



Growth mindsets, workmastery, and socioeconomic status interact in predicting achievement of adolescents in Southeast Asia

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Abstract

Growth mindsets can play an important role in student academic motivation and achievement. However, recent research has revealed that the achievement benefits of growth mindsets vary across cultures, such that students in some Asian societies may not gain much from growth mindsets. Focusing on Southeast Asia, this study sought to answer whether workmastery may potentially strengthen the benefits of growth mindsets on student achievement in reading, math, and science, particularly among socioeconomically disadvantaged students. This study used the PISA 2018 database including large and representative samples of 15-year-old students in Southeast Asian countries (total $N = 47,579$). Multilevel modeling was utilized to test the two-way interaction between growth mindset and workmastery, as well as the three-way interaction between growth mindsets, workmastery, and socioeconomic status. The results showed that the two-way interaction was significant, suggesting that Southeast Asian students with high workmastery were more likely to benefit from growth mindsets than those with low workmastery. Moreover, the results showed a significant three-way interaction, suggesting that the achievement benefits of growth mindsets for disadvantaged students were nearly the same as for their advantaged peers when disadvantaged students had high workmastery. This study generally indicates that growth mindsets can be beneficial for student achievement in Southeast Asia, particularly in the appropriate context. One key implication is that promoting growth mindsets at scale may be more effective than previous research in Asia suggests.

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Introduction

Growth mindsets are beliefs that characteristics (e.g., intellectual abilities) are malleable and can be developed, whereas fixed mindsets are beliefs that characteristics are innate and cannot be changed (Dweck & Master, 2009). Students' mindsets play a critical role in their academic motivation and achievement by orienting them toward different meaning systems comprised of effort beliefs, goals, and responses to difficulties (Burnette et al., 2013). For example, when students perform poorly in an important subject, those with a growth mindset are more likely than those with a fixed mindset to believe that they should put in more effort and work harder (e.g., taking a remedial tutorial; Hong et al., 1999). Within a growth mindset framework, effort represents the process by which students can improve. Within a fixed mindset framework, effort is a sign that students lack ability, which is threatening because they can never improve. Students with a growth mindset are more likely to hold learning goals, which involve a focus on learning and mastery, than performance goals, which involve a focus on performing well or avoiding performing poorly (Dweck & Master, 2009). This is because students who believe intelligence is fixed wish to demonstrate that their intelligence is high; in contrast, students who believe intelligence can change are more focused on improving themselves (Dweck & Master, 2009; Yeager & Dweck, 2020).

Mindset theory also suggests that growth mindsets should be most beneficial for students who are struggling, disadvantaged, or who face negative stereotypes (Broda et al., 2018; Yeager et al., 2016). A recent meta-analysis showed that growth mindset interventions have a modest “overall” effect on achievement ($d = 0.05$, 95% CI = [0.02, 0.09]; Macnamara & Burgoyne, 2023). However, they significantly benefit students in highly challenging situations, such as those receiving low grades ($d = 0.09$, 95% CI [0.04, 0.14]), and show a marginally significant impact for students of low-socioeconomic status ($d = 0.13$, 95% CI [-0.01, 0.27]; Macnamara & Burgoyne, 2023). This is consistent with another recent meta-analysis which concluded that growth mindset interventions are particularly impactful for at-risk subgroups (Burnette et al., 2023). Overall, the current mindset research underscores the importance of context (Bernardo, 2022; Walton & Yeager, 2020; Wang et al., 2021).

However, mindset theory has been largely shaped within Western countries, especially the United States. Cultural context is significant because important components of the mindset theory framework have been shown to vary across cultures, including beliefs about the value of effort and how intelligence is defined (Chen & Stevenson, 1995; Hsin & Xie, 2014; Sun et al., 2021). In 2018, the Programme for International Student Assessment (PISA) assessed nationally representative samples of 15-year-old students in 79 countries (see Organisation for Economic Co-operation and Development [OECD], 2019a). The data from PISA 2018 suggest that the advantages of having a growth mindset vary greatly across cultures (OECD, 2021). For instance, in line with mindset theory, there were significant achievement differences favoring students with a growth mindset over students with a fixed mindset in the United States, whereas the differences were smaller, non-existent, or even reversed in Asia (OECD, 2021). The present study focuses on the benefits of growth mindsets in Southeast Asian countries participating in PISA 2018 (i.e., Thailand, Singapore, the Philippines, Malaysia, Indonesia, and Brunei).

Growth Mindsets in Southeast Asia

Although PISA 2018 showed that the achievement benefits of holding a growth mindset might not be significant in many Asian societies, there were notable variations between East Asia (e.g., China) and Southeast Asia. In terms of PISA test scores, East Asian students gained little benefit, if any, from having growth mindsets, while Southeast Asian students significantly benefited from growth mindsets (OECD, 2021). This suggests that a growth mindset intervention that aims to boost academic achievement may be more effective among students in Southeast Asia relative to East Asia.

Another important pattern in Southeast Asia is the interaction between growth mindsets and socioeconomic background in predicting achievement. Mindset theory expects that growth mindsets should especially benefit disadvantaged students (Claro et al., 2016) or benefit students equally regardless of socioeconomic backgrounds (Destin et al., 2019; Hwang et al., 2019; but see King & Trinidad, 2021). However, unlike East Asia and the United States, the overall pattern in Southeast Asia contrasts with predictions from prior mindset research. Specifically, holding a growth mindset was significantly less helpful for students from lower (vs. higher) socioeconomic backgrounds in Southeast Asian countries, except in Singapore (OECD, 2021). Similarly,

studies in the Philippines found that a growth mindset was useful in predicting reading, math, and science achievement for socioeconomically advantaged students but not disadvantaged students (Bernardo, 2021; 2022). There may be many meaningful differences between the East Asian and Southeast Asian contexts overall, including higher socioeconomic status among East Asian countries, as well as wide variation in culture and religious ideology among Southeast Asian countries (Höllinger & Makula, 2021; OECD, 2019a). Moreover, East Asian countries were top performers of PISA, whereas most Southeast Asian countries were bottom performers (OECD, 2019a).

The unexpected interaction between growth mindsets and socioeconomic status in Southeast Asia has important practical implications. It implies that teaching a growth mindset could potentially widen the socioeconomically achievement gap in this region if advantaged students gain disproportionately more from these interventions than their disadvantaged peers. This raises a question of whether researchers, educators, and policymakers should promote growth-mindset interventions at scale in Southeast Asia. To shed some light on this paradoxical finding, the current study explored a potential moderator—workmastery—which may boost the benefits of growth mindsets, particularly among disadvantaged students.

Workmastery and Growth Mindsets

Workmastery refers to the desire or characteristic to work hard to master tasks (Spence & Helmreich, 1983). It is conceptualized as a personal trait or disposition, distinct from beliefs such as growth mindsets (Guo et al., 2023; Harackiewicz et al., 1997). Students with higher levels of workmastery are more likely to focus on learning and improving themselves, which relate to numerous educational outcomes such as self-efficacy and performance, as well as learning goals and emotions (Guo et al., 2023; OECD, 2021; Payne et al., 2007). For example, individuals with a high level of workmastery typically possess a strong drive to succeed in their endeavors. As a result, they are more likely to experience mastery events. These mastery experiences are crucial in shaping students' beliefs about their ability to execute behaviors essential for goal attainment. According to self-efficacy theory, such mastery experiences are among the primary sources of self-efficacy beliefs (Bandura, 1997).

Workmastery and growth mindsets are related and seem mutually reinforcing. On the one hand, students

with growth mindsets should believe that abilities can be grown through hard work. In turn, students with those effort beliefs should be more motivated to work hard to achieve their academic goals (Hong et al., 1999). This way, mindsets precede workmastery. On the other hand, students who put forth the effort to master tasks may be convinced through their own mastery experiences that abilities can be cultivated through dedication and hard work. In line with the latter argument, one longitudinal study showed that the predictive effects of perseverance on growth mindsets appeared to be considerably stronger than the reverse (Park et al., 2020). However, research on the relations between growth mindsets and workmastery is limited in Asia. Moreover, most research has been focused on the individual effects of growth mindsets and workmastery on academic achievement. Much less is known about whether they may interact.

Growth mindsets and workmastery may reinforce (or undermine) one another such that the impact of one factor on academic success is strengthened (or weakened) by the influence of the other. For instance, students with growth mindsets may believe that effort can increase abilities and then engage in challenging tasks that provide an opportunity for them to grow. Together with high workmastery, students are also more likely to persist in working toward these tough tasks, enhancing the effects of growth mindsets. In contrast, even if growth-mindset students tend to believe effort is fruitful in general, they may not personally work hard if they have low workmastery, and thus their growth mindsets may not turn into enduring engagement and achievement (Eccles & Wigfield, 2020). That is, the positive consequences of growth mindsets should be limited among students with low workmastery.

Socioeconomic Status, Growth Mindsets, and Workmastery

Socioeconomic status is a strong contextual factor that can determine student access to resources, opportunities, and ultimately academic achievement (Sirin, 2005). Students who are learning in disadvantaged backgrounds face many challenges, including fewer resources and support, that can impact the effectiveness of motivational beliefs (Bernardo, 2022). As mentioned previously, links between growth mindsets and achievement vary across the socioeconomic spectrum, such that growth mindsets are more beneficial for advantaged students in most Southeast Asian countries (OECD, 2021; see also Claro et al., 2016). It is also possible that the interaction between growth mindsets and workmastery may differ between advantaged and disadvantaged students.

One possibility is illustrated in **Figure 1**, which shows how much students may benefit from growth mindsets relative to fixed mindsets. **Figure 1** is a hypothetical graph showing that students who come from a low socioeconomic background and have low workmastery may not gain much from growth mindsets, but if disadvantaged students have a high desire to master tasks, they will work hard towards growth. In other words, disadvantaged students may need to believe that hard work will pay off and to put those beliefs into practice by working hard. However, advantaged students can capitalize on their growth mindsets in many ways, even if they have low workmastery. For instance, advantaged students with growth mindsets may utilize their abundant resources and improve through good strategies and help from others, even without the drive to work hard. In other words, advantaged students with growth mindsets may be given support and opportunities to succeed, whether or not they work hard.

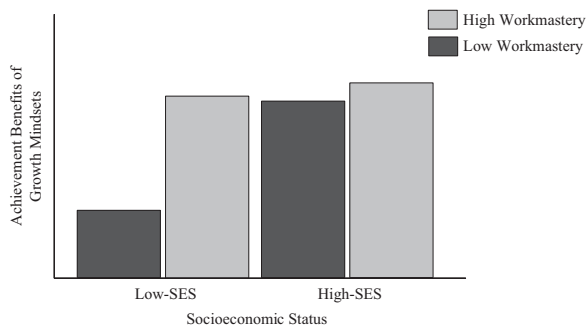


Figure 1 Potential achievement benefits of growth mindset by Workmastery and SES

Note: Achievement benefits of growth mindsets represent the average achievement of students with growth mindsets minus the average achievement of students with fixed mindsets. This figure is a hypothetical graph. Figure 2 shows empirical findings based on PISA data for reading, math, and science achievement. SES = Socioeconomic status.

This potential three-way interaction effect between growth mindsets, workmastery, and socioeconomic status on achievement has meaningful implications. That is, disadvantaged students who have high workmastery may still benefit from growth mindsets alongside their peers from higher socioeconomic backgrounds. In other words, interventions that boost both growth mindsets and workmastery may be able to lift student achievement equally across the socioeconomic strata. However, interventions that solely boost growth mindsets without workmastery may widen preexisting socioeconomic achievement gaps. This could happen if advantaged

students gain disproportionately more from these interventions than their disadvantaged peers, thereby further widening the gap. To clarify, this is not to suggest that growth mindset interventions are problematic, but to emphasize that their impact might vary based on individual circumstances. For students who are both socioeconomically challenged and have lower workmastery, a growth mindset alone may not provide the desired improvement in academic performance.

In summary, research showed that growth mindsets were positively associated with Southeast Asian students' achievement. However, the association appeared to be weaker among socioeconomically disadvantaged students. To extend the knowledge on achievement benefits of having a growth mindset, this study brought workmastery into consideration.

The overarching goal of the present study was to explore the potential moderating role of workmastery in enhancing the positive associations between growth mindsets and academic achievement, particularly among disadvantaged students in Southeast Asia. Using the PISA 2018 database, we sought to answer two research questions:

1. Do growth mindsets and workmastery interact to predict student academic achievement in Southeast Asia? The interaction between growth mindsets and workmastery in predicting achievement has not yet been examined. We expected that Southeast Asian students with high workmastery would benefit more from having growth mindsets relative to fixed mindsets.

2. What is the role of socioeconomic status in the relations between growth mindsets, workmastery, and achievement in Southeast Asia? Previous research has suggested that socioeconomic status may moderate the relation between growth mindsets and achievement in Southeast Asia (e.g., OECD, 2021). However, research has not yet examined the three-way interaction between growth mindsets, workmastery, and socioeconomic status. We believed that socioeconomic status might also moderate the interaction between growth mindsets and workmastery in predicting achievement.

Methodology

Sample

We used a subset of the PISA 2018 database, which consisted of 15-year-old students from six countries in Southeast Asia (total $N = 47,579$; 48.3% boys, 51.7% girls). The countries included Thailand ($N = 8,633$; 45.6% boys),

Singapore ($N = 6,676$; 50.9% boys), the Philippines ($N = 7,233$; 46.5% boys), Malaysia ($N = 6,111$; 48.8% boys), Indonesia ($N = 12,098$; 48.4% boys), and Brunei ($N = 6,828$; 50.5% boys). Vietnam participated in PISA 2018 but was not included because the results were not comparable to other countries due to technical reasons (see OECD, 2019b). The data were collected at a single time point to be representative of the population of 15-year-old students in each country. More information and publicly available data files can be found at the PISA 2018 database website: <https://www.oecd.org/pisa/data/2018database/>.

In brief, PISA is a survey conducted every three years to assess students' knowledge and skills globally. In 2018, 612,004 students from 79 countries completed the assessment. PISA 2018 primarily utilized a two-hour computer-based test. To provide a comprehensive view of student performance, PISA supplemented these tests with multiple questionnaires that took around 35 minutes to complete. These questionnaires gathered contextual data about the students, their educational environment, beliefs, and other relevant factors. PISA specifically targeted students near the end of their compulsory education (i.e., around 15 years old) to ensure global comparability (see OECD, 2019c).

Measures

Complete description and evaluation of all measures are reported in OECD (2019d).

1. Growth mindsets

Students responded on a 4-point scale from 1 (*strongly disagree*) to 4 (*strongly agree*) how much they agreed with the single statement, “Your intelligence is something about you that you can't change very much.” This item was reverse coded into 0 (*strongly agree*) to 3 (*strongly disagree*) so that higher scores indicate greater growth mindsets. This item was identical to one item of a well-validated measure of growth mindset (Yeager & Dweck, 2020). Moreover, OECD (2021) showed that the relations between this single-item measure and many relevant constructs (e.g., achievement and fear of failure) were in the expected direction in Southeast Asian countries, suggesting some predictive validity.

2. Workmastery

The measure of workmastery was developed from research on the need for achievement (e.g., Spence & Helmreich, 1983). Using a 4-point scale from 1 (*strongly disagree*) to 4 (*strongly agree*), students were

asked about their workmastery with three items, “I find satisfaction in working as hard as I can”; “Once I start a task, I persist until it is finished”; and “Part of the enjoyment I get from doing things is when I improve on my past performance.” Higher scores indicate greater workmastery. PISA provided an index of workmastery which was transformed to have a mean of 0 and a standard deviation of 1 across OECD countries, $\alpha = .83$.

3. Socioeconomic status

Socioeconomic status was measured by the PISA index of economic, social, and cultural status, calculated from three indicators: parents' highest level of education, parents' highest occupational status, and home possessions. Since some of these indicators were based on an arbitrary metric (e.g., latent scores), the index was transformed by the PISA team to have a mean of 0 and a standard deviation of 1 across OECD countries, making it more interpretable. Higher scores indicate more socioeconomically advantaged status.

4. Outcomes: Student achievement in reading, math, and science

Student achievement in reading, math, and science were operationalized through PISA test scores in these domains. As students completed a different subset of test questions instead of the entire test, PISA provided test scores through “plausible values.” Plausible values are a range of likely scores that a student might have. In each domain, 10 plausible values were given per student. We used rigorous procedures to incorporate plausible values (described below). More details on how to analyze plausible values are provided in the PISA Data Analysis Manual (OECD, 2009). The PISA test scores were designed to approximately follow a normal distribution with a mean of 500 score-points and a standard deviation of 100 across OECD countries.

Analysis Plan

A series of multilevel models were conducted using Mplus version 8.6. We utilized three-level models as these could accommodate the nested structure of the PISA data: students (Level 1) nested within schools (Level 2) and schools nested within countries (Level 3). For each achievement outcome, we examined four multilevel models: the null model, the baseline model, the two-way interaction model, and the three-way interaction model (see Table 1).

Table 1 Correlations, Means, and Standard Deviations

Variable	1	2	3	4	5	6	7
1. Mindset	–						
2. Workmastery	.02	–					
3. Socioeconomic status	.21***	.11***	–				
4. Reading achievement	.29***	.24***	.51***	–			
5. Math achievement	.29***	.21***	.51***	.88***	–		
6. Science achievement	.31***	.22***	.50***	.92***	.86***	–	
7. Gender (1 = boys, 0 = girls)	-.01	-.12***	.02*	-.12***	-.03	-.03	–
Mean	1.40	0.25	-0.87	413.71	433.08	435.11	0.49
Standard deviation	0.91	0.93	1.23	107.71	108.77	105.55	0.50

Note: Correlations, means, and standard deviations were pooled across 10 imputed datasets.

N = 47,579.

* $p < .05$. *** $p < .001$.

To probe the interaction, we computed the predicted achievement (PISA scores) at two values of growth mindsets, workmastery, and socioeconomic status. The two values were one standard deviation below and above the mean of each variable, representing low and high levels of the relevant construct. Low and high growth mindsets were defined as fixed and growth mindsets, respectively. We were especially interested in looking at the achievement benefits of growth mindsets over fixed mindsets at different levels of workmastery and socioeconomic status. The achievement benefits of growth mindsets were defined as the score-point differences in PISA scores between growth- and fixed-mindset students.

To obtain unbiased population estimates, the final student weights variable (W_FSTUWT) was used. There were missing values in growth mindset (2%), workmastery (3%), and socioeconomic status (1%). Missing data were handled by multiple imputation (10 times). Technical details can be found in the online supplemental materials and Appendix A. Supplemental materials, computer scripts showing precise steps of

the analyses, and Mplus output files are available on the Open Science Framework at https://osf.io/4pfhm/?view_only=bc367149d8264386946f54fd9f9a4c7b.

Results

Means, standard deviations, and bivariate correlations of the entire Southeast Asia sample in PISA 2018 ($N = 47,579$) are presented in Table 1. Table 2 shows results from multilevel models for reading, math, and science achievement. As expected, the baseline model showed that growth mindsets, workmastery, and socioeconomic status significantly predicted achievement in reading, math, and science, controlling for gender. Gender was included as a controlling variable because numerous studies have identified distinct gender differences in academic achievements, especially in areas like reading (e.g., OECD, 2021). By controlling for gender, we aimed to ensure that results were not confounded by known gender differences.

Table 2 Results from multilevel models for reading, math, and science achievement

Variable	Null Model		Baseline Model		Two-Way Model		Three-Way Model	
	b	SE	b	SE	b	SE	b	SE
Reading								
Intercept	414.15***	23.97	398.76***	22.24	397.42***	22.82	396.84***	22.81
Gender			-19.10***	1.29	-18.94***	1.31	-18.92***	1.31
MS			14.72***	1.68	15.87***	1.60	16.25***	1.47
WM			15.47***	2.58	11.46***	2.54	12.35***	2.65
SES			12.28***	2.87	11.07**	3.92	10.40**	3.87
MS×WM					2.06***	0.47	1.57	0.82

Table 2 Continued

Variable	Null Model		Baseline Model		Two-Way Model		Three-Way Model	
	b	SE	b	SE	b	SE	b	SE
MS×SES					1.51	1.17	1.99	1.20
WM×SES					-2.01	1.12	-0.35	0.81
MS×WM×SES							-1.06*	0.47
Math								
Intercept	433.04***	24.72	421.33***	24.03	421.15***	24.81	420.79***	24.78
Gender			-0.37	2.25	-0.24	2.24	-0.23	2.24
MS			12.59***	1.32	13.50***	1.22	13.74***	1.21
WM			12.98***	2.58	9.09***	2.26	9.68***	2.15
SES			11.40***	2.87	10.52*	4.16	10.04*	4.09
MS×WM					2.02**	0.64	1.70*	0.80
MS×SES					1.09	1.06	1.43	1.10
WM×SES					-1.86*	0.90	-0.65	0.67
MS×WM×SES							-0.77†	0.39
Science								
Intercept	436.28***	22.34	419.41***	19.93	418.38***	20.66	417.82***	20.62
Gender			0.63	2.07	0.75	2.07	0.76	2.07
MS			14.86***	1.73	16.02***	1.61	16.39***	1.50
WM			13.17***	2.08	9.43***	2.02	10.35***	2.18
SES			11.83***	2.78	10.92**	4.13	10.27*	4.05
MS×WM					1.92**	0.60	1.40	0.84
MS×SES					1.22	1.20	1.68	1.21
WM×SES					-1.89	1.00	-0.26	0.84
MS×WM×SES							-1.06*	0.43

Note: Only fixed effects are presented. Random effects and variances can be found in the Appendices B, C, and D. Pooled results across 10 imputed datasets. Gender was centered ($-.5 = girls$, $.5 = boys$). SE = standard error; SES = socioeconomic status; MS = mindset; WM = workmastery.

$N = 47,579$.

† $p = .051$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Research Question 1: Do Growth Mindsets and Workmastery Interact to Predict Student Academic Achievement in Southeast Asia?

To address this research question, we tested the growth mindsets × workmastery interaction on reading, math, and science achievement. As reported in Table 2, the results showed that the two-way interaction was significant in predicting achievement in reading, $b = 2.06$, $p < .001$, math, $b = 2.02$, $p = .002$, and science, $b = 1.92$, $p = .001$ (Two-Way Model). The growth mindsets × workmastery interaction indicated that the benefits of growth mindsets on reading, math, and science achievement were larger for students with high workmastery compared to low workmastery, controlling for covariates.

Research Question 2: What Is the Role of Socioeconomic Status in the Relations Between Growth Mindsets, Workmastery, and Achievement in Southeast Asia?

In addressing this research question, we tested whether the strength of the growth mindsets × workmastery interaction varied across the socioeconomic spectrum through the growth mindsets × workmastery × socioeconomic status interaction (Three-Way Model). The results showed that the three-way interaction was significant in predicting achievement in reading, $b = -1.06$, $p = .025$, and science, $b = -1.06$, $p = .013$, and marginally significant in predicting math achievement, $b = -0.77$, $p = .051$, controlling for covariates (Table 2).

The three-way interaction is graphically depicted in Figure 2 as the achievement benefits of having growth mindsets over fixed mindsets. As shown in Figure 2, the achievement benefits were larger at high workmastery relative to low workmastery, consistent with Research Question 1. However, the three-way interaction further revealed that the two-way interaction between growth mindsets and workmastery was stronger at low socioeconomic status. That is, our results showed that socioeconomically disadvantaged students with high workmastery reaped the benefits of growth mindsets at nearly the same level as advantaged students with high workmastery. In contrast, disadvantaged students with low workmastery gained much less from growth mindsets. Advantaged students reaped the benefits of growth mindsets slightly more when they were high rather than low in workmastery, but to a smaller extent compared to disadvantaged students.

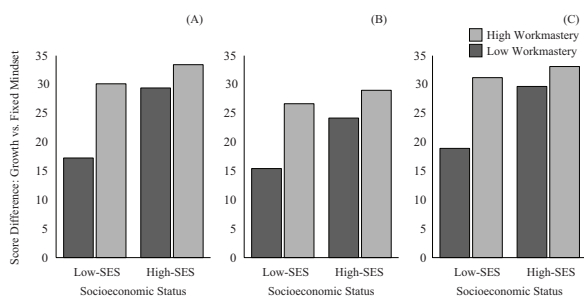


Figure 2 Achievement benefits of growth mindsets derived from the three-way model; (A) Reading achievement, (B) Math achievement, (C) Science achievement

Note: The y-axis represents achievement benefits of growth mindsets. Low and high values were based on means and standard deviations presented in Table 1. SES = Socioeconomic status

Additionally, we examined the random effect of the three-way interaction at the country level (Appendices B, C, and D). The results showed that the three-way interaction did not significantly differ across countries, providing some evidence supporting the cross-country generalizability of the results, random effect estimates = 0.72–1.10 across outcomes, $p_s \geq .217$.

Discussion

A growing body of research has shown that the links between growth mindsets and academic achievement appear to be weaker than expected in many East Asian societies (OECD, 2021). However, findings from East Asia may not generalize to their neighboring region—Southeast Asia—in which large scale research on mindset theory is sparse. Using the entire Southeast Asian sample of PISA 2018 ($N > 47,000$), the current study examined the benefits of growth mindsets on student academic achievement. In particular, we examined whether the potential achievement benefits of growth mindsets could be strengthened by workmastery, especially among socioeconomically disadvantaged students. In line with our expectations, we discovered that typical Southeast Asian students with high workmastery were more likely to benefit from growth mindsets than those with low workmastery across a range of achievement domains, including reading, math, and science. Importantly, the findings revealed a significant three-way interaction between growth mindsets, workmastery, and socioeconomic status, suggesting that the potential achievement benefits of growth mindsets for disadvantaged students were nearly the same as for their advantaged peers when disadvantaged students had high workmastery.

The current study extends the understanding of the relation between growth mindsets and achievement in two important ways. First, our findings support the idea that growth mindsets are beneficial for adolescents' academic achievement in Southeast Asia. Our results align with mindset theory—students who believe that their intelligence can be developed are more likely to outperform those who believe that their intelligence is fixed (Dweck & Master, 2009). The findings are also consistent with OECD (2021), showing that 74 out of 78 societies had significant positive correlations between growth mindsets and reading scores. However, our results contrast emerging evidence from China, which showed that students might not benefit from having growth mindsets (OECD, 2021). One speculation why growth mindsets may not be beneficial in China is that Chinese students have a different conceptualization of intelligence compared to students in the United States (Sun et al., 2021). It is unclear how Southeast Asian students conceptualize intelligence. Future research is needed to examine whether students in Southeast Asia conceptualize intelligence more similarly to that of students in China or students in the United States.

Second, this study contributes to the growing literature on the importance of contexts for growth mindsets by showing that the benefits of growth mindsets may be limited only for disadvantaged students with certain characteristics (Wang et al., 2021). Specifically, our findings showed that disadvantaged students with low workmastery gained less from growth mindsets. They also gained much less compared to their disadvantaged peers with high workmastery, who could capitalize on their growth mindsets more than advantaged students with low workmastery and to almost the same extent as advantaged students with high workmastery (see [Figure 2](#)).

How could growth mindsets provide little benefit for disadvantaged students with low workmastery? One reason might be that that high socioeconomic status is a gateway to growth-mindset-supportive environments. Research has shown that students with growth mindsets grow and flourish when they are surrounded by supportive environments (Walton & Yeager, 2020). For example, this includes students in schools in which their teachers endorse growth mindsets (Yeager et al., 2022) and schools in which their peers support growth-mindset behaviors such as challenge-seeking (Yeager et al., 2019). In Southeast Asia, advantaged students tend to attend well-resourced urban schools, and students in urban schools are more likely than rural schools to have growth mindsets, providing optimal environments for growth mindsets to prosper (World Bank Group, 2020). On the other hand, without supportive environments, the benefits of growth mindsets may be limited (Walton & Yeager, 2020; Yeager & Dweck, 2020).

Then, how could workmastery strengthen the association between growth mindsets and achievement among disadvantaged students? Mindset theory argues that one way in which students with growth mindsets improve themselves and succeed is through effort (Yeager & Dweck, 2020). Disadvantaged students with growth mindsets may prefer challenging tasks that give them the opportunity to develop. When they have high workmastery, these students are more likely to be persistent in working toward their tasks. In contrast, disadvantaged students with low workmastery may not work hard, and thus their growth mindsets may not turn into enduring engagement, limiting the influence of growth mindsets (Eccles & Wigfield, 2020). To overcome the systemic challenges and lack of resources faced by disadvantaged students, they need both the beliefs and the tendency to put those beliefs into practice.

Lastly, in terms of advantaged students, they may benefit from growth mindsets even if they have low workmastery. Even without the desire to work hard to master tasks, advantaged students with growth mindsets may utilize their available resources and advance themselves in other ways. In addition to effort, mindset theory posits that students with growth mindsets develop themselves through positive strategies and seeking help from others (Yeager & Dweck, 2020). As such, advantaged students with growth mindsets but low workmastery may overcome challenges with help and strategy guidance from their well-qualified teachers.

Implications

Our study provides both research and practical implications. One key research implication is that promoting growth mindsets at scale may be more effective than previous research in Southeast Asia suggests. Previous findings from Southeast Asia showed that growth mindsets might be more effective for advantaged (*vs.* disadvantaged) students' achievement (OECD, 2021), suggesting that students who are more likely to be at risk of academic failure may not gain much from holding growth mindsets. Counteracting this idea, this study provides evidence from a representative sample that there may be an additional factor that can potentially enhance the benefits of growth mindset among disadvantaged students. One such factor is workmastery, the tendency to work hard to master tasks.

As for the practical implications, these findings suggest that growth-mindset interventions still hold promise in promoting student academic achievement in Southeast Asia. However, such efforts may be more effective when targeted at students with high workmastery or when combined with other interventions aimed at boosting the desire to master tasks. It is noteworthy that even though disadvantaged students with high workmastery may reap the benefits of growth mindsets to nearly the same extent as advantaged students, their achievement may still be lower than their advantaged peers. This is because socioeconomic status has a strong (main) effect on achievement (Sirin, 2005). As such, additional interventions aiming at providing student opportunities and resources may still be required.

Limitations and Future Directions

There are several noteworthy limitations and directions for future research. First, growth mindset was measured by one item and thus was suboptimal. Although previous studies found that a single growth-mindset item was associated with expected outcomes showing relatively good validity (e.g., Guo et al., 2023; King & Trinidad, 2021), relying on just one item might impact the reliability and attenuate the correlation. For example, we anticipated a small association between mindset and workmastery. However, given the potential reliability issues, this expected small association might have been further reduced. This potential unreliability could explain the non-significant correlation between mindset and workmastery ($r = .02$). Future research is needed to replicate our findings using a more established measure of growth mindsets (e.g., Yeager & Dweck, 2020).

Second, we only focused on students' personal mindsets. Much like planting a seed in fertile soil, growth mindsets may be most effective when students are surrounded by others who believe in growth and taking on challenges (Yeager et al., 2019). Future studies should examine the role of others' mindsets.

Third, caution should also be taken in generalizing across cultural contexts, as many Southeast Asian countries were not included in PISA 2018. Future research should also more closely examine relationships between growth mindsets, workmastery, and beliefs about effort across cultural contexts.

Finally, this study focused on students aged 15 years old. PISA 2018 exclusively collected data from 15-year-old students to ensure that students within most countries are at a comparable stage in their academic journey, just before they confront significant life decisions, such as opting between joining the workforce or furthering their education (OCED, 2019c). Future research could potentially expand this study's scope by considering students from a wider age spectrum.

Conclusion and Recommendation

This study suggests that growth mindsets, workmastery, and socioeconomic status interact in predicting academic achievement, such that the benefits of growth mindsets may be greater for disadvantaged students with high workmastery. The belief that intelligence can change is valuable for students, but this belief needs to be supported by students' propensity

to put forth the necessary effort and a cultural and environmental context where growth is possible. Growth mindsets are beneficial for student achievement in Southeast Asia, particularly in the appropriate context.

Conflict of Interest

The authors declare that there is no conflict of interest.

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