



NATIONAL UNIVERSITY OF SINGAPORE

MAP THE SYSTEM – RESEARCH SUMMARY

TEAM MEMBERS:

Tan Yong-Jia, Naaman

Liew Zheng Jie

Wu Meng Hui

Yap Pei Zhen

Zhu Hong Yue

**THIS REPORT IS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR MAP THE SYSTEM HOSTED BY THE UNIVERSITY OF
OXFORD**

Table of Contents

- 1. Introduction** 2
- 2. Challenge landscape** 3
 - 2.1 Meritocracy in Singapore 3
 - 2.2 Systems boundaries 4
 - 2.2.1 Key drivers of educational performance 4
 - 2.2.2 Key actors: school, family and students 4
 - 2.3 School: how institutional meritocracy stratifies education access 5
 - 2.3.1 Different schools, different quality of teachers 5
 - 2.3.2 Additional programmes offerings 5
 - 2.3.3 Accelerated and curated curricula 6
 - 2.3.4 Different peer composition in later loops 6
 - 2.4 Family: how different starting points undermine meritocracy 6
 - 2.4.1 Access to financial capital and additional resources 6
 - 2.4.2 Parental support 7
 - 2.4.3 Cultural capital as intangible drivers of educational attainment 7
 - 2.5 Self: how meritocracy impacts self-confidence and mental health 8
 - 2.5.1 Academic performance and self-confidence: a reinforcing loop 8
 - 2.5.2 Academic streaming and self confidence 9
 - 2.5.3 Academic performance and stress: a balancing loop 9
 - 2.6 How actors interact 10
 - 2.6.1 Family SES and student mental health 10
 - 2.6.2 Quality of schools and stigmatisation 10
 - 2.6.3 Cultural and financial capital bypassing meritocracy through preferential admissions 11
- 3. Solution Landscape** 11
 - 3.1 Alternative pathways to promoting academic merit: Subject Based Banding (SBB) 12
 - 3.2 Broader scales of assessments in academic performance: PSLE Revisions 13
 - 3.3 Social Services balancing the financial playing field 14
 - 3.4 Shifting towards holistic assessment 15

4. Systems level insights	15
4.1 System Insights #1: Unintended segregation of students by SES	16
4.2 System Insights #2: Academic Performance – The early, narrow and reinforcing definition of success and merit	16
4.3 Levers of change	16
4.3.1 Motivation	16
4.3.2 Quality of School	17
5. Breaking the loops – Recommendations	17
5.1 Removing non-meritocracy: Removal of legacy admissions	17
5.2 Addressing early segregation: Removing early streaming	17
5.3 Addressing motivation: Project-based education having removed early streaming	17
6. Conclusion	17
7. Appendix	19
Singapore’s Education System	19

1. Introduction

Education sits at the core of Singapore’s approach to tackling social inequality. In the wake of Covid-19, where schools have transitioned to home-based learning, the disparities of education access and the inequalities of Singapore’s education system have become especially pronounced. Examples include the uneven transition to online learning and access to the private tuition industry in a difficult education environment.

Meritocracy – the notion that opportunities should be granted on merit – lies at the heart of Singapore. With Covid-19 thrusting social inequality into the limelight, it is worth examining how meritocracy as a policy principle has fared at maintaining educational equality. With a systems thinking approach, we ask: “How does a meritocratic education system unintentionally exacerbate social inequality?”

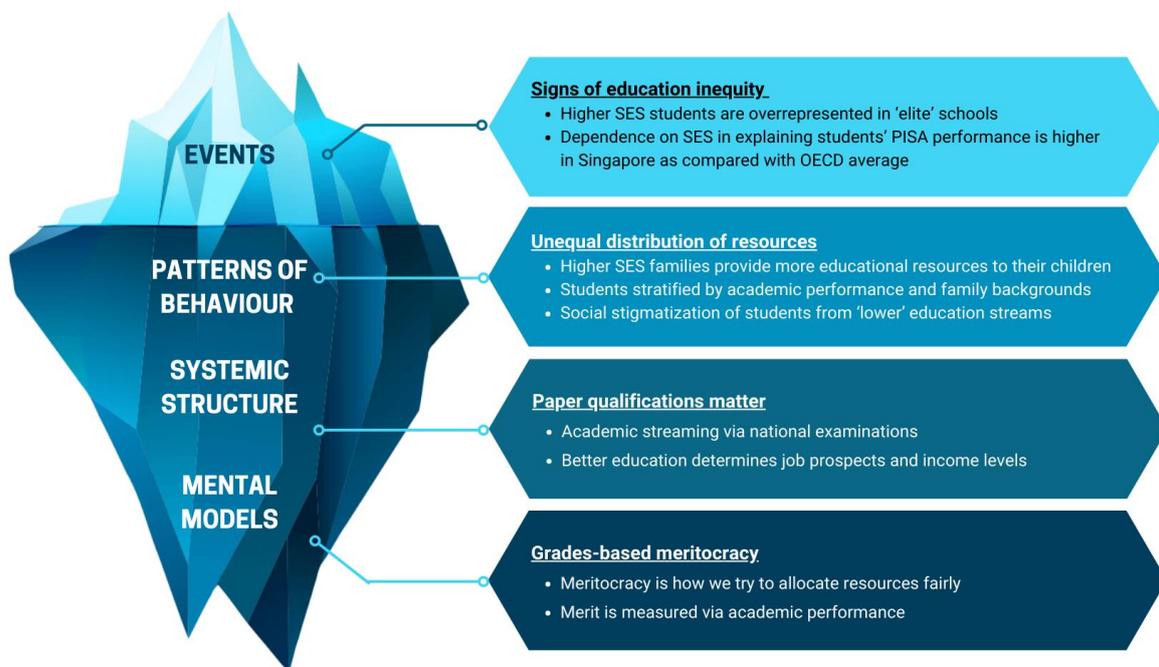


Figure 1: Iceberg model of Education and Meritocracy in Singapore

2. Challenge landscape

2.1 Meritocracy in Singapore

Meritocracy presents a vision in which rewards are allocated by individual merit, not by social origins. One’s merit – defined by their productivity as a member of society – would be measured and opportunities accordingly provided for the individual.

So, how merit is measured thus plays a pivotal role in determining one’s access to opportunity. The meritocratic ideal rests on individuals being granted equal opportunity. However, it is hard

to regulate as complex interactions between actors systematically grant children different starting points in the race.

Academic grades as an unbiased metric were intended as Singapore’s measurement of merit. Singapore has been maintaining a multi-track education system with school examinations as the sine qua non factor in deciding one’s educational track. Based on the ideals of meritocracy, everyone should have a fair chance to succeed educationally. We explain Singapore’s education system in the Appendix.

2.2 Systems boundaries

2.2.1 Key drivers of educational performance

Literature suggests that socioeconomic status (SES)^{59,75}, intelligence^{36,55} (and factors including environmental, biological and psychological beliefs about intelligence), academic self-concept, physical health, socio-emotional factors⁷ and socio-emotional competence⁴⁶ are strong predictors of academic achievement in children. We consider these factors in our system analysis.

2.2.2 Key actors: school, family and students

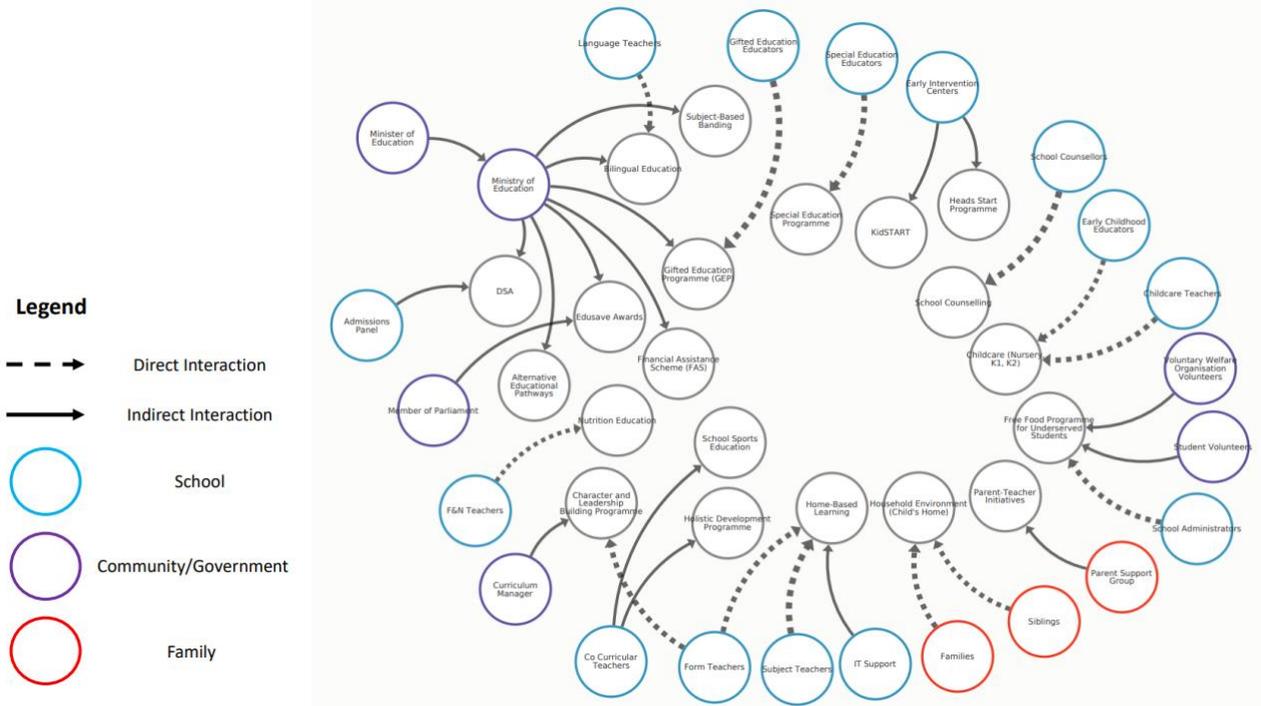


Figure 2: Actors map surrounding education in Singapore

We identified key actors which influence students in their educational environment as family, peers, and teachers. Although students interact with other actors in various settings, these are the most influential actors as their close proximities to students allow them to form tighter bonds and relationships with the students.^{4,25,45,48,61}

2.3 School: how institutional meritocracy stratifies education access

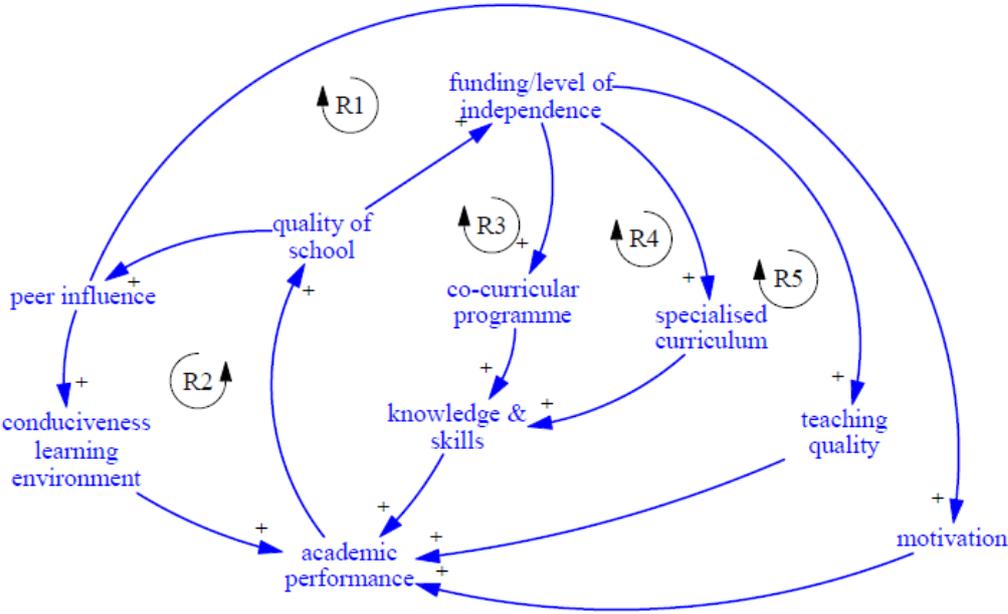


Figure 3: Causal Loop Diagram of How Institutional Meritocracy stratifies Education Access

National examinations were introduced in Singapore to sort students into different schools and cater to different academic aptitudes.⁸⁰ However, as these schools differ beyond curriculum rigor (see the Appendix for a breakdown of the systematic differences in school funds and degree of autonomy of schools in different streams), this differentiation-by-grades stratifies education access and distorts outcomes.

2.3.1 Different schools, different quality of teachers

First, schools at the higher tier of academic achievement generally have greater funding and autonomy in hiring practices. These schools can hire teachers with better qualifications and provide further training opportunities to improve them.⁷⁸ A teacher’s general academic accreditations are shown to be highly correlated with their students’ academic achievement, which is possibly due to the more comprehensive educational content that a teacher can impart.²⁰ The discriminate allocation of autonomy and resources to different schools disproportionately favours students in independent and autonomous schools.

2.3.2 Additional programmes offerings

Secondly, more autonomous schools have the flexibility to offer additional enrichment programmes.³¹ For instance, independent schools such as Nanyang Girls High School offer bicultural exchange opportunities with prestigious Universities such as Peking University and Cambridge University.⁷⁰ These experiential learning opportunities promote holistic development and personal motivation, which contribute to students’ better academic results.⁸⁹

2.3.3 Accelerated and curated curricula

The better teaching quality and additional programmes increases the attractiveness of independent schools, consequently increasing the enrolment standards.⁷⁸ Therefore, these schools have tailored accelerated programmes that cater to the higher academic capabilities of their students. For instance, Hwa Chong Institution and Raffles Institution are independent schools that offer advanced curricula such as the Science and Mathematics Talent Programme (SMTP) and Raffles Academy (RA).^{34,66} The rigorous curriculum accelerates the academic development of already high-performing students, thus disproportionately improving their ability to progress in Singapore’s grades-based meritocracy.⁴¹

2.3.4 Different peer composition in later loops

The effect of peers on educational achievement occurs primarily through observational learning¹⁰ and peer-to-peer teaching.⁴⁰ A student’s mental health, adjustment levels and consequently level of academic achievement can be predicted by the learning environment with their peers.³⁴ A meritocratic education system streaming individuals by academic ability creates learning environments of different peer compositions. Considering the early and relatively non-porous academic segregation of students through a national examination at 12-years-of-age, this systematically disadvantages students of lower academic ability.

2.4 Family: how different starting points undermine meritocracy

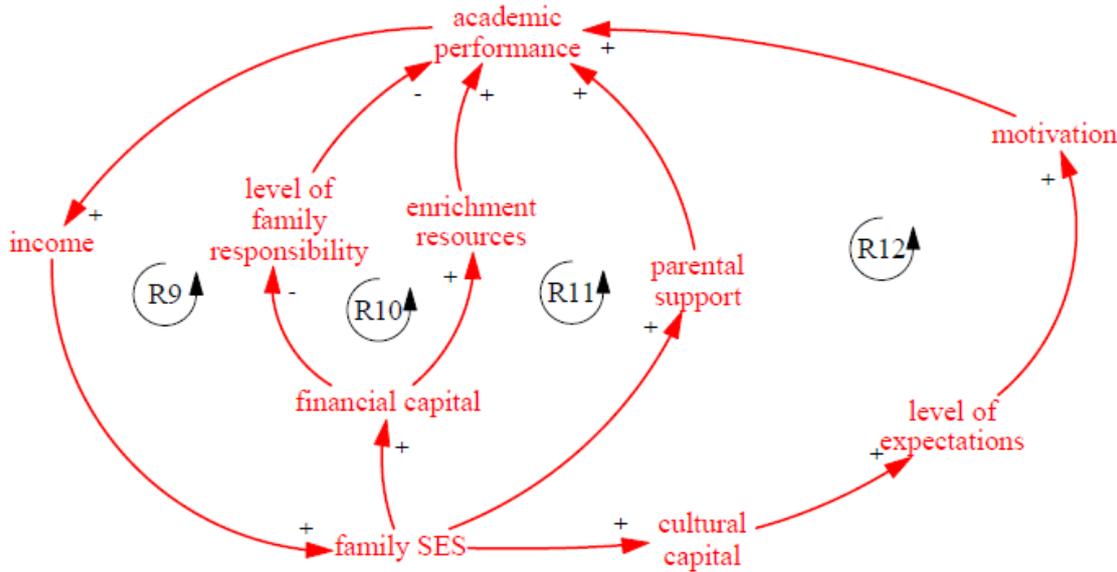


Figure 4: Causal Loop Diagram of How Different Starting Points undermine Meritocracy

2.4.1 Access to financial capital and additional resources

A child’s access to financial capital influences his academic performance in two ways.

Firstly, it grants access to commercial educational resources. Singapore's booming private tuition industry is valued at \$1.4Bn.⁷¹ 34% of families with children in tuition spend between \$500 and \$1,000 per month per child, while 16% spend up to \$2,000. Yet, only 20% of those in the lowest two income brackets have a child in tuition.⁹⁰ This highlights the distortionary effects that private tuition has on Singapore's education equity.

Secondly, a child's home environment and his responsibilities differ across socioeconomic backgrounds, impacting their ability to commit time to academics or study in a conducive environment. Of surveyed families in the lowest two income deciles, 21.8% were single parent households, 77% had families taking care of children, and the household size was 5.26 people in a home size of only 45 square meters on average. An empirical study by Ng and Ho³² suggests that educational attainment of youths with divorced parents are reduced by about 1.8 years of schooling.

2.4.2 Parental support

Parental academic support, such as assisting children with their schoolwork, also perpetuates cycles of academic performance and future socioeconomic status. Hill, et al.³⁰ found that for high-education parent groups, parental academic involvement positively impacted child behaviour, which benefited their achievement, but not for low-education parent groups.³ This is true in Singapore, where a fathers' education has a statistically significant influence on their child's educational attainment: about 16% of his economic status is transmitted.

2.4.3 Cultural capital as intangible drivers of educational attainment

Cultural capital, in the form of parental expectations and experiences, may influence a child's academic achievement. Literature suggests that students whose parents are better educated expect more from their children's education compared to their less educated counterparts.^{15,37,38} Evidence suggests that parental expectations are a causal determinant of student academic outcomes,^{69,86} and are the strongest family-level predictor of student achievement, beyond those accounted for by other parental beliefs and behaviours.³⁷

Thus, children with parents of higher SES and educational backgrounds are likely to face higher academic expectations, which virtuously drives academic success and future socioeconomic status. A grades-focused-meritocracy in this sense unintentionally discriminates against low-SES students. This corroborates findings in Singapore: reports^{5, 56} show a pervasive performance gap between Singapore's social classes and ethnic groups through this mechanism of educational aspiration.⁷²

2.5 Self: how meritocracy impacts self-confidence and mental health

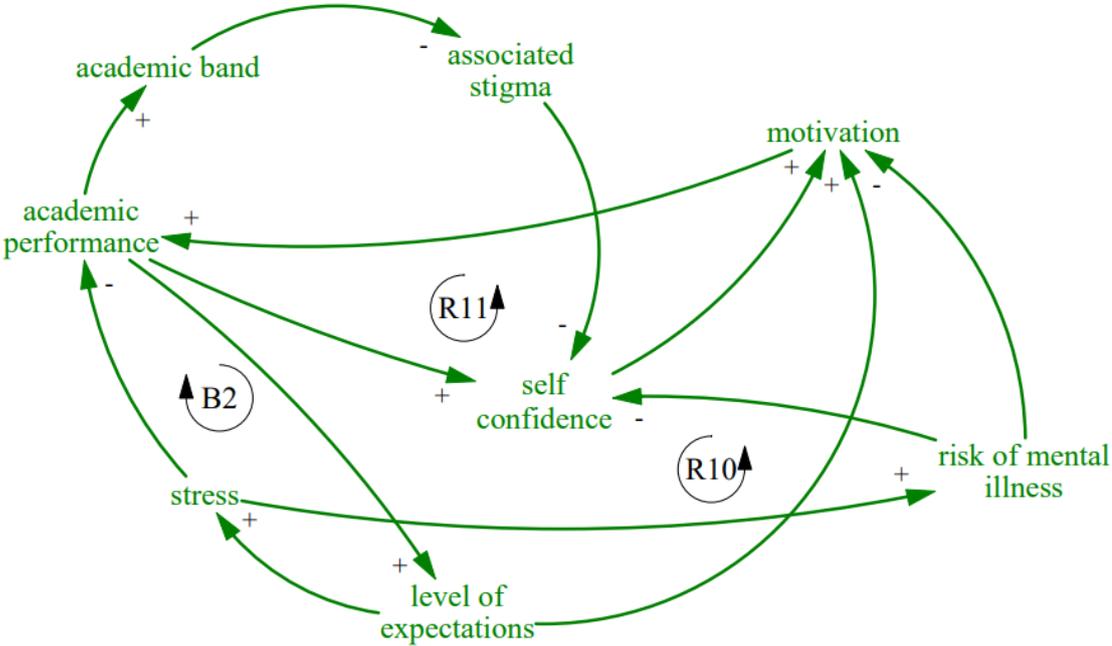


Figure 5: Causal Loop Diagram of How Meritocracy impacts Self-Confidence and Mental Health

Academic performance as a distinct measure of merit – legitimized by government policy – breeds a pervasive belief in Singapore that doing well in school equates to success. This is to the extent that "the idea that academic achievement is a necessary ingredient to obtain lifelong success has become a long-held but unhealthy belief ingrained into [Singapore’s] culture."⁵⁷ In this environment, children develop a sense of self-worth that is defined by how well they do in school.

Academic performance influences self-confidence and creates vicious cycles of achievement and mental health, particularly for students at either extreme.

2.5.1 Academic performance and self-confidence: a reinforcing loop

Confidence is an important factor in students’ academic performance as it is found to generate noncognitive skills such as grit, perseverance, and resilience.⁸⁷ Confidence can also enhance motivation, which is positively associated with good study habits.⁴² This supports the inference that students with higher confidence and motivation levels tend to have higher academic achievement.¹ Thus, a student’s academic performance can cyclically influence their levels of confidence, motivation, and achievement. This is probably especially so in Singapore, where grades are the measure of merit.

However, socioeconomic backgrounds can affect early educational performance, and by extension the students’ self-confidence level.^{13,17,27} In this way a narrowly defined meritocracy based on grades may systematically disadvantage students of low SES.

2.5.2 Academic streaming and self confidence

The academic stream (and its associated perceptions) a student attends can affect their self-esteem and in turn (cyclically) academic performance.

Students from different secondary school types had differing academic confidence⁶⁰: those from prestigious and autonomous schools have higher confidence in attaining university degrees (80.2%) and children streamed into non-elite secondary schools tend to have lower academic self-concept (54% and 42%).

2.5.3 Academic performance and stress: a balancing loop

In Singapore, 82% of students surveyed affirmed that they want to be top of their class, but are also among those who are most afraid of failure globally.⁵⁸ This high self-imposed expectation stems from a deeply ingrained culture that academic achievement means success and social status. The bell curve model of assigning grades also breeds a hyper-competitive learning environment.⁷⁹

76% of Singapore students were found to experience test anxiety and an average of 2,400 new cases of stress-related anxiety and depressive disorders amongst children were reported by Child Guidance Clinics every year. These mental health problems usually affects academic performance, resulting in a balancing feedback loop.⁴⁷

3.2 Broader scales of assessments in academic performance: PSLE Revisions

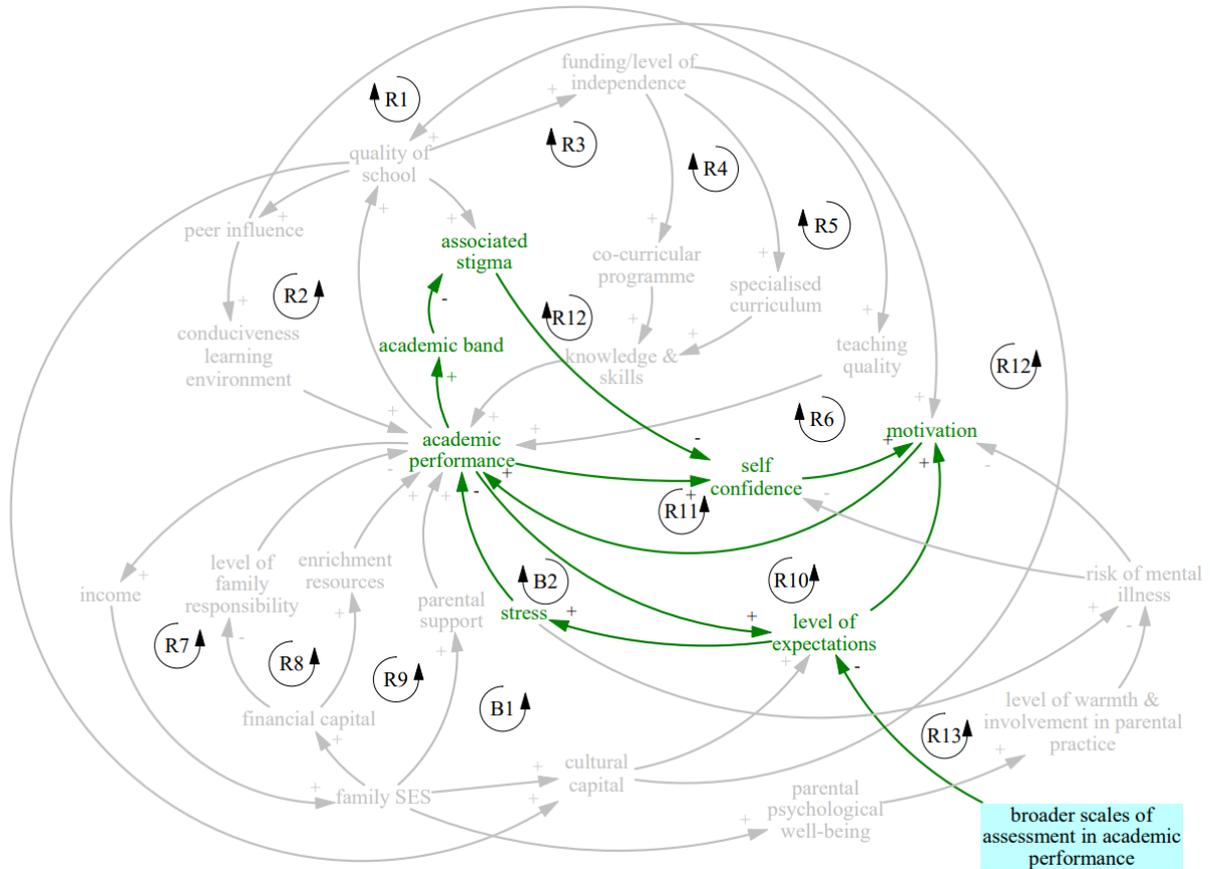


Figure 9: Causal Loop Diagram of how PSLE reforms attempt to correct educational inequalities

HOW IS PSLE SCORE DETERMINED?

- The PSLE Score ranges from 4 to 32, with 4 being the best
- Students will be placed in secondary school courses based on their PSLE Score – Express, Normal (Academic) or Normal (Technical)

Subject	Level	PLACEMENT OUTCOME	PSLE SCORE
English Language	AL3	Express	4 – 20
Mother Tongue Language	AL2		
Mathematics	AL1	Express / Normal (Academic) Option	21 – 22
Science	AL2	Normal (Academic)	23 – 24
PSLE SCORE : 8		Normal (Academic) / Normal (Technical) option	25
		Normal (Technical)	26 – 30, with AL7 or better in both EL and MA

* As announced in 2019, the Express, Normal (Academic) and Normal (Technical) courses, together with their labels, will be phased out by 2024

Infographic: Kenneth Choy
Source: Ministry of Education



Figure 10: Revised system of PSLE in 2021

The PSLE system was revised in 2021 to reduce the fine differentiation of students based on academic achievement.⁵⁰ This is intended to reduce the level of expectations placed upon students and reduce the impact of grades on a student’s confidence.²¹

However, this only superficially alleviates the focus on grades, as academic results are still used to place students into their secondary schools.

3.3 Social Services balancing the financial playing field

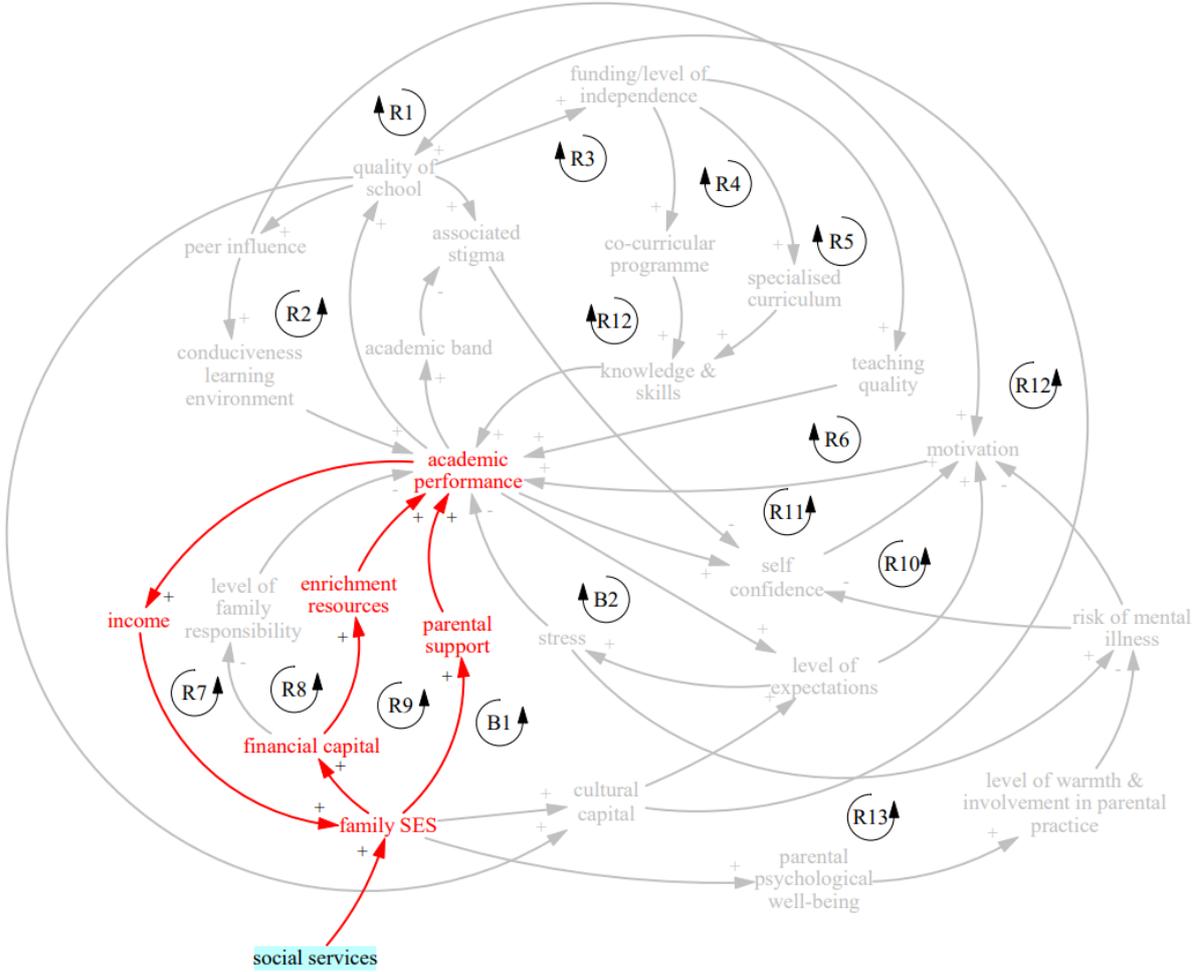


Figure 11: Causal Loop Diagram of how social service organisations intervene to correct educational inequalities

Social Service Organisations (SSOs) offer mentorship programs to provide emotional and academic support to students who tend to lack parental support. The KidSTART programme was also introduced to provide financial assistance for preschool education.

Nonetheless, the extent of this support is limited as it cannot address the unequal spread of cultural capital that perpetuates educational inequality.

4. Systems level insights

4.1 System Insights #1: Unintended segregation of students by SES

In section 2.4, we discussed how family background can play an influential role in cyclically affecting students' academic performance. We also noted in 2.6.2 that there are non-meritocratic mechanisms that impact the enrolment of children in schools of varying prestige.

Our system suggests that any initial difference in academic performance creates reinforcing loops. Because of early academic streaming, these loops can be virtuous or vicious for students, depending on their family background. An important point of examination is how to provide children with the necessary support to close these inherited gaps and remove non-meritocratic systems that grant hereditary privileges.

4.2 System Insights #2: Academic Performance – The early, narrow and reinforcing definition of success and merit

Because merit is narrowly defined to academic grades, it significantly determines students' admission to schools, their peer influences, and the deep-seated mental models they have of themselves. Thus reinforcing a culture where academic achievement becomes a prerequisite to lifelong success. One's academic grades are cyclically tied to factors beyond a student's effort – parental backgrounds, SES, schooling, and distribution of education resources. Since students are assessed so early in their education, we penalise them unfairly.

Such a narrow definition of success and merit can limit students' holistic development and perpetuate inequalities early in the system.

4.3 Levers of change

Levers of change can additionally be identified by the number of their downstream connectors.

4.3.1 Motivation

Motivation is an influential lever of change as it interacts with variables that affect academic performance through school, family, and self feedback loops. This is commensurate with literature⁷⁷, which suggests that motivational factors are important influencers of student performance.⁴² Self-Determination Theory suggests that motivated individuals have a stronger intention to complete a task, and adopt goal-oriented behaviors to achieve their objectives. Educators play a key role in enhancing a student's motivation level, as they can impart a growth mindset that skills are developed rather than innate.⁶⁸

4.3.2 Quality of School

Since schools are not equally endowed in Singapore, quality of schools also exists as a significant variable in several feedback loops. In the long run, there exists a “success to the successful” archetype where more resources are channelled towards high performing students, making them more likely to succeed compared to their peers.

5. Breaking the loops – Recommendations

5.1 Removing non-meritocracy: Removal of legacy admissions

The existence of non-meritocratic legacy admissions systems stands out as a questionable feature in an apparently-meritocratic education system. As a matter of principle, schooling admissions should provide students with equal opportunity and the inheritance of cultural capital breaks that. As a matter of logistics, legacy admissions offer no advantage over MOE’s robust six-point admission balloting. Removing legacy admissions would be a direct means of reducing educational stratification in Singapore.

5.2 Addressing early segregation: Removing early streaming

Our analysis suggests that early segregation of students – particularly when resources are unevenly distributed across schools – creates reinforcing loops that perpetuate social inequality. We thus propose the removal of early streaming of Primary 6 students and instead offer an integrated educational pathway for students to directly attend affiliated secondary schools. Without early streaming, students have more room to develop, reducing the likelihood of disadvantages by birth causing one to fall through the cracks. This follows the Finnish education model, where streaming only begins when students are aged 16 and all schools are regarded as equal in quality.²⁹

5.3 Addressing motivation: Project-based education having removed early streaming

One avenue for influencing motivation is project-based learning (PBL). The adoption of PBL can increase the level of intrinsic motivation in students.⁸⁴ Literature suggests that due to its interactive nature,⁶ PBL develops greater personal interest in learning while also teaching students soft skills like creativity²⁰, self-regulation³³ and communication.⁴⁴ Most importantly, PBL as a form of assessment can diminish the achievement gap that low SES students face against their peers.³³

6. Conclusion

In this paper, we analysed how Singapore's grades-focused meritocratic education has ironically impeded social mobility. We used this model to understand existing solutions, identify key insights and propose solutions.

Key issues identified include how a narrow definition of merit unintentionally segregates students by SES and uneven resource allocation to schools cyclically perpetuates success and struggles. Recommendations include giving children more space and time to develop before assessing their capabilities.

However, these insights are not unique to Singapore.

The issue of using national examinations to stream students occurs in other countries: China uses the Gaokao and South Korea uses the CSAT.^{2,73} Problematic school admission policies are also endemic elsewhere, such as legacy admissions in American universities.²⁸ Hong Kong faces the issue of inherited cultural capital creating an uneven playing field, where affluent parents are better equipped to navigate the school 'market'.⁴³

While the differences in local contexts mean that solutions should be appropriately customised, these parallels allow our analysis to serve as an interesting case study.

Word Count: 2989 (excluding captions and headers, which comprise 249 words)

7. Appendix

Singapore's Education System

Singapore maintains a multi-track education system. School examinations are crucial in deciding the tracks and social position occupied by the students. Meritocracy supports this system, as everyone is ostensibly given a fair chance to succeed educationally.

Singapore's educational pathway comprises primary school, secondary school, and post-secondary education. Singapore's primary education is compulsory.⁵⁰ Application to primary schools can be highly competitive: there are various registration phases with the earlier ones benefiting parents who are alumni or who have children in the same school.⁸³ At the end of primary school, students take a national exam before they apply for secondary schools.

Secondary schools are organized into 5 types: government schools, government-aided schools, independent schools, specialized independent schools, and specialized schools.^{52,54} Government schools offer quality education such as applied subjects. Government-aided schools are set up by community organisations to cater to the educational needs of their respective communities. Independent schools have the flexibility to set their own fees and develop their academic and non-academic programmes, with some offering a pathway directly to GCE A-level examinations and the International Baccalaureate (IB) diploma programme. Specialised independent schools offer specialized education catering to students who have talent and strong interests in specific subjects, such as the sciences, the arts, or sports. Specialised schools offer hands-on learning.

Some government and government-aided schools are autonomous, which means they offer a wider range of programmes than the national syllabus. Some government-aided and independent schools are under the Special Assistance Plan (SAP) which promotes Chinese bilingualism and biculturalism.

Government and government-aided schools have fees of \$25-43 a month, independent schools have fees of \$300-\$600 a month, specialized independent schools have fees of \$300-\$830 a month, while the fees for specialized schools vary across schools. Autonomous schools charge an additional Autonomous School Fee ranging from \$3 to \$18.⁵²

Currently, students are split into 3 streams. Normal (Technical) prepares students for the N(T)-level examination. Normal (Academic) prepares students for the GCE N-level examinations, with some students eventually taking the GCE O-level examination. Express prepares students for the GCE O-level examination.

At present, schools receive financial support from the government based on the students they have. Specialised schools receive the most funding (\$24,000), followed by students in the Normal (Technical) stream (\$20,000) and students in the Normal (Academic) stream (\$15,000).¹⁴

Normal (Academic) prepares students for Polytechnic and the Institute of Technical Education (ITE), Normal (Technical) prepares students for ITE, and Express prepares students for junior college.⁴⁹

ITE is a post-secondary education institution that offers full-time and traineeship courses to prepare students for the workforce.³⁵ Junior colleges prepare students for university by standardizing the pre-University courses and examinations. Students take the GCE A-levels. Polytechnics are an industry-oriented institution which offers broad-based education to prepare students for the workforce.⁹¹ Generally, JC students enter university at higher rates than polytechnic students. JCs are completed over the course of two years, while polytechnic is a three-year course.