International students' learning strategies and challenges under an English as a medium of instruction (EMI) setting: A case study at National Taipei University

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Abstract

English as a medium of instruction, or EMI, is the medium of instruction primarily or entirely in English, where English is not the first language. The effectiveness of English-Medium Instruction (EMI) courses on local students' academic performance and learning experiences has been studied in Taiwan for decades. However, little research has been conducted on international students' difficulties and learning strategies in the Taiwanese EMI context. To fill this gap, the researcher collected information from 17 non-English-speaking international students at a public university in Taiwan through observation, questionnaires, and interviews. The research found that differences in English proficiency and strategy adoption between Asian and European international students play a vital role in learning EMI courses. Asian students tended to have lower English proficiency and use social, affective, and cognitive strategies, while European students tended to have higher levels of English proficiency and use metacognitive and cognitive strategies. However, the cognitive strategies of their European peers differed significantly from those of their Asian peers. Interaction with peers, academic and non-academic stressors, and expression in English posed challenges for international student engagement in EMI courses. This research suggests that teachers should ensure inclusiveness in the curriculum and that school administrators should encourage and support international students. Students' learning experiences in EMI courses may be enhanced by considering international students' performance and learning styles.

Keywords: English as a Medium of Instruction (EMI), learning challenges, learning strategies, international students, mixed-methods research.

1. Introduction

English has become the world's most widely spoken international language among second-language speakers since the 1990s. This trend also began in Europe's higher education sector with the initiation of the Bologna Process to promote English-taught courses and the Erasmus Programme (now known as Erasmus+) [1], [2]. From 2001 to 2014, the number of degree programs taught in English increased from 725 to 8,089 [3]. This trend has spread to other continents, such as Asia, where Japan reported 1,540 official bachelor's, master's, and doctoral degree programs taught in English by 2021 [4].

Taiwan has also followed the trend towards internationalizing higher education due to political and economic circumstances and a decline in the birth rate and new students. Universities have encouraged overseas exchange and degree students to study in Taiwan through English-taught programs under the Ministry of Education's Aim for the Top University Program and the National Development Council's Bilingual 2030 Policy. For example, National Taiwan University (NTU) increased the number of English-taught courses from 618 in the academic year 1994 to 2,910 in the academic year 2022 [5]. This phenomenon occurs not only in degree programs for international students but also in departments where Chinese has been the primary teaching language [6], [7].

Despite the increasing importance of English as a medium of instruction (EMI), its practical implementation needs to be improved. EMI is defined as the medium of instruction primarily or entirely in English, where English is not used as the first language [7], [8]. English proficiency is thus the primary concern of an EMI course. Professors may not be sufficiently capable of teaching in English [9]. On a positive note, suitable curriculum design and group activities can enable both Taiwanese and international students to benefit from courses [10]. When teaching international students, professors should adapt to the different accents of English speakers from different   countries

and understand cultures outside of Taiwan and the Western world. This bridges the gap between professors and students, facilitating students' learning [11].

1.1 The Current Implementation of English as a Medium of Instruction (EMI)

There are numerous papers on English as a medium of instruction, EMI, English teaching, and English language courses available in the National Digital Library of Theses and Dissertations in Taiwan; however, most of them focus on Taiwanese students, such as Zhang's study on understanding Taiwanese student experiences in EMI environments [12] and Shu's exploration of the impact of self-efficacy and teacher effectiveness on the learning outcomes of EMI students [13]. International research on EMI has yielded key findings on instructional strategies, language abilities, and teacher training. Teachers have used strategies such as repetition, code-switching, and input enhancement to address language barriers [14], [15]. Although EMI courses can improve English language proficiency, as Rogier found [16], debates still exist regarding whether they improve course quality [17]. To ensure teaching effectiveness, some academic institutions require EMI teachers to undergo training to enhance or attain English proficiency [17].

Research in Taiwan has primarily focused on students' English proficiency and subject matter knowledge absorption. Zhou found that students' English listening skills impact their support for EMI courses [10]. EMI evaluation mechanisms have been implemented according to the Ministry of Education [7]; however, enrichment opportunities and active teacher support may be improved. Few studies have been conducted on international students' EMI experiences in Taiwan. Marpaung identified personal, language, and cultural factors influencing Indonesian students' participation in EMI classes [18]. Arun highlighted the language barriers that international students face in communicating with local students and accessing course-related information [19]. Students may seek assistance from their professors or peers in their first language when struggling with English writing, as noted by Puspitasari [20]. On the other hand, international students may be averse to using a mix of Chinese and English, as suggested by Lan [21].

1.2 EMI Learning Challenges

EMI may increase the cognitive load of comprehension for non-English native speakers, resulting in learning shocks. For example, Zhang found that students in EMI classes might have less efficient expressions in the classroom because of their language proficiency [12]. Students may not only have difficulty expressing themselves, but they may also struggle to understand the content of the lessons. Hua explained that grasping English messages requires more concentration for non-English speakers [22]. If the teaching style is unidirectional rather than interactive, students will easily be distracted and miss critical points in the course. In addition, when subjects not covered in secondary education (e.g., psychology) are taught in English, students without sufficient prior knowledge or scaffolding may find learning challenging. Furthermore, insufficient language skills and cultural differences may make teachers' instruction tantamount to 'preaching to deaf ears' [23].

On the other hand, Puspitasari incorporated the research of Ishikura, Hengsadeekul et al., and Huang, showing that students in EMI classes are prone to anxiety, loss of confidence, and even decline in their learning performance [20]. Lee suggested that schools in South Korea should increase teacher-student interactions in the curriculum. Meanwhile, language centers similar to Taiwan's colleges and universities and an English language tutoring system should be established to improve students' academic English. Relying solely on a teacher-centered approach, even with solid learning motivations and scaffolding strategies, can still result in barriers to learning. [24]

1.3 Learning Strategies for EMI

Learning strategies refer to methods learners use to acquire information and improve their learning effectiveness. These strategies vary among learners from different countries [25] and are crucial for EMI students as they often face language barriers.

EMI students are highly motivated to learn and use high-level learning strategies like self-discipline, time management, and goal-setting competence, leading to better academic performance when compared to non-EMI peers [15]. They adopt various second language learning strategies such as memory, cognitive, compensatory,

metacognitive, affective, and social strategies [26]. Learners in EMI classes use second language learning strategies such as asking for explanations in English and seeking feedback [27]. EMI learners leverage cognitive strategies as compensatory measures to overcome the comprehension challenges caused by insufficient language proficiency, according to Yeh's words cited in Xiao & Zhou's paper [28]. Thus, EMI learners may use a multitude of approaches, such as note transcribing, extracurricular reading, in-class concentration, in-class questions, and post-class discussions [19]. EMI learners use metacognitive and social strategies to deal with an exam-oriented EMI course curriculum [24]. It is essential to develop strategies for EMI learners to facilitate understanding, organize ideas, and engage in classroom activities in the long term [29].

Given the limited research on English-taught courses for international students in Taiwan and the fact that most studies have been conducted from the teachers' perspective, this study sheds light on international students' learning strategies and challenges from their perspective. Through an in-depth analysis, we will understand the characteristics of students from different countries and identify possibilities for improving EMI curricula.

2. METHOD

In the first semester of the academic year 2021, the researcher worked as a teaching assistant on the English-taught course Tourism English for the Hai Shan Area and found a gap in learning achievements between the international students in the class. Some students could meet or exceed the criteria set by the teacher, while others could not even understand the content of their assignments. From the private conversations between the researcher and international students, it emerged that despite their best efforts, some students needed help to keep up with the classes. However, some students who met or exceeded these criteria still faced varying learning challenges in other English-taught courses. Therefore, the researcher intended to understand why there was such a gap in learning challenges, even though the students were enrolled in English-medium courses. Since many factors might influence student learning performance, the researcher examined how learning strategies affect students' learning from a student's perspective.

In addition, the researcher aimed to further understand whether students' English language proficiency contributes to diverse levels of learning challenges. A Hong Kong study suggests that students' English proficiency may have a minor impact on their work in EMI courses [27]. However, another study found that unfamiliarity with English may lead to learning challenges [30]. Given that the results of these two studies are inconsistent, the researcher tested the correlation between students' English language proficiency and their learning challenges.

Accordingly, the research questions in this study are as follows:

1. What learning strategies do international students of different nationalities tend to use in EMI classes?

2. What are the learning challenges international students potentially face in EMI courses?

3. Are the learning challenges worse for international students whose English language proficiency is below CEFR B2?

To answer these questions, the researcher employs the triangulation method described by Denzin [31]. The descriptions and details of these three approaches are listed in Table 1.

Table 1. Research tools and data collection periods

Research Tool	Content	Data Collection Period
Background questionnaire	Closed-ended questions were supplemented with some open-ended questions to understand the educational background, English level, and past and present learning challenges faced by international students in the EMI course.	September 2022 (the start of the first term of the academic year)
Anecdotes	Students' behavior in the classroom is recorded, with particular attention paid to the impact of the teacher's behavior (e.g., lecturing style, student-teacher interactions) or the	September to December 2022

	content of the course on the students, and the frequency and time scale of student behavior (e.g., mobile phone use, drowsiness).	
Learning strategies questionnaire	Considering that the course has been in progress for one semester, this questionnaire asks students to make statements using a Likert scale to understand the learning strategies they employ in the classroom.	December 2022
Semi-structured interviews	Based on the anecdotes, background questionnaire, and learning strategies questionnaire, four to six interview questions were designed for the three interviewees to gain an in-depth insight into their use of learning strategies and the learning challenges they face.	December 2022 to January 2023

3. RESULTS AND DISCUSSION

3.1. Quantitative Analysis

An initial survey was conducted to examine the learning strategies used by international students in courses taught in English and the difficulties they faced. The survey was administered to 18 international students enrolled in the following courses: Chinese (1), Creative Cities, Learn Chinese from Food in Taiwan, and Urban Diplomacy. The students were asked to report their latest English language proficiency test results, such as TOEIC and IELTS, and to briefly describe their English learning experience, including their years of learning English and university- level EMI experience. The initial questionnaire questions were based on those from the Appendix of Pun & Jin's article [27]. They were adapted slightly to analyze the learning strategies and potential difficulties international students face in EMI courses.

One week before their final exams, 17 international students described the learning strategies they employed in class on paper questionnaires. Before administering the end-of-term questionnaire, the researcher conducted a pilot study and revised the content. The final questionnaire was designed based on the topics of Lee's questionnaire, but with the question stem wording slightly adjusted considering students' English proficiency [24].

After the questionnaires were collected, Excel version 2212 was used for preliminary data processing to understand trends in the questions. Univariate and multivariate analyses were performed using R-v4.2.2. Finally, the differences between the outcomes of this study and those of other studies were compared to better interpret the results.

The study participants were all international students at the university whose first language was not Chinese. MB002 was disqualified because her first language was English. Table 2 presents basic information about the students.

Table 2. Basic information about the test subjects

Test Subject Code	School Year	First Language	Second Language	CEFR Level
MB001	Master's First Year	Vietnamese	English	B2
MB003	Master's First Year	Vietnamese	English	B2
MB004	University Senior	Indonesian	English	C1
MB005	University Sophomore	Japanese	English	B1

MB006	Master's First Year	Thai	English	C1
MB007	Master's Second Year	French	English	B2
MB008	University Junior	Korean	English	B2
MB009	Master's First Year	Thai	English	B1
MB010	University Senior	Japanese	English	B1
MB011	University Sophomore	German	English	B2
MB012	Master's First Year	French	English	B2
MB013	Master's Second Year	French	English	B2
MC001	University Junior	Japanese	Chinese	B1
MC002	University Sophomore	Japanese	English	B1
MC003	Master's Second Year	French	English	C1
CC001	University Senior	Polish	English	B2
CD001	Master's First Year	Thai	English	B2

3.1.1. Analysis of the Initial Questionnaire

Table 3 first provides the scores of all test subjects for each question. A further Mann-Whitney U test showed no significant differences between Asian and European students across all aspects. However, Asian students scored lower on question five than European students, as indicated by a significant deviation between the median and mean, suggesting they were less likely to deviate from the original text or interpret the topic after reading (Table 4). Additionally, using the Kruskal-Wallis test to compare Northeast Asian, Southeast Asian, and European students showed no significant differences in any of the questions (Table 5). However, on average, Southeast Asian students had fewer learning difficulties. This trend was also apparent with Asian students, particularly those in Northeast Asia, who experienced more difficulty reading texts and interpreting topics in their own words than their European peers. Meanwhile, a Mann-Whitney U test found no significant differences in scores between college and master's students, but dividing students based on their English proficiency levels showed significant differences on questions 5 and 6, with CEFR B1 students being less likely to read beyond the original text or interpret themes and less likely to meet teachers' expectations (Tables 6 and 7). Only one Northeast Asian student reached the CEFR B2 level, which explains the results in Tables 4 and 5.

Table 3. Primary data from test subjects' responses (N=17)

Question No.	1	2	3	4	5	6	7	8	9	10
Mean	2.35	2.12	2.35	2.65	2.41	2.76	2.35	2.53	2.71	2.76
	±1.23	±1.02	±1.28	±1.19	±1.19	±1.31	±1.28	±1.14	±1.32	±1.35
Median	2	2	2	3	2	3	2	3	3	2

Table 4. Questionnaire score differences between European and Asian students (N=17)

Question No.		1	2	3	4	5	6	7	8	9	10
Asia N=11	Mean	2.64	2.09	2.55	2.64	2.73	2.82	2.55	2.64	2.82	2.82
		±1.43	±1.14	±1.37	±1.21	±1.27	±1.4	±1.44	±1.21	±1.33	±1.33

	Median	2	2	2	3	3	3	2	3	3	2
Europe *N=6*	Mean	1.83 ±0.75	2.17 ±0.98	2 ±1.26	2.67 ±1.37	1.83 ±0.98	2.67 ±1.37	2 ±1.1	2.33 ±1.21	2.5 ±1.52	2.67 ±1.63
	Median	2	2	1.5	3	1.5	3	2	2.5	2.5	2.5
	p-value	0.31	0.79	0.44	0.88	0.18	0.96	0.56	0.72	0.64	0.8

Table 5. Questionnaire score differences between students in the three regions (N=17)

Question No.	*Northeast Asia (N=5)*		*Southeast Asia (N=6)*		*Europe (N=6)*		*p-value*
	Mean	Median	Mean	Median	Mean	Median	
1	2.8±1.3	2	2.5±1.64	2	1.83±0.75	2	0.42
2	2.4±0.89	2	1.83±1.33	1	2.17±0.98	2	0.39
3	3±1.58	3	2.17±1.17	2	2±1.26	1.5	0.47
4	3±1.22	3	2.33±1.21	2.5	2.67±1.37	3	0.75
5	3.4±1.14	3	2.17±1.17	2	1.83±0.98	1.5	0.11
6	3.4±1.14	3	2.33±1.51	2	2.67±1.37	3	0.4
7	2.8±1.3	2	2.33±1.63	2	2±1.1	2	0.66
8	3.2±1.1	3	2.17±1.17	2	2.33±1.21	2.5	0.35
9	3.6±1.14	4	2.17±1.17	2	2.5±1.52	2.5	0.19
10	3.6±1.52	4	2.17±0.75	2	2.67±1.63	2.5	0.31

Table 6. Differences in scores between college and master's students on different topics (N=17)

Question No.		*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
BSc Students (N=8)	Mean	2.25 ±1.28	2±0.93	2.25 ±1.58	2.25 ±1.39	2.5 ±1.51	2.5 ±1.51	2.12 ±1.36	2.38 ±1.41	2.62 ±1.6	2.62 ±1.77
	Median	2	2	1.5	2	2.5	2.5	2	2.5	2.5	2
MSc Students (N=9)	Mean	2.44 ±1.33	2.22 ±1.2	2.44 ±1.13	3 ±1	2.33 ±1	3 ±1.22	2.56 ±1.33	2.67 ±1	2.78 ±1.2	2.89 ±1.05
	Median	2	2	2	3	2	3	3	3	3	3
p-value		0.8	0.84	0.62	0.16	0.96	0.46	0.42	0.55	0.81	0.49

Table 7. Differences in scores divided into three groups according to English proficiency level (N=17)

Question No.	CEFR B1 (N＝5)		CEFR B2 (N＝9)		CEFR C1 (N＝3)		p-value
	Mean	Median	Mean	Median	Mean	Median	
1	3.4±1.52	3	1.67±0.5	2	2.67±1.53	3	0.06
2	2.8±1.1	2	2±1	2	1.33±0.58	1	0.12
3	3.4±1.52	4	3.11±1.05	2	1.33±0.58	1	0.1
4	3.4±1.14	3	2.33±1.12	3	2.33±1.53	2	0.31
5	3.8±0.84	4	1.78±0.83	2	2±1	2	0.01*
6	4±1	4	2.11±1.05	2	2.67±1.53	3	0.05*
7	3.4±1.52	3	2±1	2	1.67±1.15	1	0.17
8	3.6±0.89	3	2.11±1.05	2	2±1	2	0.06
9	4±0.71	4	2.33±1.32	2	1.67±0.58	2	0.03*
10	3.8±1.3	4	2.44±1.33	2	2±1	2	0.14

$p \leqq 0.05$

3.1.2. End-of-term Questionnaire Analysis

Table 8 categorizes the questionnaire questions according to their corresponding second language learning strategies. Significant differences in scores between Asian and European students were found for questions 3, 11, 14, and 16, with Asian students scoring significantly higher than European students. Asian students were more aware of the need to improve their English proficiency, break course content into smaller components for better absorption, pay attention to their peers' talks, and repeat questions for more thinking time. Asian students were more likely to use metacognitive, social, and compensatory strategies, while there were hardly any differences between Asian and European students in the use of cognitive strategies (Table 9). The scores of students from Northeast Asia, Southeast Asia, and Europe differed significantly on Questions 3 and 16 (Table 10). Northeast Asian students were more aware of the need to improve their English proficiency. In contrast, Southeast Asian students often used repetition as a strategy to gain more thinking time about questions.

College and master's students scored similarly on all items, as shown in Table 11. However, master's students performed slightly better than college students regarding metacognitive and cognitive strategies. Significant differences in scores were found between the CEFR B1, B2, and C1 groups on questions 3, 10, 17, and 20 (Table 12). CEFR B1 students were more aware of their language proficiency insufficiencies than B2 and C1 students. Students with better English proficiency were likelier to read outside class, and B1 students were less likely to associate prior knowledge with English-taught lectures. B2-level students were less likely to interrupt professors or confirm information than their B1 or C1 peers were.

Table 8. Primary data from all test subjects (N=17)

Strategy Category	Question No.	Mean	Median
Metacognitive	1	2.41±1.46	2
	2	2.29±1.18	3
	3	2.47±1.33	3
	4	2.71±1.18	2
Cognitive	5	4.18±0.98	4

	6	2.59±1.09	3
	7	3.41±1.5	3
	8	2.38±1.32	2.5
	9	3.65±1.33	4
	10	2.94±1.21	3
	11	2.59±1.19	3
Social	12	2.71±1.23	3
	13	3.18±1.29	3
	14	3±1.37	3
	15	2.76±1.16	3
Compensation	16	2.41±1.19	3
	17	3.76±1.16	2
	18	3.65±1.03	4
	19	2.65±1.19	4
	20	3.06±1.47	3

Table 9. Questionnaire score differences between European and Asian students (N=17)

		Asia (N=11)		Europe (N=6)		p-value
Strategy Category	Question No.	Mean	Median	Mean	Median	
Metacognitive	1	2.45±1.69	1	2.33±1.21	2.5	0.96
	2	2.64±1.12	3	1.67±1.21	1	0.15
	3	3.09±1.22	3	1.33±0.82	1	0.01**
	4	3±1	3	2.17±1.47	2	0.09
Cognitive	5	3.91±1.14	4	4.67±0.52	5	0.17
	6	2.91±1.14	3	2±0.89	2	0.13
	7	2.91±1.58	3	4.33±1.03	5	0.08
	8	2.7±1.34	3	1.83±1.33	1	0.23
	9	3.45±1.29	3	4±1.55	4.5	0.32
	10	2.82±1.17	3	3.17±1.47	2.5	0.75
	11	3±0.77	3	1.83±1.6	1	0.04*
Social	12	3±1.26	3	2.17±1.17	2	0.22
	13	3.27±1.49	3	3±1.1	3	0.68
	14	3.55±1.21	4	2±1.26	1.5	0.04*
	15	3.18±1.17	3	2±0.89	2	0.07

Compensation	16	3±1	3	1.33±0.82	1	0.006**
	17	3.91±0.94	4	3.5±1.64	4	0.83
	18	3.45±1.04	3	4±1.1	4	0.3
	19	2.82±0.87	3	2.33±1.75	1.5	0.41
	20	2.91±1.51	3	3.33±1.63	3.5	0.61

$* p \leqq 0.05, ** p \leqq 0.01$

Table 10. Questionnaire score differences between students in the three regions (N=17)

		Northeast Asia (N=5)		Southeast Asia (N=6)		Europe (N=6)		p-value
Strategy Category	Question No.	Mean	Median	Mean	Median	Mean	Median	
Metacognitive	1	2.4±1.95	1	2.5±1.64	2.5	2.33±1.21	2.5	0.99
	2	2.4±1.34	3	2.83±0.98	3	1.67±1.21	1	0.28
	3	3.8±1.1	3	2.5±1.05	2.5	1.33±0.82	1	0.01*
	4	2.6±0.89	2	3.33±1.03	3	2.17±1.47	2	0.13
Cognitive	5	3.8±1.1	4	4±1.26	4.5	4.67±0.52	5	0.31
	6	3±1.58	3	2.83±0.75	3	2±0.89	2	0.29
	7	3±2	3	2.83±1.33	3	4.33±1.03	5	0.18
	8	1.8±1.3	1	3.6±0.55	4	1.83±1.33	1	0.06
	9	3.2±1.48	3	3.67±1.21	3.5	4±1.55	4.5	0.52
	10	2.4±1.14	2	3.17±1.17	3	3.17±1.47	2.5	0.54
	11	2.8±0.84	3	3.17±0.75	3	1.83±1.6	1	0.09
Social	12	2.6±1.52	3	3.33±1.03	3	2.17±1.17	2	0.31
	13	2.8±1.79	3	3.67±1.21	3.5	3±1.1	3	0.61
	14	4±1.22	4	3.17±1.17	3.5	2±1.26	1.5	0.05*

	15	3.2±1.3	3	3.17±1.17	3	2±0.89	2	0.17
Compensation	16	2.8±0.84	3	3.17±1.17	3	1.33±0.82	1	0.02*
	17	4±0.71	4	3.83±1.17	4	3.5±1.64	4	0.96
	18	3.8±0.84	4	3.17±1.17	3	4±1.1	4	0.36
	19	3±0.71	3	2.67±1.03	3	2.33±1.75	1.5	0.61
	20	2±1.41	1	3.67±1.21	3.5	3.33±1.63	3.5	0.18

* $p \leqq 0.05$

Table 11. Differences in scores between university and master's students on different topics (N=17)

		University Students (N=8)		Master's Students (N=9)		p-value
Strategy Category	Question No.	Mean	Median	Mean	Median	
Metacognitive	1	2.25±1.58	1.5	2.56±1.51	3	0.76
	2	2.25±1.16	2.5	2.33±1.32	3	0.92
	3	2.75±1.67	3	2.22±1.09	2	0.58
	4	2.38±0.92	2	3±1.41	3	0.39
Cognitive	5	4.25±1.04	4.5	4.11±1.05	4	0.8
	6	2.5±1.41	2	2.67±0.87	3	0.58
	7	2.75±1.67	3	4±1.22	5	0.13
	8	2.12±1.36	1.5	2.62±1.41	3	0.54
	9	3.75±1.39	4	3.56±1.42	4	0.8
	10	2.62±1.3	2	3.22±1.2	3	0.29
	11	2.5±0.93	2.5	2.67±1.5	3	0.88
Social	12	2.25±1.39	2	3.11±1.02	3	0.22
	13	3.38±1.6	4	3±1.12	3	0.4
	14	3.62±1.41	4	2.44±1.24	3	0.07
	15	3±1.07	3	2.56±1.33	2	0.43
Compensation	16	2.25±1.04	2	2.56±1.42	3	0.73
	17	3.88±0.99	4	3.67±1.41	4	0.96
	18	3.38±1.06	3.5	3.89±1.05	4	0.34
	19	2.38±1.06	2.5	2.89±1.36	3	0.43

	20	2.62±1.6	2.5	3.44±1.42	3	0.3

Table 12. Score differences in three groups divided by students' English proficiency level (N=17)

		CEFR B1 (N=5)		CEFR B2 (N=9)		CEFR C1 (N=3)		p-value
Strategy Category	Question No.	Mean	Median	Mean	Median	Mean	Median	
Metacognitive	1	1.6±1.34	1	2.67±1.5	3	3±1.73	4	0.32
	2	2.4±1.34	3	1.89±1.17	1	3.33±0.58	3	0.21
	3	4±1	4	1.78±0.97	1	2±1	2	0.02*
	4	2.4±0.55	2	2.78±1.56	2	3±1	3	0.78
Cognitive	5	3.8±1.1	4	4.22±1.09	5	4.67±0.58	5	0.42
	6	2.8±1.48	3	2.44±1.13	2	2.67±0.58	3	0.88
	7	2.6±1.67	3	4±1.22	5	3±2	3	0.27
	8	1.8±1.3	1	2.12±1.25	2	4±0	4	0.06
	9	3.4±1.67	3	3.56±1.42	4	4.33±0.58	4	0.69
	10	2±0.71	2	3±1.12	3	4.33±1.15	5	0.04*
	11	2.6±0.55	3	2.11±1.27	2	4±1	4	0.09
Social	12	2.6±1.52	3	2.78±1.39	3	2.67±0.58	3	0.98
	13	2.8±1.79	3	3.11±1.17	3	4±1	4	0.49
	14	3.6±1.14	4	2.44±1.59	2	3.67±0.58	4	0.28
	15	3.4±1.52	3	2.44±1.01	3	2.67±1.15	2	0.54
Compensation	16	3±1.22	3	2±1.32	1	2.67±0.58	3	0.3
	17	4±0.71	4	3.22±1.3	4	5±0	5	0.04*
	18	3.8±0.84	4	3.44±1.01	4	4±1.73	5	0.64
	19	2.8±0.45	3	2.44±1.42	2	3±1.73	4	0.66
	20	2±1.41	1	3±1.22	3	5±0	5	0.02*

* $p \leqq 0.05$

3.2. Qualitative Aspects

3.2.1. Anecdotes from Students

The researcher asked three professors if they would allow their classes to be observed, but only one agreed to participate. The students of the Creative Cities and Urban Diplomacy courses were selected as subjects of observation. Despite dozens of copies of anecdotal records, since there were only three international students in these two courses, it was impossible to conclude the learning achievement of all international students from these results.

To maximize the benefits of this method, the researcher chose students from the International Program on Urban Governance (IPUG). Students from IPUG had the highest proportion of questionnaire respondents and an approximately equal distribution of advanced and intermediate groups.

They were asked about their current participation in EMI courses to understand the required courses. Finally, the researcher obtained email consent from the Urban Governance (1) course professor to observe international students' classroom participation on December 20.

During class observation, the researcher observed the interactions between teachers and students in the classroom to understand students' challenges during classroom activities. This information was used to develop questions for follow-up interviews.

3.2.2. Interviews

According to Adams, semi-structured interviews combine open- and closed-ended questions. With semi-structured interviews, questions that cannot be covered in a questionnaire can be answered using extension questions. [32] Semi-structured interviews were hence conducted with three IPUG students: two with a CEFR B2 level and one with a CEFR C1 level. The interview outline consisted of must-answered and individually tailored questions based on the subject's background, learning strategies, learning difficulties, anecdotes, and results from the initial and end-of-term questionnaires. In-depth questions were asked to provide an overview of students' learning. After the interviews, verbatim transcriptions were generated, followed by content analysis. Table 13 specifies the interview coding scheme.

Table 13. Interview coding scheme

Theme		Classification
1. Learning attitude and way of thinking		1. Viewing learning as a combination of input and application.
		2. Dedication to learning
2. EMI course challenges		1. Psychological stress
		2. Accent adaptation
		3. Concentration Maintenance
		4. Reduced learning efficiency
3. Application of strategies	(1) Pre-class	1. Changing the learning environment
		2. Using appropriate learning tools
		3. Reading course materials
	(2) In-class	1. Understanding of the course content completely
		2. Clarifying any uncertainties
	(3) Post-class	1. Reviewing materials
		2. Having discussions with professors
		3. Having fun with friends
	(4) Language barriers	1. Using online resources
		2. Using language learning strategies
		3. Getting to know each other through interaction
		4. Taking opportunities to use the language
		5. Peer learning

Based on Table 13, the researcher compiled the content of three interviews conducted from December 2022 to January 2023. The learning perceptions students held, the learning challenges they might face, and the learning strategies they adopted at various stages of their studies were documented.

1. Learning attitude and way of thinking

1. Viewing learning as a combination of input and application.

In an interview, CC001 stated that courses usually consist of lectures and practices at Adam Mickiewicz University. Having been guided in this way, he expected both elements in his learning. He elaborated:

> There will be like two things. The first will be lecture[s].... And there [will] be like some laboratory part that maybe they will tell you, 'Oh, there will be two projects. First, make maybe some map[s] of the connections of the cities…and stuff like that.' […] It's just like working [on] a computer and [doing] projects.

2. Dedication to learning

MA006 is a scholarship holder and must maintain her academic achievements in line with the scholarship rules; otherwise, she may lose her scholarship due to poor academic performance and suspend her studies next semester due to insufficient funds. She discussed the differences in attitudes towards learning: In Thailand, even with poor academic performance, it was easier to start over, and family and friends were always close by to take care of her. However, upon arrival in Taiwan, she had to be self-reliant; if she failed academically, she would lose more. She further elaborated:

> I feel like I have more to lose if I don't do [well] in school. Like…I keep asking myself, like 'Why did I quit my job and come here?' …. It's the difference between like learning in your home country and [going] to another country [to] do something…. There [are] more thing[s] you lose [in] life.

2. Course Challenges

1. Psychological stress

CD001 felt pressured to take English language courses because his fellow students were fluent in Chinese. However, he had insufficient time to study Chinese and could only express himself in English. This phenomenon is similar to the research by Qiu et al. They found that Chinese international students are generally proficient in English but face difficulties in daily life and academic seminars in countries where English is a foreign language, such as Japan. This is due to their lack of Japanese proficiency despite being able to learn in English-taught courses [33].

2. Accent adaptation

The two respondents from Thailand indicated that adjusting to the accent was the most challenging early in EMI classes, as their unfamiliarity with the accent took them more time to understand what the other person was trying to convey. In the words of CD001:

> The first thing and the only thing [challenges] me is the accent. For example, CC001, his English pronunciation is quite hard for me to understand because he [comes] from the eastern part of Europe, but [we] most Asian people [are] familiar with American accents and British accents.

MA006, whose English level is CEFR C1, also indicated that the different accents among his peers hindered her from having a good relationship with them, as she said:

> I do have my accents as well like other classmates. […] I think only one person in the class is [a] native speaker, [and] the rest of us…we all [come] from different countries.

3. Concentration Maintenance

It has already been suggested that teaching in English leads to less active participation and a lower concentration of students in the classroom [34]. Based on anecdotal records, the researcher asked CD001 if he was often distracted in class. Admitting this was often the case, the interviewee said, 'I will drink coffee when I get distracted in class, sometimes drinking even more, and will reply to my friends who message me during class.'

4. Reduced learning efficiency

MA006 herself reported that she learns more efficiently when she learns in her first language (Thai), but in an EMI class, she must spend more time taking notes and applying study strategies, as shown in the following excerpt.

Of course, it's gonna be different. […] For example, when I take note[s], I just take [them] in Thai. […] I do need to look up after class for the [words] that I don't understand, [but] most of the time I understand all the context already. […] If in English, [I] may say some words that I might not, like, understand clearly. So, I might, like, take more time to do some research on that, but in Thai, …I don't need to do that. […] Everything (the way to study) is quite similar, but in terms of understanding, [it] is [a] big difference.

3. Use of Strategies

(1) Pre-class learning strategies

1. Changing the learning environment

CD001 stated that he would go to an independent study room to focus on preparing for mid-term exams, final exams, and class reports.

2. Using appropriate learning tools

Using tools can improve productivity and efficiency and reduce frustration. CD001 stated that he used digital tools to make presentations: 'This semester, I had to give presentations on the stage quite often. Thanks to Canva and Google Slides for helping me with the slides. Thank you very much. Thank you, Canva.'

3. Reading course materials

Because master's degree courses require students to gain background knowledge before classes, and the classes provide many opportunities for discussion and practice, two respondents (CC001 and MA006) habitually pre-studied for their classes. MA006 added: 'I read the textbook and articles intensively so that I can keep up with my peers and participate in the discussions in class.'

(2) In-class learning strategies

1. Understanding of the course content completely

The researcher found that the European interviewee CC001 was less likely to take notes and highlight key points in class than his Asian peers. The interviewee corroborated these findings and stated that this approach helped him gain an overview of the course content:

Because Prof. Tam provides […] the PPT[,] you can just renew your knowledge. OK, so I'm doing it because I just want to focus on understanding the whole stuff, not [memorizing]. …. If you take [notes]…maybe […] you don't understand the topic, but you still write it down. [So], when you are at the dorm [or] your home, how [do] you manage to understand it?

2. Clarifying any uncertainties

MA006 said she would ask her classmates and professors if unclarity arose. She specifically mentioned that asking questions would benefit the entire class. Her professor encouraged students to ask questions in class because it was likely that her classmates did not know the answers, either.

(3) Post-class learning strategies

1. Reviewing materials

All three respondents had the habit of reviewing after school. MA006 expressly referred to two strategies she used after class: (1) referring to the course materials and (2) compiling notes, as she describes, 'I will look at the presentation and other class notes. Yes, I review them and integrate them into my notes.'

2. Having discussions with professors

CC001, a European interviewee, said he enjoyed discussing his learning with his professor. He found these discussions easy and appreciated two-way interaction in which teaching and learning worked in tandem. He stated the following:

> I really enjoy that. […] So, …basically exchange your knowledge, as we may have that. Even [from time to time], I still [get] to hear that she even says…she (Prof. Tam) learns something from me. And, of course, I learned many things from other professors. [It's] like confirmation that you understand what they are talking about [and] what the subject is about, right?

3. Having fun with friends

Sherry et al. discovered that international students frequently experience isolation in a literature review [35]. Thus, the presence of supportive social networks can facilitate their adjustment to new environments and contribute to their success after relocation. For instance, CD001 sought company from peers by socializing with friends:

> Especially the methodology class that I have to spend many hours [finishing] my research project. So, I spend my time [on] every weekend to frame my research idea. But…when I'm [bored], I will go to Taipei to hang out with my Thai and Taiwanese friends. I just want to make myself [more] sociable. [Being] sociable is so important.

(4) Strategies for overcoming language barriers

The researcher interviewed three students of non-native English speakers (NNES) to understand how they adapted to a classroom and interactive environment in which English was the common language.

1. Using online resources

All three respondents used online materials meaningfully. Unable to understand some of the professors' explanations, CD001 watched clips online to clarify the concepts:

> [In] some parts that I [learn] about urban governance […], I don't understand because…some professor[s] use technical terms or buzzwords…. [After] class, I spend […] 20 minutes…search[ing] on YouTube to see [clips]…from BBC or National Geographic.

MA006 used the Internet to watch English movies and listen to English songs, and when she encountered something she does not understand, she searched online for answers. CC001 used Google Translate to switch back to his native language when encountering a language barrier. He admitted, 'This takes a little longer, but in the end, I still get my work done.'

2. Using language learning strategies

CC001 said, 'I sometimes ask the other person to repeat what they said because I didn't understand it. I mean, I know the word, but I don't understand the different pronunciations.' This corresponds with the social strategy 'Asking questions – Asking for clarification or verification.' Besides CC001, the researcher observed that all three interviewees used this technique to recheck their questions. CC001 also used the compensatory strategy of 'Overcoming limitations in speaking and writing – Using a circumlocution or synonym' and slowed down the speech to avoid comprehension difficulties for the listener.

3. Getting to know each other and learning through interaction

Whether it is a problem with accent or peers, it is necessary to become acquainted with each other's way of speaking and characteristics by spending time with people so that there is less friction in the learning interaction, as mentioned in CD001:

> When I have dinner with [CC001], I mean, when I get closer to him, I'm familiar with his pronunciation. I think it's [a] good way to adapt and to open [your] mind about your language [proficiency] because we have to learn various accents, right?

From a social perspective, MA006 proves that interaction can breed familiarity with others:

You just need to […] get a lot of exposure. […] If I talk to my friend[s] a lot more, I will try…to…more…actually understand like their meaning[s] behind the words. So, I think it's about like taking more time to spend with them or to spend in that situation until we get comfortable, and that's why we can overcome the [difficulties].

4. Taking opportunities to use the language

To enhance his ability in oral English expression, in addition to classroom presentations, CD001 had been actively involved with activities run by the Office of International Affairs on campus to practice his spoken English, improve his expression skills, and regain his confidence:

[When] I [lose] my confidence to speak in English, I […] get some opportunit[ies] [to] speak in English. […] Last month, [at the Office of International Affairs], [they're] hiring some student[s] to speak with Ukrainian student[s] and to share overseas student experience[s] with traveling student[s]. […] I know sometime[s] I speak [with] wrong grammar, but I try to speak, and now I think I'm OK with my English pronunciation because most of my Taiwanese friend[s]…understand me. But I need to improve some of my pronunciation.

5. Peer Learning

Boud et al. identified benefits of peer learning, including opportunities for students to practice planning and teamwork, reflect on and explore ideas, engage in elaboration and mutual evaluation, and take collective responsibility to identify and address their learning needs. These skills allow students to integrate into a complex society [36]. CD001 utilized peer learning to develop his ideas during the first semester of his master's program when teachers and administrators were not always available to help.

Last semester, I was [a] freshman [at] NTPU. […] When [the] professor assigned me to read some textbook[s], it's quite hard for me because I [didn't] have any [vocabulary] or some idea[s] related to that class […] so I try to learn from them. I think…the first thing that is easy for us is: You have to learn from your classmate[s]. [….] You can know some, uh, some simple idea[s] from your classmate[s], and then you can develop your idea[s] from your classmate[s]. …. When I try to accumulate or collect some idea[s] from my classmate[s], I can develop my idea[s]. Then I can debate…learning from classmates better.

Table 14 summarizes the strategies to overcome language barrier at each phase of learning.

Table 14. Strategies used by international students to overcome language barriers at all stages of a course

Memory	Pre-class	● Changing the learning environment to focus on lesson preparation
		● Reading course materials and articles
	In-class	● Having a complete understanding of the course content and developing a framework
	Post-class	● Reviewing class materials
	Overcoming language barriers	
Cognitive	Pre-class	● Reading before classes to contextualize the subject and lay the foundations for in-class discussion
	In-class	
	Post-class	● Reviewing class materials and combining them with one's summary
		● Discussing the course content with a professor to reinforce memory
	Overcoming language barriers	● Using online search engines to clarify questions

		• Familiarizing with the accents of students from other countries through social interaction
		• Taking opportunities to speak English outside of the classroom
Compensation	Pre-class	• Using tools, such as apps, to address areas of insufficient language proficiency
	In-class	
	Post-class	
	Overcoming language barriers	• Using Google Translate to switch between one's first language and English
		• Developing strategies for understanding others' speech through social interaction
Metacognitive	Pre-class	
	In-class	• Understanding the course content completely and seeking to understand the context
	Post-class	
	Overcoming language barriers	• Looking for opportunities to use English outside of the classroom
Affective	Pre-class	
	In-class	
	Post-class	• Having fun with friends to relieve stress
	Overcoming language barriers	• Watching English movies and listening to English songs to relieve stress
		• Having successful experiences in using English outside the classroom to boost confidence
Social	Pre-class	
	In-class	• Ask questions in class to clarify uncertainties
	Post-class	• Discussing the content with the professor, confirming what has been learned, and exchanging information
		• Having fun with friends in order to become closer and understand one another better
	Overcoming language barriers	• Understanding other's ideas through interaction also increases cross-cultural knowledge
		• Making effective use of peer learning to study and discuss within the group

3.3. Discussion

This study arrives at two main findings: (1) a student's CEFR level in English is closely related to the learning challenges they face and the strategies they employ, and (2) students of different nationalities tend to use different learning strategies. The following issues are drawn accordingly.

3.3.1 What learning strategies do international students of different nationalities tend to use in EMI classes?

Due to the limited sample size, the researcher was unable to make a comprehensive generalization about which strategies learners from different countries tend to use. Table 15 shows the learning strategies used by the students from Northeast Asia, Southeast Asia, and Europe.

Table 15. The learning strategies used by students from the three regions

Northeast Asians	• Dividing the course into smaller units of study • Focusing on using conversations with peers to study English • Using self-repetition to have more time to think in English • Using language learning strategies more often than Southeast Asian peers
Southeast Asians	• Focusing on course content summaries more often • Dividing the course into smaller units of study • Focusing on using conversations with peers to study English • Using self-repetition to have more time to think in English
Europeans	• Getting used to absorbing and processing information directly in English • Listening to media or watching clips to strengthen English listening and improve understanding of the course • Organizing the course content independently and using it to familiarize oneself with the course content direction • Frequently using language learning strategies to help course learning

The results suggest that Northeast Asian students, who may have weaker English proficiency, often employ various strategies to understand and keep pace with the course. Southeast Asian students generally have higher English proficiency and frequently summarize course content, but their learning strategies are similar to those of Northeast Asian students. European students with higher English proficiency and exposure to EU (European Union)-promoted Information Communication Technology (ICT) in education [37] are likelier to use technology and language-learning strategies. According to the questionnaire and interview data, European students focus less on details and confusing concepts and instead grasp the overall picture of the content, consistent with the 'global' learning style described by Felder & Silverman [38].

Asian and European students routinely read before class. In addition, Asian students were highly aware of areas where their English proficiency was insufficient, even Southeast Asian students with higher average English proficiency. Southeast Asian students also desire to establish good relationships with fellow students.

3.3.2 What are the learning challenges international students potentially face in EMI courses?

This study explored the learning challenges faced by international students in EMI environments using quantitative and qualitative approaches.

First, the statistical results of the initial questionnaire show that all students face issues with 'understanding the course content and expertise' and 'studying to meet the expectations of the professor.' Further analysis of students from the three regions showed that Northeast Asian students had the most difficulty interpreting the text themes (p=0.09) and expressing their opinions in English (p=0.13). Although the data did not show a significant difference, the mean and median data indicated that Northeast Asian students were more often faced with learning challenges. Additionally, this study compared university and master's students and found no positive correlation between the degree of learning challenges and year of study. This result contradicts the findings of Pun & Jin that 'first-year undergraduates reported considerably greater challenges...than non-

freshmen' [27]. No statistical significance was found in the results, whether the students were split into two groups or analyzed by grade level.

After calculating the average scores of students from the three regions, Southeast Asian students were found to have scored the lowest, probably because they were more eager and prepared to study abroad, which confirmed that most Southeast Asian students could participate in EMI courses (Code 1-2 in the content analysis). Although European students had high proficiency in English, the interview results suggest that their motivation to learn may be lower. Students from Northeast Asia were likelier to encounter learning challenges in English-speaking environments owing to their relatively low English proficiency levels.

Psychological stress is also a factor in learning challenges. In addition to the curriculum of EMI courses, students achieved other goals for themselves, resulting in enormous pressure and an impact on their mood. For example, CD001 responded, 'I can only express myself in English, and I cannot speak Chinese fluently' (Code 2-1). In the interview, he stated, 'The first thing I want to say is that I want to learn Chinese (Mandarin).' In addition, in the interviews, two Southeast Asian students reported that they could only comprehend English speakers with American or British accents. They had to adapt to communicate with students from different regions because ELF contexts are not considered in English listening practice. In addition, students found it challenging to stay focused in EMI classes, needing more time to study and review.

3.3.3 Are the learning challenges worse for international students whose English language proficiency is below CEFR B2?

The initial questionnaire revealed that B1 students scored significantly higher than the more proficient B2 or C1 students on questions measuring their ability to express themselves and study to meet professorial expectations. Some questions, such as comprehending terms and answering English questions correctly, were also relatively high for B1 students. Although insignificant, B1 students faced more learning challenges in EMI courses than their more proficient peers. Students at the C1 level scored higher on some questions, such as comprehension of terms, explanation of topics after reading a text, and alignment with professorial expectations. Good language learners possess metacognitive skills and practice communication, but they may also increase their self-imposed requirements, leading to learning challenges [39]. Students at the B1 level face challenges in EMI courses due to their low English proficiency and lack of comprehension. They were less likely to read outside their assigned English reading and were more likely to ask for slowdown or repetition to understand conversations, while students at the C1 level used questioning strategies to clarify uncertainties. Teachers should consider providing appropriate learning support and strategies.

4. CONCLUSION

The study found that international students in EMI classes adopt different learning strategies based on nationality. Asian students rely on peer resources to improve their understanding, while European students use digital resources and deliberation skills to understand the approach of the course content indirectly. International students in EMI programs must overcome learning challenges inside and outside the classroom. Inside the classroom, students may struggle with participation and content comprehension, whereas outside the classroom, they experience psychological stress, accent adjustment, focus maintenance, and increased study time. English proficiency below the CEFR B2 level poses greater learning challenges, while learners at all levels of English proficiency face several types of learning challenges, and individual challenges vary. Based on these findings, the researcher makes the following recommendations for educational institutions and teachers.

1. To facilitate student participation, teachers should assess students' English proficiency levels and design courses with inclusive education. Inclusive education includes setting out the course content, requirements, and support measures in the syllabus, putting in the effort to establish good teacher-student relationships, promoting cooperation, diversifying course activities (e.g., individual activities, one-to-one interactions, and group interactions), giving opportunities for expression and directly expressing thoughts, using plain English to teach and encourage discussions, encouraging collaborative learning in groups, and providing learning support after class [40]–[43]. The 'Universal Design for Learning Guidelines' can also be referred to for informing the overall curriculum design, to design a course with three main aspects and nine

subsections which give students equal opportunities to succeed in a safe and inclusive learning environment, rather than being frustrated [44]. The diversity of students' backgrounds also allows for sharing learning experiences and strategies.

2. At the beginning of a semester, teachers can administer the Index of Learning Style (ILS) [45] to students to understand the learning styles of international students. During the semester, teaching styles can be adjusted and individualized, and various teaching materials should be provided to suit different students' needs. Students' learning styles can also be used as a reference for grouping students.

3. Academic institutions should use questionnaires and interviews to understand international students' academic and living conditions regularly. If students encounter difficulties, the Office of International Affairs, relevant departmental staff, mentor, or schoolmate should provide further assistance.

4. Academic institutions should carefully consider when admitting international students whose English proficiency is at the B1 level or below. Institutions should also provide intensive English language courses for students to reach the B2 level and keep up with their EMI courses.

5. For developing students' information literacy, classes on ChatGPT and summarizing and paraphrasing software can be offered in addition to enhancing their English language proficiency. Chatbots can provide detailed explanations and timely responses to questions, saving students time and boosting their performance [46]. While institutions should encourage using information tools with caution because of the possibility of biases and incorrect information, the tools serve as brilliant aid for students and strengthen their critical thinking and academic ethics [47], [48].

Meanwhile, future research could compare international students in different types of EMI courses (e.g., teacher-centered courses versus problem-based learning (PBL) courses) or to study interactions between Taiwanese and international students in and outside of the classroom in EMI courses.

In addition, the key finding of this study is that having English proficiency in CEFR B2 is crucial in determining whether students can adapt to EMI courses. Future researchers could conduct other studies on English language teaching based on these findings.

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