Original Article

Mindsets among Sixth Grade Students and their Correlation with Academic Achievement and School-related Happiness

Khemika Khemakanok Sudnawa, Chakriya Theeranate and Apirom Yailaibang

Department of Pediatrics, Phramongkutklao College of Medicine

Abstract:

Background: *Mindset Theory has illustrated that people hold either "fixed" (intelligence is static) or "growth" (intelligence can be developed) mindsets and that these views may affect people's emotions, behaviors, and finally outcomes. Many studies have shown that growth mindset is a positive influence on academic success and happiness. However, little is known about the mindsets among primary school students, and how mindset could affect their academic achievement and happiness.* ***Objective:*** *The study aimed to determine children's mindsets and any associations and correlations between mindset and academic achievement, measured by the Ordinary National Educational Test (O-NET), and school-related happiness using a school-related happiness questionnaire among 6th grade students.* ***Methods:*** *We conducted a cross-sectional analytic study of 6th grade students from December 1st, 2017 to April 30th, 2018. After obtaining informed consent, we collected demographic data, identified mindset, and determined school-related happiness using questionnaires. At the end of the trimester, we collected O-NET scores in 4 subjects (Math, Science, Thai, and English). The results were analyzed by descriptive statistical methods, one-way MANOVA with post hoc analysis, and simple regression analysis.* ***Results:*** *The total number of participants was 431, which were classified as growth mindset (56%), undecided (38%), and fixed mindset (6%). Growth mindset was significantly associated with higher O-NET scores in all 4 subjects and school-related happiness scores ($p < 0.05$). However, the mindset had low correlation with school-related happiness scores (β 0.529, adjust R^2 0.278, $p < 0.001$), and very low correlation with the total O-NET scores (β 0.173, adjust R^2 0.028, $p < 0.001$). In addition, the mindset had very low correlation with Thai, Math, and Science but wasn't correlated with English. When controlling other variables, the mindset could predict the total O-NET scores by 3%, and school-related happiness scores by 28%.* ***Conclusion:*** *Among sixth grade students, growth mindset was the predominant mindset. Growth mindset was associated with higher O-NET scores and school-related happiness scores. However, mindset had low correlation with school-related happiness scores and very low correlation with the total O-NET scores.*

Keywords: ● *Growth mindset* ● *Implicit theories of intelligence* ● *Academic achievement* ● *Aappiness*

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Corresponding author Lt. Khemika Khemakanok Sudnawa, M.D.. Department of Pediatrics, Phramongkutklao Hospital, Ratchathewi, Bangkok 10400

นิพนธ์ต้นฉบับ

ลักษณะกรอบความคิดของนักเรียนชั้นประถมศึกษาปีที่ 6 และความสัมพันธ์กับผลสัมฤทธิ์ทางการเรียนและความสุขในการเรียน

เขมิกา เขมะกนก สุดนาวา ชาคริยา ธีรเนตร และ อภิรม ใหญ่ไล้บาง
กองกุมารเวชกรรม โรงพยาบาลพระมงกุฎเกล้า

บทคัดย่อ

บทนำ *กรอบความคิด (mindset) เป็นความเชื่อที่ส่งผลต่ออารมณ์และพฤติกรรม กรอบความคิดมี 2 ลักษณะ คือ กรอบความคิดแบบตายตัว (fixed mindset) เชื่อว่าความฉลาดคงที่ และกรอบความคิดแบบเติบโต (growth mindset) เชื่อว่าความฉลาดพัฒนาได้ หลายการศึกษาพบว่ากรอบความคิดแบบเติบโตมีผลต่อความสำเร็จในการเรียนและความสุข แต่การศึกษาเกี่ยวกับกรอบความคิดในนักเรียนชั้นประถมศึกษายังมีอยู่อย่างจำกัด* ***วัตถุประสงค์*** *เพื่อศึกษาลักษณะกรอบความคิดของนักเรียนระดับชั้นประถมศึกษาปีที่ 6 และเปรียบเทียบความสัมพันธ์ของกรอบความคิด กับคะแนนการทดสอบทางการศึกษาระดับชาติขั้นพื้นฐาน (O-NET) และคะแนนความสุขในการเรียน* ***วิธีการวิจัย*** *การศึกษาแบบตัดขวางเชิงวิเคราะห์ ในนักเรียนชั้นประถมศึกษาปีที่ 6 ในช่วงเวลา ธันวาคม 2560 ถึง เมษายน 2561 นักเรียนและผู้ปกครองที่สมัครใจเข้าร่วมงานวิจัย ตอบแบบสอบถามเกี่ยวกับข้อมูลพื้นฐาน กรอบความคิด และความสุขในการเรียน เมื่อจบปีการศึกษาทำการรวบรวมคะแนนการทดสอบทางการศึกษาระดับชาติขั้นพื้นฐาน 4 วิชา (คณิตศาสตร์ วิทยาศาสตร์ ภาษาไทย และภาษาอังกฤษ) จากนั้นนำข้อมูลที่ได้มาวิเคราะห์ทางสถิติ โดยใช้สถิติเชิงพรรณนา การวิเคราะห์ความแปรปรวนทางเดียวและทดสอบความแตกต่างรายคู่ และการวิเคราะห์การถดถอยอย่างง่าย* ***ผลการวิจัย*** *ผู้เข้าร่วมงานวิจัย 441 คน โดยจำแนกเป็น กลุ่มกรอบความคิดแบบเติบโตร้อยละ 56 กลุ่มกรอบความคิดแบบไม่ชัดเจนร้อยละ 38 และกลุ่มกรอบความคิดแบบตายตัวร้อยละ 6 และ จากการศึกษาพบว่า กลุ่มกรอบความคิดแบบเติบโตมีความสัมพันธ์กับคะแนนการทดสอบทางการศึกษาระดับชาติขั้นพื้นฐานและคะแนนความสุขในการเรียนที่มากกว่าอย่างมีนัยสำคัญทางสถิติ ($p < 0.05$) โดยกรอบความคิดมีค่าสหสัมพันธ์ที่ต่ำกับคะแนนความสุขในการเรียน (β 0.529, adjust R^2 0.278, $p < 0.001$) และมีค่าสหสัมพันธ์ที่ต่ำมากกับคะแนนรวมการทดสอบทางการศึกษาระดับชาติขั้นพื้นฐาน (β 0.173, adjust R^2 0.028, $p < 0.001$). เมื่อควบคุมตัวแปรอื่นๆ ให้คงที่พบว่ากรอบความคิดสามารถทำนายคะแนนรวมการทดสอบทางการศึกษาระดับชาติขั้นพื้นฐานได้ร้อยละ 3 และสามารถทำนายคะแนนความสุขในการเรียนได้ร้อยละ 28* ***สรุป*** *นักเรียนระดับชั้นประถมศึกษาปีที่ 6 พบสัดส่วนของกลุ่มกรอบความคิดแบบเติบโตมากที่สุด กลุ่มกรอบความคิดแบบเติบโตมีความสัมพันธ์กับคะแนนการทดสอบทางการศึกษาระดับชาติขั้นพื้นฐานและคะแนนความสุขในการเรียนที่มากกว่าอย่างมีนัยสำคัญทางสถิติ โดยกรอบความคิดมีค่าสหสัมพันธ์ที่ต่ำกับคะแนนความสุขในการเรียนและมีค่าสหสัมพันธ์ที่ต่ำมากกับคะแนนรวมการทดสอบทางการศึกษาระดับชาติขั้นพื้นฐาน*

คำสำคัญ: ● *กรอบความคิด* ● *ทฤษฎีความเชื่อส่วนบุคคลเกี่ยวกับสติปัญญา* ● *ผลสัมฤทธิ์ทางการเรียน* ● *ความสุขในการเรียน*

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ได้รับต้นฉบับ 30 กันยายน 2562 แก้ไขบทความ 18 ตุลาคม 2562 รับลงตีพิมพ์ 20 พฤศจิกายน 2562

ต้องการสำเนาต้นฉบับติดต่อ ร.ท.หญิง เขมิกา เขมะกนก สุดนาวา กองกุมารเวชกรรม โรงพยาบาลพระมงกุฎเกล้า ถนนราชวิถี เขตราชเทวี กรุงเทพฯ 10400

Introduction

Academic achievement is defined as when students have achieved their educational goals such as obtaining good grades or completion of education. Academic achievement is commonly measured by examination. Many factors affect academic achievement such as community characteristics, family factors, and students themselves[1]. The individual child's factors influencing academic performance include cognitive (intelligence) and noncognitive factors[2]. Noncognitive factors comprise a set of attitudes, behaviors, and strategies such as self-efficacy, self-control, motivation and mindset.

The mindset is an important part of a self-concept constituting children's beliefs about their intelligence and talents. According to mindset theory, people hold either a "fixed (entity)" or "growth (incremental)" mindset. Fixed mindset individuals believe that their intelligence and talents are basic about themself that they can't change. It can make them worry about how intelligent they are, so their goal is to look smart. They avoid challenging tasks that they might fail, give up easily, see efforts as fruitless, ignore feedbacks, and feel threatened by the success of others. On the other hand, growth mindset individuals believe that their intelligence and talent can be developed through learning. They hold an idea that with effort and guidance they can increase their abilities. Therefore, their goal is to learn and increase their competences. They embrace challenging tasks, persist in the face of obstacles, see efforts as a path to mastery, learn from mistakes and feedbacks, and are inspired by the success of the others[3-6]. Mindset may affect students' emotions, learning behaviors, and academic outcomes. Studies have shown that students who have a growth mindset tend to obtain better academic achievement than students with fixed mindsets[7-11]. Costa A, et al.[11] reviewed 46 studies reporting 412,022 students presenting a low-to-moderate association between growth mindset and students' academic achievement. The results indicated that growth mindset students are more likely to have better grades in specific subjects (verbal and quantitative) and in overall achievement. Moreover, students from Eastern continents (Asia and Oceania) reported a positive association between incremental beliefs and achievement, while Europeans displayed a positive link between entity beliefs and achievement, and North American presented negative correlations between entity perspectives and academic achievement. Furthermore, studies about mindset intervention have found that developing a growth mindset among students leads to academic achievement[7, 12-15]. Aronson J, et al.[12] did the randomized controlled trial study in growth mindset intervention of 79 undergraduates students and found that students encouraged to have growth mindset reported greater happiness of the academic process and greater academic engagement than their control group.

However, the meta-analytic review of Costa A, et al.[11] found that mindsets are moderated by cultural background and all of the studies were conducted in middle schools and colleges. Thus, limited data is available concerning mindset among primary school students in Thailand and how mindset would affect their academic achievement and school-related happiness. The objectives of this study were to determine children's mindsets and find associations and correlations between mindset and academic achievement and school-related happiness among 6th grade students. We postulated that students with growth mindsets would have higher academic achievement and school-related happiness levels than students with fixed mindsets.

Methods

Study design and population

We performed a cross-sectional analytic study of 6th

grade students from December 1st, 2017 to April 30th, 2018. We selected 6th grade students because performing Ordinary National Educational Test (O-NET) is compulsory for all 6th grade students. Our calculated sample sizes was 1,060 students as refered from Jegathesan M, et al. study[16] with power 80% and $\alpha < 0.05$. The population was selected using purposive sampling from 3 Royal Thai Army schools and 2 public schools located in Bangkok and other provinces of Thailand. The exclusion criteria included children with intellectual disability (IQ < 70) determined by Standard Progressive Matrics (SPM) and Autism Spectrum Disorder (ASD). After obtaining informed consent, we collected demographic data and determined mindset and school-related happiness levels using questionnaires. At the end of the trimester, we collected Ordinary National Educational Test (O-NET) scores in 4 subjects (Thai, Math, Science and English). The study was approved by the Institutional Review Board of Royal Thai Army Medical Department (IRBRTA 1613/2560).

Instruments

The mindset questionnaire was developed from the mindset assessment profile which was permitted from Mindsetworks. It comprises a questionnaire consisting of 8 statements regarding intelligence theory, learning goals, effort beliefs, and response to failure, based on Dweck's scale[4,7]. Some examples of these statements included "Your intelligence is something about you that you can't change very much", "I like my work best when it makes me think hard", "I like work that I'll learn from even if I make a lot of mistakes", and "When something is hard, it just makes me want to work more on it, not less". Participants had to decide how much they agreed or disagreed with the statement, rating from 1 (disagree a lot) to 6 (agree a lot). We categorized scores in 3 categories according to the mindset assessment profile from Mindsetworks: scores 8 to 24 were considered as fixed mindset, scores 25 to 32 were as categorized as undecided, and scores 33 to 48 represented growth mindset. After translating to Thai and checking by a linguist, we performed content validity using 2 developmental behavioral pediatricians and 1 child psychiatrist. The Index of Item-Objective Congruence (IOC) was 0.8-1.0. Internal reliability was tested among 30 children, and the Cronbach's alpha coefficient was 0.6. Although the reliability was questionable, we used the questionnaire in an expertise prospective.

The school-related happiness questionnaire was developed from the School Children's Happiness Inventory" consisting of 30 statements[17]. Two developmental behavioral pediatricians and 1 child psychiatrist adapted it to a short questionnaire with 10 statements by choosing from 3 domains (self-esteem, affect, and depression). Participants had to decide how much they agreed or disagreed with a statement, rating from 1 (disagree a lot) to 4 (agree a lot). Higher scores indicated more school-related happiness. After translating to Thai and checking by a linguist, we tested content validity using 2 developmental behavioral pediatricians and 1 child psychiatrist. The Index of Item-Objective Congruence (IOC) was 0.6-1.0. Then we had revised some of the items in the questionnaire according to expert advices. Internal reliability was tested among 30 children, and the Cronbach's alpha coefficient was 0.7.

Statistical analysis

Statistical analysis was carried out using SPSS, Version 25. Demographic data and mindsets were represented in the descriptive statistical analysis. We found associations and correlations between mindset and O-NET scores in 4 subjects using one-way MANOVA with post hoc analysis (between growth and undecided mindset, undecided and fixed mindset, and growth and fixed mindset) and simple regression analysis. One-way ANOVA and simple regression analysis were used to

determine the associations and correlations between mindset and school-related happiness scores.

Results

Demographics

A total of 441 students participated in the study. Ten students were excluded: 3 students due to intellectual disability and 7 students from missing O-NET scores. Eventually, 431 subjects participated. Forty-seven percent were male. Most parents had education levels below bachelor's degree and low socio-economic status (income < 15,000 THB/month), 37.4% (Table 1).

When we classified students according to their mindset score, 241 students (56%) had growth mindsets, 164 students (38%) were undecided, and 26 students (6%) had fixed mindsets (Figure 1). No difference was found regarding sex, parental education, and socio-economic status between mindsets (Table 2).

We found an association between mindset and academic achievement. From one-way MANOVA with post hoc analysis, students with growth mindsets had significantly higher O-NET scores in Thai, Math, Science, and the total O-NET scores than students with undecided and fixed mindsets ($p < 0.05$) (Table 3). For English, students with growth mindsets had significantly higher score than those with fixed mindsets, but the scores did not differ from those with undecided mindsets ($p < 0.05$) (Table 3). From simple regression analysis, all mindsets correlated with Thai subject (β 0.194, adjust R^2 0.035, $p < 0.001$), followed by Math (β 0.162, adjust R^2 0.024, p 0.001), and Science (β 0.141, adjust R^2 0.018, p 0.003) but did not correlate with English subject (β 0.091, adjust R^2 0.006, p 0.057). High mindset scores could be used to predicted incrementally Thai subject, Math, Science, and the total O-NET scores ($p < 0.05$), however mindset scores could not be used to predict English scores (p 0.057). When controlling other variables, mindset scores could be used to predict Thai subject scores by 3.5%, Math scores by 2.4%, Science scores by 1.8%, and the total O-NET scores by 2.8% (Table 5).

For school-related happiness scores, student with growth mindsets had significantly higher happiness scores than those in undecided and fixed mindset groups ($p < 0.05$) (Table 4). From simple regression analysis, growth mindset strongly correlated with school-related happiness scores (β 0.529, adjust R^2 0.278, $p < 0.001$). When controlling other variables, mindset scores could be used to predict school-related happiness scores by 28% (Table 5).

Discussion

This study found that the 6th grade students held growth mindsets of 56%, undecided of 38%, and fixed mindsets of 6% which differed from general population in related studies that held growth and fixed mindsets equally of 40% and undecided of 20%[4]. However, most of the mindset researches were conducted among middle school and college students or adult subjects.

Table 1 Demographic data

Data		n (%)
Children sex	Male	201 (46.6)
	Female	230 (53.4)
Maternal education bachelor's degree or above (n 423)		107 (25.3)
Paternal education bachelor's degree or above (n 390)		90 (23.1)
Low socioeconomic status (< 15,000 THB/month) (n 431)		161 (37.4)

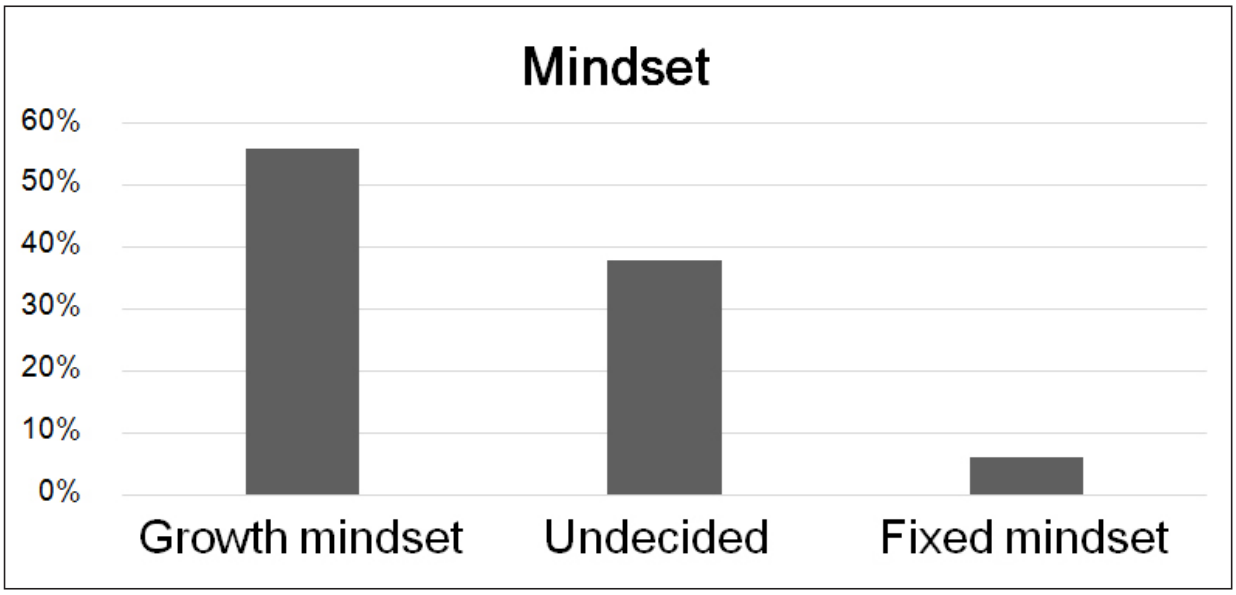

Figure 1 Percentage of mindset in 6th grade students

Table 2 Mindset and demographic data

Variables	Mindset			p-value
	Growth (N 241) n (%)	Undecided (N 164) n (%)	Fixed (N 26) n (%)	
Male	110 (53.6)	86 (52.4)	10 (38.5)	0.26
Maternal education bachelor's degree or above	53 (22.0)	46 (28.0)	8 (30.8)	0.77
Paternal education bachelor's degree or above	54 (22.4)	30 (18.3)	6 (23.8)	0.27
Low socioeconomic status (< 15,000 THB/month)	88 (36.5)	61 (37.2)	12 (46.2)	0.68

Table 3 Association between mindset with O-NET score

O-NET score	Mindset			*F*	*p-value*
	Growth (n = 244) Mean ± SD	Undecided (n = 165) Mean ± SD	Fixed (n = 26) Mean ± SD		
Thai	51.12 ± 14.29	46.21 ± 15.06	40.53 ± 15.01	9.789*	< 0.001
Math	42.48 ± 17.29	37.45 ± 15.11	31.54 ± 13.55	8.339*	< 0.001
Science	44.35 ± 12.09	41.21 ± 12.44	38.81 ± 14.33	4.635*	0.010
English	41.55 ± 18.32	38.92 ± 18.81	31.63 ± 14.58	3.879*	0.021
Total score	179.50 ± 51.16	163.79 ± 51.57	142.49 ± 45.03	9.094*	< 0.001

Box's Test of Equality of Covariance Matrices Box's M = 35.712, F = 1.722, p = 0.023

Pillai's Trace = 0.056, F = 3.111, p = 0.002

Levene's Test of Equality of Error Variances

Thai F = 0.134, p = 0.875; Math F = 3.125, p = 0.045; Science F = 0.265, p = 0.767; English F = 2.377, p = 0.094

*One-way MANOVA

Table 4 Association between mindset with school-related happiness score

Score	Mindset			*F*	*p-value*
	Growth (n = 244)	Undecided (n = 165)	Fixed (n = 26)		
	Mean ± SD	Mean ± SD	Mean ± SD		
School-related happiness	31.05 ± 3.68	28.11 ± 3.81	23.56 ± 4.22	65.793*	< 0.001

Test of Homogeneity of Variances Levene's Statistic = 0.382, p = 0.683

*One-way MANOVA

Table 5 Correlation between mindset with total O-NET and school-related happiness score

Score (Dependent)	Mindset (Predictor) Coefficients			Coefficient of multiple correlation	ANOVA	
	β	*t*	*F*	*Adjust* R^2	*F*	*p*
Thai	0.194	17.008*	17.008*	0.035	17.008*	< 0.001
Math	0.162	11.804*	11.804*	0.024	11.804*	0.001
Science	0.141	8.846*	8.846*	0.018	8.846*	0.003
English	0.091	3.656	3.656	0.006	3.656	0.057
Total O-NET	0.173	13.357*	13.357*	0.028	13.357*	< 0.001
School-related happiness	0.529	170.16*	170.16*	0.278	170.16*	< 0.001

*Simple Regression Analysis

Interestingly, young children in primary school might hold growth mindsets more than fixed mindsets. It was possible that young children may feel fun in learning therefore they might have learning goals which cultivate growth mindsets. Older children or adults may focus on performance goals and outcomes, face more competition or stress related to education, and might cultivate fixed mindsets. Culture may affect people's mindset differently. The meta-analytic review of Costa A, et al.[11] discussed that more collectivist societies might focus less on individual results and encourage students to value the learning process over the outcome which may cultivate more growth mindsets in Thailand.

This study showed that students with growth mindsets associated with higher academic achievement when measured by O-NET scores and all mindsets correlated with Thai, Math and Science scores similar to the meta-analytic review of Costa A, et al.,[11] which reviewed 46 studies all among middle school and college students. Costa A found a positive direct association between students' implicit theories of intelligence (or growth mindset) and their academic performance at a modest level. The link between implicit theories of intelligence and achievement were positively significant for specific subjects such as verbal and quantitative academic domains[11]. In our study, mindsets correlated the most with Thai but did not correlate to English. This may have been because English is a foreign language in Thailand when learning requires both intrinsic factors of children such as mindset and extrinsic factors such as curriculum or teachers[18], therefore learning limitations exist when studying English in Thailand.

Our study also found that growth mindset was associated with and correlated to higher school-related happiness scores. This finding was consistent with the study of Aronson et al.,[12] which found that African American college students, who were encouraged to view intelligence as malleable, reported greater enjoy-

ment of the academic process and greater academic engagement. King RB[19] showed that the entity theory of intelligence was negatively associated with life satisfaction and positively associated with negative effects. One cross-lagged longitudinal study[19] showed that implicit theories and certain dimensions of subjective well-being were reciprocally related. Thus, children with growth mindsets may experience more happiness in school, or when these children are happy at school they will probably have growth mindsets. However, studies on mindset types and happiness levels remain limited.

The strength of our research related to the population we studied i.e. younger children than those in previous studies, in which they may be more open to mindset interventions. We also measured the outcomes using O-NET scores, the standard test of elementary school students in Thailand, and school-related happiness which constitute limited data.

Even though high mindset scores (more growth mindset) could predict increased Thai subject, Math, Science, and the total O-NET scores but only at low correlation. This may be due to low sample sizes, questionable reliability of the mindset questionnaire, and purposive sampling of the population which may not represent all of the students in Thailand. Larger population study of growth mindset in students and adjusted multiple mindset questionnaires are needed.

Conclusion

Among sixth grade students, growth mindset was the predominant mindset. Growth mindset was associated with higher O-NET scores and school-related happiness scores. However; mindsets had low correlation with school-related happiness scores and very low correlation with the total O-NET scores. Further growth mindset studies using longitudinal designs, larger populations, or growth mindset interventions are needed.

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