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English Language Mindsets of Engineering Students

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Introduction

"When I learn English, I feel like my brain will reset itself" – Student X

The premise above suggests a distinct mindset domain when the brain *resets* itself in language learning. Mindset or Implicit Theory of Intelligence (Dweck, 2006) is not a single construct in foreign language education. Students may endorse growth or fixed or both (Burnette et al., 2013; Khajavy, Pourtahmasb & Li, 2021; Lou, 2019). Accordingly, students with a growth mindset of intelligence may adapt, adjust or respond to learning challenges to reach their goals, unlike those with a fixed mindset who may disengage or resign from the task. In language learning, students who attribute intelligence as changeable tend to value the effort to learn from challenging language tasks. In contrast, fixed-minded students who experience difficulties regard effort as pointless or dislike negative feedback even though it helps them become better.

The multifaceted construct of mindsets may be evident in language learning. For example, learners may hold mixed-, fixed- or growth-oriented systems concerning effort beliefs (negative or positive), attribution (uncontrollable or controllable), achievement goals (performance or mastery goals), failure/mistake mindset (failure vs. debilitating or enhancing), the self-regulatory tendency (self-defensive or self-improvement strategies), and competence-based emotional tendency (anxiety or confidence) (see Lou, 2019).

The malleability of intelligence (incremental or growth mindset) or its opposite (entity or fixed mindset) has been linked with motivation (Aditomo, 2015; Armsun, Fried, & Good, 2002; Grant & Dweck, 2003), academic achievement (Blackwell, Trzesnievski, & Dweck, 2007), challenges and setbacks (Dweck & Legget, 1988), anxiety (De Castella et al., 2015; Kneeland et al., 2016). Since mindset is linked with academic achievement, it is important to trace the beliefs held by students, in this study, engineering students, to help them succeed in their current studies and future career and life. When students have a strong fixed language mindset or weak growth language mindset, teachers may create intervention programs to shape the 'right' mindset to counter the challenges emanating from language learning in engineering education.

In the context of the present study, engineering education refers to engineering programs offered in L1 (herein, Thai), of which English is not the medium of instruction nor communication inside and outside the classroom. One of the requirements to obtain an undergraduate degree in engineering recently imposed in Thailand is to pass a certain degree of English language level similar to that of the Common

European Framework of Reference for Languages (CEFR). The Exit Examination (Exit Exam) covers the following components – listening, speaking, reading, and writing. The test aims to develop a workforce with academic, professional, and high levels of English communication skills. Having a growth language mindset may help engineering students overcome the challenges of English language learning and situations where English is used as a medium of instruction or communication in engineering content courses.

The extent of mindset studies along various contextual considerations is not yet fully known. For example, in Thailand, studies on the mindset of university engineering students are rarely found in the current literature. Added to that, it has not been revealed if year level and perceived English language proficiency are associated with students' mindset significantly. Therefore, this study sought to answer the following questions. (1) What are the mindsets of engineering students toward English language learning? (2) Is there a significant relationship between year level and language mindsets? (3) Is there a significant relationship between perceived English language proficiency and mindsets? (4) What are students coping strategies when they are faced with difficulties in English language learning?

Literature Review

Mindset has been applied to various domains in education, specifically on the psychological factors that affect student success despite the ubiquity of challenges in English language learning. As noted previously, several researchers have also explored its relationships with attitude, confidence, positive reinforcements, motivation, self-awareness, resilience, efficacy, and teaching practices (see Lou & Noels, 2016, 2017; Ryan & Mercer, 2012; Waller & Papi, 2017; Yeager & Dweck, 2012).

In language learning, Lituchy (2019) noted verbal attributions of a child with a fixed mindset such as "I'm stupid", "I can't", "I'm not smart at this", "I'm no good", and "I'm no good at anything I do". Nonverbal cues include pacing, groaning, and body drooping. Such utterances could be counteracted by saying, "You can do it. Keep trying" or "You can do this. Your brain is big". Those verbal acts by the teacher may positively impact the students' self-esteem and academic ability.

Understanding language mindsets could also be attributed to cultural orientations. Ryan and Mercer (2012) compared Austrian and Japanese students' mindsets in language learning, general intelligence, athleticism, and geography. Austrians seemed to have a fixed mindset (M = 4.77, SD = 0.87), while Japanese students leaned toward a growth mindset (M = 5.03, SD = 0.97). They argued that the findings with Japanese students were associated *"ganbaru"* or effort or persistence theory of learning in Japanese educational values. Among high school students in Thailand, Wilang (2021) reported a fixed mindset concerning effort – *If I have to work hard during English language class, it means I am not smart* (M = 2.57, SD = 1.11) instead of growth-minded thinking – *The more difficult the English task is, the more motivated I become to put in effort* (M = 2.52, SD = 1.00). Cultural factors such as '*sabai-sabai*' or '*easy-going'* and '*mai pen rai*' or '*it is okay*' were known to contribute to the student's fixed mindset. Furthermore, the 'no-fail' policy of the Thai education ministry may push back high school students to strive for higher learning goals in English. In the Chinese context, Rui and Priyadarshini (2018) explored the role of growth mindset and teacher feedback as predictors of English achievement among Chinese high school students. Dweck's mindset inventory was used and it was reported that Chinese students have moderate growth mindset (M = 3.19, SD = 1.09).

Exploring the domain-specificity of language mindset may yield deeper comprehension of the topic. For example, in reading, Khajavy et al. (2021) reported that a growth mindset in L2 reading was the sole predictor of L2 reading performance. Students with L2 reading growth mindset always believed that their reading ability could be improved regardless of their intellectual ability, they become better when they try to learn L2 reading skills, and doing enough practice could help them gain enough skills to comprehend L2 texts. On the other hand, an entity-based mindset in L2 reading believed that one could not change and improve limited aptitude, that few people are capable of learning and improving their L2 reading skills,

and one can never improve their reading comprehension skills. Further findings indicated that L2 reading growth mindset and L2 reading achievement had a higher correlation as previously reported in general education. Such shreds of evidence provide convincing results on the effects of a growth mindset in language learning.

In other learning domains, the proficiency of the students may have affected their mindsets. For example, Limeri and colleagues (2020) found a more robust fixed mindset among undergraduates who persistently struggled in organic chemistry. Several factors were known, including academic experiences, observing peers, deducing logically, taking societal clues, and formal learning. Similar findings were reported by Flanigan and colleagues (2017), where "helpless" first-year students in computer science shifted toward a fixed mindset compared with other groups. However, more work is needed to investigate other groups of students, i.e., engineering students, with regard to their proficiency and mindset.

Little is known among university students if year level is correlated with language mindset. Gottfredson (2021), in his blog – *Do our mindsets change as we age?* reported no correlation between growth mindset and age as people get more growth-minded over time. For example, on the scale of 1 to 7, the mean scores for the following age groups were: 4.37 (age 10-19), 4.61 (20-29), 4.71 (30-39), 4.81 (40-49), 4.78 (50-59), 4.80 (60-60), and 4.92 (70 and beyond). It remains unknown in the university context if first year students, sophomores, juniors, and seniors in engineering have differing language mindsets.

Correlated with a growth mindset is resilience, the ability to 'bounce back' from adversity in learning. For example, with a growth mindset, a student who had a low score in an assigned task would put more effort and use positive learning strategies to improve. It is believed that such an effort would increase academic engagement and performance. Therefore, it is essential to bare the engineering students' coping strategies when faced with language learning challenges.

Methods

Participants

The participants (n=82) from a university in Thailand voluntarily participated in the study. Most were first- and third-year students and have moderate to high perceived proficiency in English (see Table 1).

TABLE 1
Background of the Participants

Year of study	Frequency	
Year 3	44	
Year 2	4	
Year 1	34	
Perceived proficiency	Frequency	Interpretation
5	5	Very high
4	29	High
3	44	Moderate
2	4	Low
1	0	Very low

Instrument

The mindset survey in English language learning was used (see Puvacharunkol & Wilang, 2020; Wilang, 2021). It covers six aspects on (1) General viewpoint of own ability, (2) Success of others, (3) Challenges, (4) Obstacles, (5) Effort, and (6) Criticisms. Of the twelve items, six are fixed-minded items and the others are growth-minded statements (see Table 2). The survey has been shown to have acceptable reliability at .95 by using Ministep (see Puvacharunkol & Wilang, 2020). The fixed-minded

statements were reverse-coded then averaged. The higher score in each aspect reflects the endorsement of growth or fixed mindset.

The survey mindset included open-ended questions – *What are the difficulties that you face when learning English? Knowing such challenges, what are the coping strategies you have employed?*

Data Collection and Analysis

Data collection took place for two weeks using an online survey. The link was sent to English language lecturers in the university. They were asked to send it to their engineering students. The first part of the survey contains the information of the study. Before respondents moved on to the next section, they were asked to give their consent. If consent was not granted, they would be directed to the end with a 'Thank you' note. One hundred twenty-nine students participated, but only eighty-two students consented to use their data in the study.

To know the mindset of engineering students, descriptive analysis was used. Correlational analysis was used to explore the association of year level and mindset and perceived English language proficiency and mindset. The responses to the open question were coded accordingly, and interrater reliability was sought.

Results

Four questions were answered in the present study.

RQ1: What are the Mindsets of Engineering Students toward English Language Learning?

Table 2 shows growth mindsets of engineering students in all dimensions, such as the general viewpoint of their ability, the success of others, challenges, obstacles, effort, and criticisms.

TABLE 2
Mindsets of Engineering Students (n=82)

Statement	*M, SD*	Mindset
General viewpoint of own ability		
I can do things differently in the English language class, but the important parts of who I am can't be changed.	3.17, 0.70	*Growth mindset*
I can always change the basic things about the kind of person I am when I learn English.	3.65, 0.79	
Success of others		
When other students do better than me in the English language class, it makes me feel inferior.	3.28, 1.13	*Growth mindset*
When other students succeed in the English language class, I feel inspired.	3.80, 0.66	
Challenges		
In the English class, I avoid to try things that are hard.	3.27, 0.80	*Growth mindset*
Feeling challenged in learning English makes me want to try harder.	3.74, 0.81	
Obstacles		
I usually quit when something gets difficult in the English class.	2.83, 0.87	*Growth mindset*
I don't mind making mistakes in the English language class because I can learn.	3.72, 0.91	
Effort		
If I have to work hard during the English class, it means I am not smart.	3.06, 1.02	*Growth mindset*
The more difficult the English task is, the more motivated I become to put in effort.	3.21, 0.80	
Criticisms		
In the English language classroom, I dislike negative feedback on my performance, even if it helps me improve.	2.91, 1.04	*Growth mindset*
In studying English, I rarely take criticisms as personal attacks.	3.55, 1.03	

RQ2: Is there a Significant Relationship between Year Level and Mindsets?

The correlation indicated no significant association between year level and fixed mindset as well as year level and growth mindset.

RQ3: Is there a Significant Relationship between Perceived English Language Proficiency and Mindsets?

Results of correlation indicated a significant association between perceived English language proficiency and growth mindset, $r(82)= .27$, $p < .05$). Meanwhile, there was no significant association between perceived English language proficiency and fixed mindset.

RQ4: What are the Coping Strategies Used when Face with Difficulties in Language Learning?

Six coping strategies were coded (see Table 3) such as practicing and trying your best, seeking help from peers or teachers, talking to self, using technological affordances, having an active mind, and taking risks.

TABLE 3
Coping Strategies

Coping strategies	Frequency
Using technological affordances	70
Practicing and trying your best	53
Talking to self	45
Having an active mind	50
Taking risks	30
Seeking help from peers or teachers	25

The most frequent strategy mentioned was using technological affordances such as mobile phones, the internet, and online editing apps. For example, students talked about using Google for translation, using the phone to check spelling mistakes, using editing assistants (i.e., Grammarly) for writing, and studying free courses online. Other students suggested watching movies, taking special classes, and finding teaching aids to help them comprehend the challenging parts of the lesson.

> *There are some words in my head. Sometimes my head knows but I don't know why I can't say it. I don't how to respond. So I use my phone in class or Google some similar words. The teacher allows us to use our phone.* – Excerpt 1

When the students experience difficulties in vocabulary (i.e., don't know the words, can't remember the words), writing (i.e., grammar points), speaking (i.e., cannot communicate, cannot reply), and listening (i.e., unable to listen and comprehend), and tests, they mentioned about practicing and trying their best.

> *When you can't speak words or don't know the words to say in the class, don't skip your class. I know some of my friends who pretend to get sick when there is a speaking practice. Attend your class, sit and try harder.* – Excerpt 2

Talking to self is one way to gain the courage to do difficult tasks. For example, students discussed their fear when called to speak in front of the class and present in front of the class while everybody is staring.

> *Talk to yourself and encourage self to move away from comfort zones and dare to speak in class*. – Excerpt 3

> *I can do the exam. I can do the exam. Say it repeatedly.* – Excerpt 4

Another code that was elicited from students' responses was having an active mind. Therefore, to counter the effects of not knowing what to respond to questions, students have to stay conscious during lectures, opening their minds, listening carefully, and reading with comprehension.

> *When I listen to some foreign teachers, I feel ignorant. It's difficult to communicate to them, and most of the time I do not understand what they are saying so I just focus on something else during the class.* – Excerpt 5

> *I don't feel like I'm not keeping up with my friends at some point. It comes from ignoring vocabulary. So being active makes me catch up.* – Excerpt 6

The sixth code deduced was taking risks. Some students had difficulty expressing their thoughts due to insufficient knowledge of language expressions, having accented speech, and not being fluent.

> *I don't dare to talk. I don't dare to express my thoughts for fear of being wrong. But I think trying to answer is good in some ways.* – Excerpt 7

The least frequent strategy was seeking help from peers and teachers. Some difficulties were understanding grammar points, writing sentences, reading words, and forgetting words. Once they know that the task is too challenging, they may seek help from peers or teachers.

> *Talk to your teacher during class or in private if you are shy. Tell that you can't make the assignment because you don't understand it*. – Excerpt 8

> *There are many grammar points I don't understand and may appear in the exam. I asked my friends to at least understand it.* – Excerpt 9

Discussion and Implications

The findings have shown growth mindset among engineering students on their ability, success of others, challenges, obstacles, effort, and criticisms. A significant relationship was found between perceived English language proficiency and growth mindset. There was no association between perceived English language proficiency and fixed mindset and year level and mindsets.

Previous studies have predicted that proficiency is associated with students' language mindset. For example, Khajavy et al. (2021) previously reported that a growth mindset in reading was the sole predictor of reading performance. With similar findings in the present study, it is essential to investigate in-depth individual mindsets of students with low proficiency to provide appropriate scaffolding.

Despite the difficulties in English language learning, it is not surprising that engineering students possess a growth mindset on effort, unlike Thai high school students (see Wilang, 2021). This could be explained by Thai engineering education background, which follows western engineering systems. It means that most resources are written in English, and engineering students are expected to cope with the challenges of reading and comprehending English-based textbooks. In addition, students are expected to meet the desired proficiency level in the Exit Examination, for example, at least CEFR A2, to receive their engineering diploma. In most engineering programs in Thailand, there is a high level of motivation

as various study-abroad and cultural activities are afforded to students. At this university, joint exchange programs were made possible with universities in Japan, Malaysia, Indonesia, and other European countries. Most importantly, engineering students may possess a clear goal – success in their chosen career and life.

The growth mindsets on their ability, success of others, challenges, obstacles, effort, and criticisms could be attributed to their coping strategies in language learning. The coping strategies that they have used may serve as a buffer in difficult times. Thus, allowing technological affordances is highly recommended. Intending to succeed, there is a possibility that their motivation in studying engineering is linked with their performance in the English language class. As noted previously, growth mindset is associated with positive learning variables such as motivation (Aditomo, 2015; Armsun, Fried, & Good, 2002; Grant & Dweck, 2002, Lou & Noels, 2016, 2017; Ryan & Mercer, 2012; Waller & Papi, 2017; Yeager & Dweck, 2012). Future studies may explore the domain-specificity of language mindsets and challenges among engineering students and other majors to provide empirical evidence on this issue.

Implications for Teaching

It is essential to discuss the association of perceived English language proficiency and growth mindset due to its implications to students' language success and career goals. The higher the proficiency, the higher tendency of the growth language mindset a student possesses. So, how can teachers help fixed-minded students with low proficiency in English language learning? Before starting the semester, teachers may administer self-report questionnaires to understand students' cognition (i.e., mindset) or affect (i.e., language anxiety) in English language learning. Upon identifying cases (i.e., students with fixed mindsets), the teacher may have to observe and ask about students' well-being. The teacher may devise 'action plans' to respond, for example, on how to reshape lesson plans to include activities that enhance growth mindset when doing challenging tasks in English. With the student's consent, the teacher may conduct intervention studies in the form of action research out-of-class. In positive psychology, intervention studies are common. It is important that teachers are not trying to 'fix' the mindset (as in mainstream psychology) but to introduce some positive characteristics in English language learning such as optimism, resilience, and the like. In teaching, apart from having clear language goals to improve student's language proficiency, the university may consider the framework of positive language education. Doing so would promote non-linguistic (i.e., 21st-century skills) and linguistic skills to build a fundamental foundation to cope with personal and professional challenges in life.

Implications for Testing

Some students mentioned and were worried about the Exit Exam. Universities may encourage students to assess themselves by providing mock or practice tests throughout the academic year. These students should be encouraged to keep a record of their performances to monitor their changes. Gamification of the practice test may be promoted to make it more exciting, possibly increasing engagement and building self-confidence.

Along with the test practice, promoting of growth mindset could be launched. Previous studies have shown that students with a growth mindset can possess positive traits to counter negative experiences while doing mock-up tests. Another way is to promote individual, differentiated outcomes. A mock test should be able to point out a specific area to be improved. For example, if the student is not good at speaking, a practice test should be provided. The same concept should be afforded to students who have difficulties in writing, reading, and listening. Moreover, universities may encourage English in all levels – instruction and communication, in-class and out-of-class, spoken and written. The concepts of English as Medium of Instruction (EMI) or Content and Language Integrated Learning (CLIL) may be promoted.

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