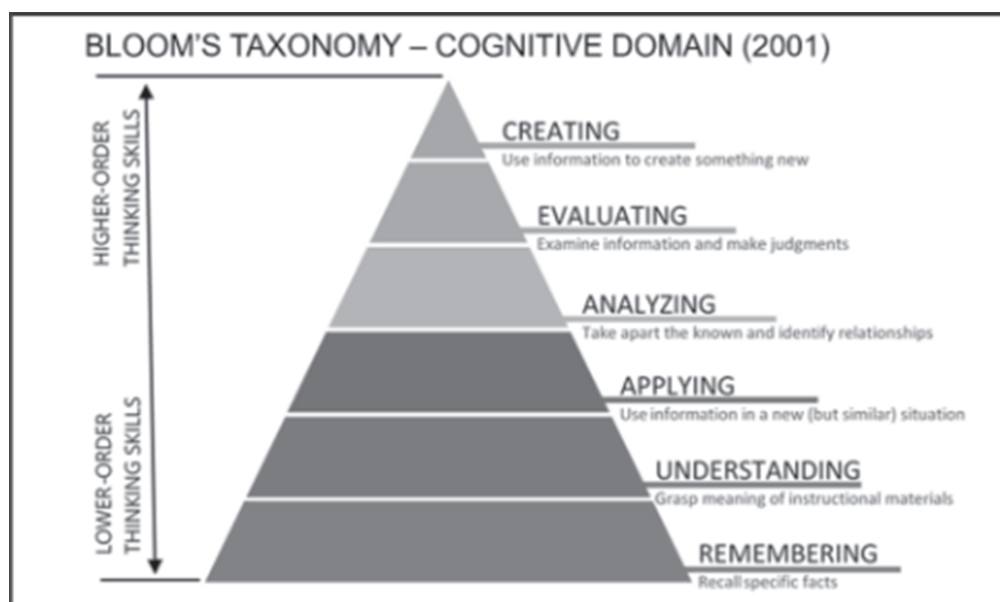


**Figure 1.** Bloom's Taxonomy (1956, revised by Anderson and Krathwohl in 2001)

Malaysia and Singapore are two countries whose education systems are interesting to study since they are geographic neighbours with some shared history and culture, yet at different stages of educational development. In this comparative study, the integration of HOTS in both countries and its similarities as well as differences will be reported, specifically focusing on classroom teaching and learning. Malaysia seems to be keeping up with the HOTS trend, which further necessitates this study to sustain improvement in the quality of student learning in an environment of rapid change. Through this study, several aspects of Singapore's education system that Malaysia can learn, emulate and implement are presented.

## Literature Review

Malaysian Ministry of Education (MOE, 2013) reported that more than sixty per cent of 15-year-old Malaysian students achieved low proficiency levels in thinking skills. Compared to Singapore, the students are lagging in schooling for more than three years. Hence, the Ministry of Education has made various

efforts to embed higher-order thinking skills (HOTS) through the curriculum, syllabus, teaching strategies and learning activities to master the HOTS. As stated in Malaysia Education Blueprint (2013-2025), every child will master a range of important cognitive skills, including critical and creative thinking, reasoning, and innovation.

Singapore's MOE has identified critical thinking as one of three broad emerging 21<sup>st</sup>-century competencies to develop in all students (MOE, Singapore, 2014). To prepare for the economic paradigm, Singapore developed a new education philosophy, "Thinking Schools, Learning Nation" (TSLN) in 1997. Instead of simply imparting knowledge to students, thinking schools develop higher-order, critical thinking skills and a passion for lifelong learning. Deliberate curricular and pedagogical shifts move learning beyond content to mastery and application of skills to solve authentic problems in various contexts (Kaur, 2021). In terms of curriculum, Singapore puts a lot of emphasis on 21st-century skills, real-world problem solving and thinking skills while integrating the use of information and communication technology (ICT) in the teaching and learning of HOTS (MOE, Singapore, 2016).

PISA is a study administered by the Organisation for Economic Co-operation and Development (OECD) on 15-year-olds in both OECD and non-OECD countries every three years to benchmark their education systems against international standards and give insights into how well education systems are preparing students for real life challenges and future success (OECD, 2023). It focuses on three domains: Reading, Mathematics or Science. Due to the Covid-19 pandemic, the last round was delayed from 2021 to 2022. By comparing results internationally, policy makers and educators can learn from other countries' policies and practices. In PISA 2022, Malaysian students scored 388 in the reading domain, a drop from 415 points in 2018, with 42% of them reaching the minimum level (Level 2). In mathematics, students scored 409 compared to 440 points, with 41% attained at least Level 2 proficiency, significantly less than OECD average of 69%, and only 1% of students were top performers attaining Level 5 or 6 compared to OECD average of 9%. Meanwhile, the scores for science also dropped to 416 from 438 points with 52% attaining the minimum level (Rajaendram, 2023). In comparison, Singapore has progressively maintained its scores and rankings (MOE, Singapore, 2020), compared to Malaysia which is evidently way behind. Table 1 summarises the PISA scores for Malaysia and Singapore over the years.

### Malaysia in Perspective

Malaysia, being an Islamic Southeast Asian country governed by a constitutional monarchy, comprises three federal territories and 13 states, with a population of great cultural, ethnic, linguistic, and religious diversity. To unite such diversity with ethnographic complexity, a standardised Malay, officially known as *Bahasa Malaysia* (formerly *Bahasa Melayu*), is used as the national language and the main medium of instruction in public primary and secondary schools. Since Malaysia was once colonised by the British, English is taught as the second language. A significant portion of its budget is allocated to education, providing free public schooling at the primary and secondary levels. Primary education (six years) is compulsory. For the secondary level (five years), students have the option to enrol in an academic, technical or vocational school before moving on to tertiary institutions with various specialisations: public and private universities, and teacher-training institutions.

| Table 1 Comparison between Malaysia's and Singapore's PISA Performances from 2009 to 2022 |          |           |          |           |          |           |          |           |          |           |      |
|-------------------------------------------------------------------------------------------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|------|
| Year/Country<br>Domain                                                                    | 2009     |           | 2012     |           | 2015     |           | 2018     |           | 2022     |           |      |
|                                                                                           | Malaysia | Singapore | Malaysia | Singapore | Malaysia | Singapore | Malaysia | Singapore | Malaysia | Singapore | OECD |
| Reading                                                                                   | 414      | 526       | 398      | 542       | 431      | 535       | 415      | 549       | 388      | 543       | 476  |
| Mathematics                                                                               | 404      | 562       | 421      | 573       | 446      | 564       | 440      | 569       | 409      | 575       | 472  |
| Science                                                                                   | 422      | 542       | 420      | 551       | 443      | 556       | 438      | 551       | 416      | 561       | 485  |
| Rank                                                                                      | 55/65    | 5/65      | 52/65    | 1/65      | *        | 1/72      | 48/79    | 2/79      | 47/78    | 1/78      | -    |

\*Malaysia's PISA 2015 results cannot be compared to previous results or other countries due to the potential of bias introduced by low response rates in the original PISA sample (51% instead of 85% standard rate).

The **Malaysian Curriculum Standards** are built on six pillars: Communication, Spirituality, Attitudes and Values, Humanities, Personal Skills, Physical Development and Aesthetics, as well as Science, Mathematics and Technology. These key domains support each other, integrated with critical, creative and innovative thinking to develop a balanced, knowledgeable, and skilled human capital. In collaboration with the Malaysian Innovation Agency (AIM), the Ministry of Education is committed to cultivating thinking skills and lifelong learning in primary and secondary schools by implementing the i-Think programme in 2013 (Tenth Malaysia Plan, 2011). The promotion of HOTS by educators in tertiary education was also emphasised in the Malaysian Education Blueprint (2013-2025) and the National Higher Education Action Plan (NHEAP,

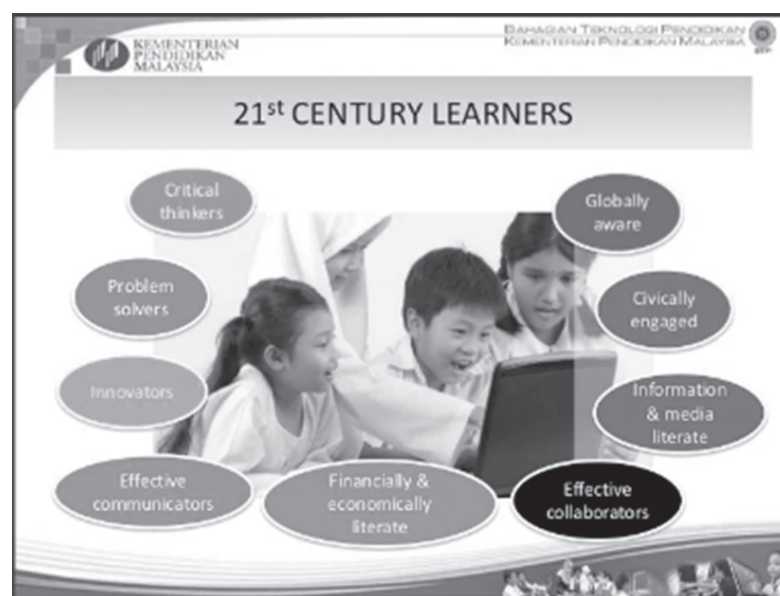


**Figure 2.** HOTS in Malaysian Education (MOE Malaysia, 2013)

2007), adopting innovative modes such as problem-based or active learning. Although the mastery of the HOTS is emphasized in the curriculum, the knowledge, engagement and level of readiness of the school, teachers and pupils are still at a low level (Mahmad et al., 2021).

### Singapore Leading the Way

Singapore owes its progress and prosperity as the most developed ASEAN country to its focal location. Singapore joined the Federation of Malaysia in 1963 but seceded to be an independent parliamentary republic in 1965. The population is diverse, predominantly Chinese, Malays and Indians with various religious affiliations. Due to this ethnic diversity, four official languages are recognised: English, Mandarin Chinese, Malay and Tamil. English, as the unifying factor, is the primary language of instruction in schools and the main medium for administration, commerce and industry. Besides English, pupils are taught their mother tongue to maintain the nation's identity, culture, heritage and values. Singapore highly values its education, and its system is elaborately structured and organised. Primary education is free (six to eight years). Students at the secondary level are placed into academic or vocational and commercial tracks. Opportunities for higher education are determined by academic performance, usually involving two or three years of pre-university instruction followed by enrolment at a university or technical college (MOE, Singapore, 2020).



**Figure 3.** Framework for 21st Century Competencies and Student Desired Outcomes (MOE Singapore, 2014)

The **Singapore Curriculum Standards** are built by setting educational objectives to produce highly confident students who can communicate effectively and independently. Therefore, the Programme for Active Learning (PAL) was introduced. In 2008, Singapore introduced Subject-Based Banding (SBB) to replace EM1, EM2 and EM3 (English and Mother Tongue at 1st, 2nd and 3rd language streams) in all primary schools in Singapore. In 1997, the vision of “Thinking Schools” was launched by the Ministry of Education to teach and assess HOTS in Singapore classrooms (MOE, Singapore, 2014). Conventional assessment or paper-and-pencil tests focusing on knowledge reproduction and low-level cognitive processing skills in artificial,

contrived contexts shift to authentic assessment tasks that underscore knowledge construction, complex thinking, elaborated communication, collaboration and problem solving in real contexts (Koh et al., 2012).

## The Integration of Hots in Teaching and Learning

### Education System

Similar to other Asian countries, the education system in Malaysia and Singapore is managed by or under the jurisdiction of the Ministry of Education. For primary schooling, the entry age into the first year is seven, and it takes six years for ordinary students in both countries. Students sit for national examinations before they can pursue secondary education: the Primary School Achievement Test (UPSR) in Malaysia (replaced with school-based assessment starting in 2022), and the Primary School Leaving Examination (PSLE) in Singapore. Malaysian students sit for the Malaysian Certificate of Education (SPM) at the end of secondary education, whereas Singaporean students are streamed into three main public secondary education: four years Express, or five years Normal (Academic or Technical) before sitting for Singapore-Cambridge GCE Ordinary Level (O-level) or Normal Level (N-level) examinations (MOE, Singapore, 2020).

In 2021, the Malaysian national examination at the end of the sixth year of primary schooling was scrapped or abolished and replaced with a school-based assessment, enabling all students to progress automatically to secondary school. This raises the issue of students' fluency, language competency in all four skills (listening, reading, reading, and writing) and level of proficiency. Without a summative assessment, students' actual performance cannot be measured or compared with the norms or the whole population. Some people also question the validity and reliability of the school-based assessment. Undeniably, there is no-one-size-fits-all approach, and further research and investigations need to be conducted to study this matter.

In both countries, the education systems are centralised with various initiatives to improve their education quality. However, when the OECD ranked education quality in 2022, Singapore continued to clinch the top spot, while Malaysia ranked 47 out of 78 countries. Despite the continuing efforts of the Malaysian government to improve its performance through the increase in enrolment rates, compulsory schooling years and access to education, Singapore takes the lead by focussing on the development of 21<sup>st</sup>-century skills amongst all students and the integration of information and communication technology (ICT) productively into teaching HOTS as part of Singapore's Fourth Master Plan.

Singapore was among the first few countries that initiated HOTS in their education system in the 1980s, while HOTS only made its debut by the Malaysian education ministry in 2013 through shifts in the curriculum, pedagogy and evaluation. With a population six times more and a size of about 330 times larger than Singapore, the implementation of education policies, plans, strategies and activities in Malaysia will not be as easy. Furthermore, with a per capita income of almost seven times that of Malaysia, Singapore has a higher human development index (World Data, 2024). Another major difference between these two countries is their study aids, especially book ownership and the use of ICT. The digital divide between urban and rural schools, and developed and less developed states in Malaysia varies, while this is non-existent in Singapore. Asia Society's Centre for Global Education reported that top students are recruited as teachers to educate Singapore's future generation, a policy that Malaysia can adopt.

## Curricula and Assessments

To enhance HOTS development in the learning process, MOE Malaysia has revised the curricula: KSSR for primary school and KSSM for secondary school. In 2012, the i-THINK programme was launched to inculcate higher-level thinking processes whereby teachers and students are trained to use effective strategies and tools, such as Thinking Maps, Habits of Mind, Thinking Hats and Q-Matrix Charts (Abu Hassan et al., 2020). In addition, the ministry has refined the standard of assessment in evaluating HOTS among students from preschool to secondary levels by incorporating it in both school-based assessments and national examinations such as SPM. The percentage of HOTS questions has increased gradually across the years. In addition, the ministry also provided a manual and guidebook to assist teachers to construct HOTS questions. Tiew and Ng (2019) found that the practices that promoted the teaching of HOTS were brainstorming, constructivist learning, inquiry teaching, thinking map, and problem-based learning whereas practices that inhibited the teaching of HOTS were teacher-centred learning and teaching lower-order thinking skills. A structured teaching method is required to assimilate both content and thinking skills (Ganapathy et al., 2017).

In teaching and learning HOTS, students in Singapore are expected to master real-world problem-solving skills and thinking skills. This is emphasised through each component of the problem rather than incorporating the problem directly into the formula. Students think actively as they solve problems. Other than that, the Singapore curriculum only focuses on several key concepts for each school year. By 2023, mid-year examinations for all primary and secondary school students will be scrapped in an ongoing move to shift the focus from academic grades and tests. Streaming will be abolished by 2025. Some countries have shifted from summative examination orientations of conventional assessments to formative and authentic ones.

## Budget Allocation

In Budget 2024, Malaysia allocated RM58.7 billion for the education ministry compared to RM55.2 billion in 2023 proves that education remains a national priority to empower its citizens. Although education gets the biggest allocation, it is only 15% of the total budget of RM393.8 billion. **Meanwhile, Singapore has continually invested about 20 per cent of the country's annual budget in the Ministry of Education, second to the budget for the Ministry of Defence (Tang, 2016). From the budget allocation, we can see the emphasis put on education** as a key development sector. The standard of education is a powerful predictor of the wealth that countries will produce in the long run (OECD, 2020). Investments in education contribute to the growth of human capital.

## Language Policy

Bilingualism is a key component in Singapore's single-stream education system, which uses English as the main language of instruction as opposed to the vernacular system, a subject of a long debate in multiracial Malaysia. Singaporeans can leverage their bicultural edge and reform education in their favour (Tang, 2016). Malaysia has witnessed a shift from one language to another, specifically a long debate on the use of *Bahasa Melayu*/Malaysia (BM) or English as the medium of instruction. In 2003, English was introduced as the medium of instruction for two subjects namely, science and mathematics for all schools, but this policy was reverted to BM in 2012. Under the government's initiative to 'Empower *Bahasa Malaysia* and Strengthen English' policy, the Dual Language Programme (DLP) was introduced in 2016 but only at selected schools (School Advisor, 2021). Similar to a bilingual programme, it allows students the opportunity to use

either English or BM in Science, Mathematics, ICT, and Design and Technology. The DLP is expected to boost English proficiency in government schools and enhance students' future employability opportunities. Unfortunately, the DLP is optional and has to meet four criteria: Adequate school resources; headmaster and teachers' collaboration, parental demand and support; and above-average school achievement in BM. In 2020, the High Immersive Programme (HIP) was implemented where English is used widely in an encouraging environment for students to practice their English in all schools throughout the country. Nevertheless, these programmes cannot escape the backlash from academicians, activists, and the general public due to various agendas.

While it is good to use BM to maintain the national identity and unite the linguistically diverse groups in Malaysia, it will cause some difficulties when the students move to international schools or proceed to the tertiary level, especially in private or foreign universities which mainly use English as the main language of instruction. Most resources including online references are written in English whereas sources in BM are rather limited. Relying on translation with most BM words borrowed from English with their spellings slightly changed may confuse the learners. Some international schools like ISKL and Taylor's acknowledge the advantage of being multi-lingual and offer a variety of additional languages such as BM, Mandarin, French and Spanish (School Advisor, 2021). A child learning another language will not affect his or her mastery of the mother tongue. Instead of playing the language card and engaging in this debate of which language is above the other, we should look at the broader picture and prepare the young generation for the 21st century.

## Challenges in the Implementation of HOTS

There are challenges in the implementation of HOTS in schools. In Malaysian settings, various researches have been done about HOTS. One fundamental factor found to foster the development of thinking skills among students is the competency of educators in planning and executing suitable approaches, techniques, and strategies (Othman & Mohammad, 2014). However, educators lacked an understanding of the requirements for teaching critical thinking skills in classrooms (Choy & Cheah, 2009; Yusoff & Seman, 2018), having basic knowledge only (Singh et al., 2018) or with low self-efficacy (Rosnani & Suhailah, 2003; Ganapathy et al., 2017). Abu Hassan et al. (2020) identified a lack of knowledge and skills as well as resistance to change on the part of the teachers as the internal factors, whereas student diversity, large class size and time constraints as the external factors. Due to the traditional concept of learning being sequential and linear, students never get to the point where they have the opportunity to engage in HOTS (Zohar et al., 2001). Thus, Chittleborough et al. (2008) suggested that educators need training via professional development programmes to promote HOTS and situate technologies within their pedagogical repertoires meaningfully (Ganapathy et al., 2017). To enhance HOTS, Wu et al. (2024) suggested incorporating Computational Thinking (CT) into academic courses with the possibility for the students to develop critical thinking skills through CT when students work on projects (Ong et al., 2023).

## Conclusion

The integration of HOTS has its fair share of obstacles along the way. To optimise learning for students, teachers need to overcome the challenges of utilising HOTS. Although the implementation of HOTS activities in the lesson plans takes a longer time, it is worthwhile in inculcating HOTS among students. Students' learning will improve significantly through a variety of HOTS activities made possible by ICT

usage that enhances their cognitive thinking processes. Potentially, learning HOTS through ICT promotes positive learning outcomes and benefits. Therefore, further investigations on the integration of HOTS in teacher training education and how it affects students' performance specifically on the issues, concerns and challenges are recommended.

Starting out on the same footing, Singapore has been progressing steadily up the ranks in the development of education while Malaysia struggles to maintain its rankings in measurements of students' ability. Despite various efforts made by both countries, education reform remains a constant challenge. Curriculum reformations and innovation in teaching and learning should be continued to produce students who are well versed in HOTS. Definitely, it requires a lot of planning, resources, teacher training and also continuous support from different levels of the community. Other factors with regards to the implementation of HOTS such as budget allocation, the use of ICT in bridging the digital gap, the credibility of teachers and bilingualism need to be addressed. It is necessary for Malaysia to catch up and follow the footsteps of Singapore to change the approach of the education system to prepare students who are ready for the real world and capable to compete in the international arena.

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