Success of EMI in Higher Education and Its Key Components: A Meta-Analytic Structural Equation Modelling Approach

Abstract

The increasing global demand for English Medium Instruction (EMI) in higher education (HE) highlights the need for empirical research to contribute to its success and suggest ways of mitigating the diverse challenges faced by students and institutions. Identifying the key factors that contribute to successful EMI is critical for improving both content and language learning outcomes for students. In the wake of the recent surge in EMI research, more research synthesis is needed to understand how these factors interact to influence EMI success rather than focusing solely on their isolated, bivariate relationships. To address this gap, we conducted meta-analytic structural equation modelling (MASEM) to examine the structural relationships among the key factors affecting the success of EMI. Synthesising data from 50 studies (N = 15,032), our analysis demonstrates that learners' engagement and English proficiency are pivotal for both content and language learning, with English proficiency being more important for language learning outcomes, although itself considerably also influenced by learners' anxiety and motivation. Additionally, the moderator analysis shows that learner engagement plays a more significant role in partial EMI contexts, leading to our recommendation for differentiated institutional support in full and partial EMI settings. However, owing to the limited availability of correlation coefficients, some key factors and moderators were excluded, prompting the need for further empirical research to explore these relationships in greater depth.

Keywords: English Medium Instruction, Meta-Analytic Structural Equation Modelling, Higher Education, Content Leaning, Language Learning

1. Background

English Medium Instruction (EMI) in Higher Education (HE) is now a well-established form of educational setting, with a major spurt in its global growth, particularly in the last ten years (e.g., Bowles & Murphy, 2020; Costa & Coleman, 2013; Rose et al., 2021; Wächter & Maiworm, 2014). This increase is driven by the internationalisation of education and the continual spread of English as a global lingua franca. Thus, EMI is broadly regarded by policymakers and, more specifically, by university managers as the most effective strategy for HE institutions to achieve prestige. This approach is closely linked to neoliberal principles of university governance (Wingrove et al., 2024). However, the resulting policies have frequently come under scrutiny for EMI's potentially negative impact on the countries in question (De Costa et al., 2021; Mortensen, 2014). As many definitions of EMI (discussed further below) stipulate that the country or jurisdiction under study must be one where English is not the majority first language (L1), the negative impact is often seen as particularly detrimental to the L1 and its associated local cultures (Ali, 2013; Kirkpatrick, 2011). The challenges faced by both university teachers and their students, when academic subjects are taught in English rather than in L1, have been well documented. Teachers have reported having to change their teaching style (Roothooft, 2019), described their inability to integrate language and content (Yuan, 2020), and claimed that students' understanding of content is likely to diminish unless some L1 is used by the teacher (Kim, 2011).

In response to the challenges and critiques of EMI, related research has turned its attention to whether teaching content subjects through English to non-L1 speakers provides evidence of success. How success can be measured is not straightforward. Some commentators (e.g., Macaro, 2018; Rose et al., 2021) have argued that outcomes should, at a minimum, show no negative impact on content learning, even if achieving the same level of understanding takes

longer than learning in an L1 medium of instruction (L1MOI). Another benchmark of success is whether the predicted considerable increase in the acquisition of English is a reality (Lei & Hu, 2014), especially when compared to the more traditional learning of English as a foreign language (EFL). Another possible indicator of EMI success is whether it provides graduates with better employment opportunities nationally and internationally. However, this research question has not been sufficiently investigated to provide even a partial answer.

One of the difficulties in providing confident answers to questions related to EMI success is that universities offer different models of EMI. A typical distinction is between 'full EMI' (all aspects of a particular subject or discipline are taught in English) and 'partial EMI' (some lessons are offered in English, and others in the L1 of the majority of the students). This distinction is further complicated by the partial use of the L1 during full EMI lessons and lectures. A second possible distinction is the relative proximity of the home language of most students to English (considering that a considerable number of international students may also be present in the class). Third is the level and type of English language support offered to students, either before embarking on an EMI course or concurrently. This last variable has not been sufficiently investigated to provide an overview of the success.

Several systematic reviews (e.g., Feng et al., 2023; Macaro et al., 2018) have assessed the EMI success in terms of content learning, English proficiency improvement, or both. These reviews have inevitably incorporated several underlying variables or factors. This meta-analysis aimed to identify which of these variables has the greatest influence on content and English learning success and to understand the mechanisms through which they exert this impact.

2. Literature Review

2.1 Theoretical Foundations of EMI in HE

EMI is defined as the "use of the English language to teach academic subjects (other than English itself) in countries or jurisdictions where the first language (L1) of the majority of the population is not English" (Macaro, 2018, p. 19). While this definition of EMI focuses purely on the use of English to teach content, many HE policies are based on an underlying assumption that EMI positively impacts students' English language development. To capture this secondary goal, McKinley (2025, p. 1) offers the following definition:

> EMI is the teaching of academic content through English in settings where other languages have traditionally been used as mediums of instruction with an intention, stated or unstated, of developing learner's skills for using English for specific academic purposes.

This definition also distinguishes EMI as an intentional policy decision to switch the medium of instruction from local L1. This demarcates EMI as a specific phenomenon different from contexts in which students learn in a second language (L2), where no policy decision has been made, such as international students learning English in Anglophone settings (Rose et al., 2023).

EMI has various forms, depending on the policies in place. Recognising that variation is intrinsic to the distinctive nature of EMI, one dimension of variability is the role and prominence of the local language in the overall course structure. Some models such as the preparatory year model or pre-selection model represent 'full EMI' programmes, which teach entirely in English (Macaro, 2018). They relegate language development needs to preparatory language courses or language proficiency tests conducted prior to entry into EMI programs. In contrast, multilingual and bilingual models represent 'partial EMI' programs (Macaro, 2018). These partial programs allow students to use their L1 as part of a system that fosters structured multilingual engagement within the classroom or represents program structures in which EMI courses are integrated into bilingual programs that also include courses taught in the L1 (Rose et al., 2021).

Considerable EMI research has aimed to ensure that students are not disadvantaged in achieving educational outcomes by studying within new educational frameworks that teach the subject matter through the English medium. However, despite the top-down planning that occurs as part of the introduction of EMI into higher education systems, a growing body of research indicates that students face considerable barriers to succeeding in English-medium environments. These include, but are not limited to, a lack of requisite technical vocabulary, difficulties comprehending lectures, low levels of academic literacy to complete academic tasks in English, and difficulties meeting institutional and disciplinary demands in English (see Evans & Morrison, 2011).

2.2 Operationalizing Success in EMI

Success in EMI research has often been operationalised by measurements of subject learning, such as via program GPA or final exam scores on English taught courses, or measurements of English language development, using general language proficiency tests or vocabulary tests. These two areas of success map on to definitional points of focus in EMI policy, which assume language development will take place as students acquire subject knowledge through the medium of English.

In terms of EMI success in English language learning, a preponderance of studies have operationalised language outcomes by measuring gains in general proficiency test scores. One example is a study of business and engineering students in EMI programs at Turkish universities (Yuksel, Soruç, Altay, et al., 2023), which demonstrated substantial improvement in English proficiency measured according to the Cambridge Preliminary English Test (B1 level). In contrast, Lei and Hu (2014) used the College English Test (Band 6), and found no significant English proficiency development over a 1-2 year period among EMI business undergraduates in China. Other studies have utilised institutional measures of proficiency to explore significant

language gains (e.g., the General English proficiency test used in Soruç et al., 2021). Overall, the effect of EMI on language development remains unclear. As Hadingham (2024) argues, “While more outcome studies have appeared over the last few years, the fragmentary, often inconsistent evidence produced still makes it difficult to reach conclusions as to the linguistic outcomes of EMI study” (p. 581). Thus, a synthesis of this evidence is overdue to explore trends in effects of EMI on language outcomes across independent studies.

In terms of EMI success in content learning, studies have often employed single measures of subject acquisition (Aizawa, 2023), such as content knowledge test scores used in EMI courses (e.g., Rose et al., 2020), researcher-designed tests of content knowledge (e.g., Aizawa et al., 2024), or aggregate GPA scores (e.g Soruç et al., 2022). Of the studies which have measured content learning in EMI, many have indicated that students are acquiring subject knowledge successfully, but this success may be related to a myriad of other factors, which are discussed in the following section. Thus, in our synthesis, while success in EMI is operationalised via performance on course based measures, it is considered alongside several other predictors that have been shown to feed into this performance.

2.3 Predictors of Success in EMI

Numerous studies on academic success in EMI have explored linguistic and non-linguistic predictors of success (e.g., Soruç et al., 2022). Among these predictors, general English proficiency has emerged as a commonly explored variable and is often measured using standardised proficiency tests. Schoepp (2018) and Rose et al. (2020) have found that proficiency scores are significant predictors of academic success in terms of GPA and test scores. Curle et al. (2024) indicate that proficiency is extremely predictive of success in the Turkish context, whereas Xie and Curle’s (2022) research in China yielded contrasting results.

Several studies have shown that prior knowledge of the subject area, even when controlled for, is highly predictive of EMI success (Aizawa et al., 2024; Satayev et al., 2024). Chung and Lo (2023) and Altay et al. (2022) highlight the need to incorporate a variable that captures students' prior knowledge in the subject area because of its predictive nature for success in EMI.

Other studies have highlighted the predictive nature of psychological variables as measures of EMI success. This includes constructs such as self-efficacy (Soruç et al., 2022; Thompson et al., 2022), various sub-constructs of motivation (Masrai et al., 2022; Rose et al., 2020), and anxiety (Soruç et al., 2022; Yuksel, Soruç, Horzum, et al., 2023), all of which are predictive to a small degree.

Finally, some studies have explored the structural elements within various EMI models to support EMI success. For example, in a partial EMI program researched by Thompson et al. (2022), concurrent models of EAP support were provided, which were shown to strongly mediate success in EMI courses. Because of language classes in partial EMI courses alongside L1, both of which have been shown to support content learning, the context of EMI (partial versus full) remains an important factor to consider when interpreting the results related to success.

2.4 Relationships Among Key Factors in EMI Success in HE

Building on previous empirical efforts to identify the key factors contributing to the EMI success in HE, it is essential to understand how these factors interact and jointly influence EMI outcomes to reveal the mechanisms behind EMI success, allowing for more effective interventions that target a specific audience, type, and timing of necessary support. However, current literature provides limited information on this issue, leaving a notable gap in our understanding.

A review of existing systematic reviews in the field (e.g., Dang et al., 2023; Feng et al., 2023; Macaro et al., 2018) reveals that studies exploring the structural relationships among key variables within EMI contexts in HE remain limited. This scarcity indicates a notable research gap, suggesting the need for a meta-analysis that not only identifies relevant factors but also examine how these factors interact to influence student outcomes. Addressing this gap, our study aims to build a more comprehensive model of the determinants of academic success in EMI settings. Given that the aforementioned studies help illuminate these relevant factors, we review them below.

In an early review of the topic, Macaro et al. (2018) highlighted various individual difference variables, such as learners' English proficiency and beliefs about EMI programs, which may affect academic achievement. However, the authors emphasised the need for further research on these variables. More recently, Feng et al. (2023) identified the determinants of students' academic success in EMI programs by reviewing studies that examined the correlation between individual difference-related factors and academic achievement. Their review identified general English proficiency, perceived self-efficacy, self-concept, vocabulary knowledge, and academic motivation as the key determinants, with general English proficiency playing a central role. Finally, Dang et al.'s (2023) systematic review focused on studies of professional learning for EMI teaching practitioners in higher education. Although the review centered on educators rather than students, its findings highlight that the roles and language proficiency of teaching practitioners may influence student engagement and achievements in complex ways, warranting greater attention in the field. Taken together, these reviews suggest that some key factors are potential predictors of academic achievement in EMI; however, they also highlight the need for further exploration of the structural relationships between these factors and EMI success.

The study by Soruç et al. (2022) is the only empirical work to date that investigates the structural relationships between key factors in EMI contexts. Using structural equation modelling (SEM) in a Turkish HE setting, this study examined the relationships between EMI students' intrinsic motivation, instrumentality, self-regulation, self-efficacy, English proficiency, and academic success. The model revealed that intrinsic motivation positively and instrumentality negatively predicted English proficiency, which in turn predicted academic success. In addition, self-regulation and self-efficacy positively influenced academic success. Studies such as Soruç et al., which use SEM to uncover how key factors interact, are limited but valuable in advancing our understanding of how these factors interact to promote EMI success.

2.5 The Current Study

To address these gaps in the literature, this study aimed to investigate the key factors contributing to EMI success and their interrelationships using a meta-analytic structural equation modelling (MASEM) approach. The MASEM combines two robust statistical techniques: a meta-analysis (MA) and structural equation modelling (SEM). The meta-analysis synthesises quantitative findings from multiple studies to provide a broader view of trends, whereas SEM explores how variables are structurally related. By employing MASEM, we can leverage these strengths to synthesise correlation data from previous studies and build a comprehensive SEM model that reveals how key factors interact and influence EMI success. Given the scarcity of SEM-based research on EMI and the emergence of studies focusing on correlations between key factors and outcomes, MASEM is particularly useful for addressing the following research questions that guided this study:

RQ1: What are the key factors contributing to EMI success?

1.1 What are the key factors contributing to successful content learning?

1.2 What are the key factors contributing to successful English learning?

RQ2: How are the identified key factors interrelated and what structures do they form in contributing to EMI success?

RQ3: To what extent do moderator variables influence the structural relationships between key factors and EMI success?

MASEM allowed us to develop a comprehensive structural model based on the accumulated evidence, offering a more nuanced understanding of the mechanisms driving EMI success. To proceed with this approach, we first selected several key variables to guide our analysis while remaining open to including others. Based on the theoretical framework and previous literature, we identified ten potential variables: engagement, English proficiency, EMI context (full vs. partial EMI), language anxiety, language motivation, institutional support, L1-English proximity (i.e., the relative linguistic distance between students' first language and English—the target language, cf. Beaufils & Tomin's stochastic approach to worldwide language classification, 2020), prior content knowledge, self-efficacy, and self-regulation. Using these variables, along with the dependent measures for EMI success in both content and language learning, we developed and proposed an SEM model, shown in Figure 1. We hypothesised that seven of these variables—self-efficacy, self-regulation, language anxiety, language motivation, prior content knowledge, engagement, and English proficiency—collectively contribute to EMI success, whereas three moderator variables (L1-English proximity, EMI context, and institutional support) may influence the strength of these relationships.

(Figure 1 near here)

The rationale for proposing these relationships among the seven key variables is briefly described below.

(1) Self-efficacy: Self-efficacy significantly influences learner engagement in EMI. According to Bandura's (1986) Social Cognitive Theory, students with high self-efficacy view EMI challenges as manageable, fostering a positive engagement that predicts success in both content and English learning. Research supports the idea that learners with greater self-efficacy perform better academically and have more favourable perceptions of EMI (Hsieh & Kang, 2010; Thompson et al., 2022).

(2) Self-regulation: Self-regulation, or the ability to manage one's learning, correlates with self-efficacy and affects learners' engagement in EMI. Zimmerman (2002) explains that self-regulated learners set clear goals and adopt strategies to enhance their engagement in EMI. Increased self-regulation leads to more active engagement, which in turn predicts success in content and English learning (Dörnyei & Ryan, 2015; Yuksel, Soruç, Horzum, et al., 2023).

(3) Engagement: Positive engagement in EMI is expected to predict student achievement in both content and English learning. Self-efficacy and self-regulation contribute to shaping this construct, which in turn influences academic success (Kpolovie et al., 2014; Mao et al., 2021).

(4) Language anxiety: Language anxiety, a construct extensively studied in L2 research, is negatively correlated with language proficiency. High levels of language anxiety hinder language acquisition and predict lower proficiency (e.g., Amini Farsani & Seyedshoja, 2024; Dewaele & Li, 2022; Li et al., 2020), thereby affecting EMI success.

(5) Language motivation: Language motivation is negatively correlated with language anxiety and is considered a predictor of success in EMI (e.g., Xie & Curle, 2022; Zhou et al., 2023). Motivated learners tend to persist in their studies, enhancing both their language skills and overall academic achievement in EMI programs (Dörnyei, 1994; Dunn & Iwaniec, 2022; Gardner, 1985).

(6) English proficiency: According to Cummins' (1979, 2000) developmental interdependence and threshold hypotheses, English proficiency is essential for EMI success. Learners must achieve a certain threshold level of proficiency to benefit fully from EMI programs–a notion explored in EMI research (Aizawa et al., 2023). English proficiency not only predicts EMI success in content learning but is also positively correlated with students' engagement and motivation (e.g., Al-Amri & Awaji, 2023; O'Dwyer et al., 2018; Yuksel, Soruç, Horzum, et al., 2023).

(7) Prior content knowledge: Prior content knowledge is crucial for success in EMI as it enables learners to connect new information to existing knowledge, thereby improving comprehension in their L2 (García & Wei, 2014). This knowledge directly predicts success in content learning, allowing students to grasp complex materials while developing their English proficiency (Coyle et al., 2010).

3. Method

This section summarises the methodological procedures of the MASEM approach used to address the research questions. First, a literature search was conducted based on the inclusion criteria. Second, we created a dataset by examining each study's data structure, coding the correlation coefficients of the key variables, and identifying potential moderators. Once the dataset was prepared, we followed a three-phase analytical plan. We then synthesised the correlation coefficients into a pooled correlation matrix, weighting each study by the sample size. Using this matrix, we constructed a baseline SEM without moderators. Next, we added moderators to determine whether they affected the path coefficients. Detailed descriptions of each MASEM step are as follows: The current study adhered to the principles of transparent reporting, following contemporary standards that recommend a clear distinction between methods and findings to ensure clarity and replicability (e.g., The Preferred Reporting Items for

Systematic reviews and Meta-Analyses (PRISMA) statement 2020 suggested by Page et al., 2021).

3.1 Literature Search

3.1.1 Reference Search

We drew on three procedures to identifying relevant studies: First, we reviewed the reference lists of a previous systematic review on the topic (Macaro et al., 2018) to collate empirical studies already identified by other researchers. This historical review was one of the most comprehensive reviews of its time, and included research published until 2016. We also consulted another systematic review (Feng et al., 2023) to add additional studies. Systematic reviews commonly mark included studies with asterisks at the beginning of the citations in the reference list, or include them an appendix listing the included studies. Second, we drew on a list of EMI studies compiled by the EMI Oxford Research Group, which applied the same criteria as Macaro et al.'s (2018) review, with an updated time frame inclusive of January 2016 to July 2023. Third, we conducted a forward citation search to identify studies published after 18 July 2023 up to 31 July 2024. We then narrowed down all identified studies to those that met our inclusion criteria.

3.1.2 Database and Journal Search

The search criteria used across the first two stages were compiled through a systematic search of the following databases:

1. The Web of Science (Inc. Conference Proceedings Citation Index – Social Science and Humanities (CPCI-SSH) (1990–present)
2. Book Citation Index – Social Sciences and Humanities (BKCI-SSH) (2005–present).
3. British Education Index (BEI)
4. Modern Language Association (MLA)

5. Education Resources Information Center (ERIC), for linguistics
6. Language and Linguistics Behavior Abstracts (LLBA)
7. ProQuest Dissertations and Theses
8. SCOPUS
9. PsycINFO

An example of the Boolean search string was:

(TITLE-ABS-KEY ('English Medium of Instruction' OR 'EMI' OR 'Content and Language Integrated Learning' OR 'CLIL') AND TITLE-ABS-KEY ('Tertiary Education' OR 'Tertiary' OR 'Higher Education' OR 'universit*' OR 'Graduate' OR 'Undergraduate' OR 'college' OR 'Master*' OR 'Postgraduate') AND NOT TITLE-ABS-KEY ('French Immersion'))

Further examples of search strings can be found in the Macaro et al.'s (2018) supplementary materials appended to the online publication.

In Macaro et al. (2018), the search identified 612 relevant sources published up until 2016. The updated search by the EMI Oxford Research Group identified 3,677 studies published between January 2016 and 18 July 2023. Duplicates were identified and removed via Endnote. In both rounds of screening, abstracts were exported to the Rayyan online platform and manually reviewed by two reviewers for inclusion according to the following criteria:

1. Research that reports on empirical data
2. Research in contexts in which the instructional language is (purported to be) English [including bilingual education programs]
3. Research in an instructional setting where the majority of the population's L1 is not English
4. Research where the population is studying at the tertiary level

5. Empirical studies published in book chapters (but not duplicates with journal articles)

6. Unpublished doctoral theses and Centre or Government Reports

7. Research designated/entitled/described as CLIL or immersion (but adhering to criterion 3).

During this review process, studies were categorised based on their focus, such as examining EMI content outcomes and exploring EMI language outcomes. These tagged studies were then added to the pool of studies for potential inclusion in the MASEM using our specific inclusion criteria for this meta-analysis.

3.1.3 Inclusion Criteria for the MASEM

In our search for empirical studies to collect data for MASEM, we established four inclusion criteria that we applied to all the identified papers. Studies must (1) be written in English, (2) focus on EMI contexts in HE, (3) must aim to explore success in EMI, either in content learning, English learning, or both, and (4) explore correlational relationships among EMI-related factors, among which engagement, English proficiency, language anxiety, language motivation, prior content knowledge, self-efficacy, and self-regulation.

3.1.4 Contacting Authors

When studies did not report correlation coefficients for the variables of interest, we contacted the corresponding authors to request permission to share the coefficients or to provide anonymised data for computation. If the corresponding author did not respond, reminder emails were sent to their co-authors. A maximum of three emails were sent at two-week intervals.

3.2 Dataset Construction

3.2.1 Quality Assessment

Once the list of studies for the meta-analysis was finalized, we assessed their quality to ensure they were methodologically sound and adequately reported. This evaluation was crucial

for guaranteeing the credibility and accuracy of the findings derived from synthesizing these studies. To this end, we appraised three aspects of the studies, such as theoretical framework, data collection method, and data analysis method, following Abdi Tabari et al.'s (2025) example. Due to space limitation, details of criteria for the quality assessment of the studies are included in Appendix 1.

3.2.2 Analysing Data Structures

After checking the qualities of the included studies, we analysed the data structure of each study, anticipating three possible scenarios: (1) a study includes a single sample (e.g., data from one group of participants), (2) a study includes multiple independent samples with correlation coefficients for each (e.g., data from two independent groups, such as different grades or classes), or (3) a study uses the same dataset as other studies within the same research project (e.g., multiple studies using the same dataset). In the second scenario, each sample was treated as an independent study. In the third case, we treated the dataset as a single sample, regardless of how many times it appeared in different publications.

3.2.3 Coding Correlation Coefficients and Moderator Variables

After reviewing all the identified studies, we created a comprehensive correlation matrix that captured all possible correlation coefficients among all the identified factors related to EMI success. This matrix served as a template in an Excel worksheet, in which we recorded each study's correlation coefficients. Each study had a worksheet, resulting in as many worksheets as included studies. While recording the correlation coefficients, we also identified quantifiable differences across studies that could have affected the relationships among EMI-related factors. Potential moderator variables were documented along with the correlation coefficients for each study in their respective worksheets.

Once the coding phase was complete, we finalised the list of variables before proceeding to the data analysis. We selected ten key factors, namely engagement, English proficiency, EMI context, language anxiety, language motivation, level of institutional support, L1-English proximity, prior content knowledge, self-efficacy, and self-regulation; this finalization phase aimed to determine whether any of the ten predicted variables were successfully identified or if any additional variables were newly identified. In terms of identifying variables, in addition to theoretical considerations, the absence of these elements was critical. If certain correlation(s) had too few correlation coefficients in the identified studies, it would be difficult to ensure stable parameter estimates for the corresponding path(s) in the SEM, potentially leading to under-identified models and reduced statistical power. To address this issue, certain variables or correlations were omitted or merged to ensure the stability of the parameter estimates for each path in the SEM analysis. In this case, flexibility in defining certain constructs was required to ensure sufficient statistical power. For example, while intrinsic and extrinsic motivation are conceptually distinct, if necessary, we treated them as a single 'motivation' variable. Any discrepancies in the coding correlation coefficients and moderator variables were resolved through discussions among the authors.

3.3 Data Analysis

To employ the MASEM approach, we used the metaSEM R package Version 1.4.0 (Cheung, 2015) within R Version 4.2.2. Specifically, we applied a two-stage structural equation modelling (TSSEM) method, which involved: (1) constructing a pooled correlation matrix using collected correlation coefficients from primary studies with varying sample sizes in Stage 1, and (2) building an SEM model based on this pooled correlation matrix in Stage 2.

3.3.1 Meta-Analytic Pooled Correlation Matrix, including Publication Bias Check

We first assessed the publication bias among the collected correlation coefficients using funnel plot analysis and Egger's regression test. Subsequently, we constructed a pooled correlation matrix by synthesising the correlation coefficients from the identified studies, which served as the foundation for subsequent SEM models. This matrix was weighted according to the sample size of each study to account for the differences in precision. Because not all studies reported every correlation, some degree of missing data was inevitable. To address this, we applied the full information maximum likelihood (FIML) estimation method to our MASEM approach (Jak & Cheung, 2020). FIML uses available data from each case to estimate the overall model without imputing missing values or excluding variables with missing data (Cham et al., 2017). This method is appropriate because we assumed that the missing correlations were 'missing at random' (MAR)—that is, the absence of certain correlations is not related to the values themselves, but likely due to the researchers' lack of interest in those specific correlations.

3.3.2 Meta-Analytic SEM #1 – Baseline Model

Using the pooled correlation matrix, we estimated the baseline SEM model to reflect the hypothesised relationships between the key factors contributing to the EMI success without including any moderators. We assessed the model's fit using multiple indices, including chi-square (χ^2), Root Mean Square Error of Approximation (RMSEA), Standardised Root Mean Square Residual (SRMR), Tucker-Lewis Index (TLI), and Comparative Fit Index (CFI). Good model fit was indicated by a non-significant χ^2, RMSEA < 0.08, SRMR < 0.08, TLI > 0.90, and CFI > 0.90 (Byrne, 1994).

3.3.3 Meta-Analytic SEM #2 – Moderator Analysis

Next, we incorporated moderator variables into the baseline SEM to explore whether the relationships between key factors were influenced by study-level differences. Changes in the model fit and path coefficients were evaluated, and the moderated model was compared with the

baseline model using a chi-square difference test to confirm the moderator's statistical significance. However, when limited sample sizes or insufficient data prevented a full moderator analysis, we simplified the baseline model to ensure the stability and valid interpretation of the results.

4. Results

4.1 Literature Search

This section presents our findings based on the methodological procedures outlined above to address the research questions. Our literature search began with a review of reference lists from previous systematic reviews. This was followed by a review of the results of the database and journal searches conducted by the EMI Oxford Research Group and a forward citation search. After removing duplicates and conducting title and abstract reviews, 227 articles remained for a full review. Consequently, 92 unique studies met our inclusion criteria, as 135 studies were excluded because (1) 18 studies were not written in English, (2) 29 studies were conceptual papers, (3) 37 studies included only one variable and we could not compute any correlation coefficients, and (4) 46 studies were not related to EMI. Among the identified 92 studies, however, 66 either did not report correlation coefficients or did not compute them. After contacting the authors for additional data, the relevant information was successfully obtained for 35 studies. The initial dataset consisted of 61 studies, which required further review before being included in the final dataset for the MASEM (see Table 1). The literature search process is illustrated in Figure 2.

(Figure 2 near here)

4.2 Dataset Construction (RQ1): What are the key factors contributing to the success of EMI in terms of both content and English learning?

As we sought to include all relevant factors associated with EMI success across 61 studies, the number of identified variables exceeded our expectations. Additional four variables emerged: L1 proficiency, the frequency of language use, socioeconomic status, and willingness to communicate (WTC). Consequently, we recorded a total of 14 variables (seven key variables, two dependent variables, and five additional variables) for the comprehensive correlation matrix, which required the computation of 91 correlations. This number was derived using the equation for unique pairwise correlations, $\frac{n(n-1)}{2}$, where n represents the number of variables: $\frac{14 \times 13}{2} = 91$.

However, not all studies provided data for every variable or correlation. This resulted in some correlations having too few supporting studies to compute a synthesised correlation, and in some cases, certain correlations lacked any supporting studies. This occurred when variables were included in the studies, but no correlation coefficients were reported or when the corresponding variables were absent. To illustrate, Study A might include WTC as an important variable in EMI without measuring other relevant variables, making it impossible to report the correlation coefficients between WTC and other variables. Consequently, some variables and correlations were omitted or merged to ensure stable parameter estimates, with at least one correlation coefficient per path in the SEM.

Ultimately, we retained six key factors: four independent variables—'Engagement in EMI,' 'Language Anxiety,' 'Language Motivation,' and 'English Proficiency'—along with two dependent variables representing EMI success in content and English learning. This refinement led to the exclusion of 11 studies from the initial 61, resulting in a final dataset of 50 studies (N =

15,032) for the meta-analysis (see Appendix 3 for a list of studies). All 50 studies met the quality assessment criteria, with detailed results provided in Appendix 1. Table 1 presents the dataset refinement process, from the initial collection to the final dataset, including additional adjustments made for the moderator analysis, along with a summary of each phase.

Table 1

Dataset Refinement Process for MASEM and Moderator Analysis

Dataset Refinement	Timeline		
	(1) Literature Search	(2) Dataset Construction	(3) Moderator Analysis
Summary	A. 227 articles remained for the full review. B. 92 unique studies met the inclusion criteria. C. 61 studies with correlation coefficients finally remained.	A. Some correlations having too few supporting studies to compute a synthesised correlation. B. Certain correlations lacked any supporting studies. C. Therefore, some variables were omitted or merged to ensure stable parameter estimates. D. We retained 6 variables, and this refinement led to the exclusion of 11 studies.	A. The final dataset of 50 studies failed to achieve convergence for goodness-of-fit due to missing data for certain parameters. B. We simplified the baseline SEM by dropping two variables, such as Language Anxiety and Language Motivation. C. This led us to exclude 8 studies, ensuring adequate statistical power.
No. of Studies	61	50	42
No. of Variables	14	6	4

Regarding the collected correlation coefficients from these 50 studies, as shown in Table 2, their numbers ranged from 1 (e.g., between Language Motivation and Language Anxiety) to 27 (e.g., EMI Success in Content Learning and English Proficiency), indicating that the extent of missing data varied between 48% and 98% (See Appendix 4 for the complete dataset).

Table 2

Number of Collected Correlation Coefficients and Samples Sizes Between Target Variables

Variable	(1)	(2)	(3)	(4)	(5)	(6)
(1) EMI Success in Content Learning	-	2,336	594	862	1,350	8,472
(2) EMI Success in English Learning	9	-	2,293	2,252	2,520	882
(3) Engagement in EMI	4	2	-	2,291	2,938	456
(4) Language Anxiety	2	1	2	-	2,252	872
(5) Language Motivation	4	3	5	1	-	1,170
(6) English Proficiency	27	9	6	3	3	-

Note. Values below the diagonal represent the number of studies that reported correlation coefficients for each specific correlation between the target variables, whereas values above the diagonal indicate the total sample size of those studies. In total, 50 studies had a cumulative sample size of 15,032 for all the collected correlation coefficients.

While coding these six key factors, we faced challenging decisions regarding the merging of similar variables into single constructs to ensure sufficient statistical power for the SEM model parameters. Along with the definitions and examples of the variables provided below,

Appendix 2 outlines how they were operationalised in the collected studies to ensure transparency.

First, ‘Engagement in EMI’ refers to the involvement of students in their academic experience within an English-medium learning environment. While many studies have typically focused on how students behave in relation to EMI teaching and learning, we chose to broaden our perspective based on the suggestions of Kahu (2013) and Fredricks et al. (2004) who advocated viewing engagement as a multifaceted construct. This construct includes not only behavioural but also emotional and cognitive dimensions. Therefore, our definition of ‘Engagement in EMI’ encompasses nine measurements, namely attentiveness to EMI, attitudes toward EMI, beliefs about skill development, confidence in EMI, overall engagement, participation, positive perceptions of EMI, preference for EMI, and satisfaction.

Second, ‘Language motivation’ refers to the internal and external factors that drive students to learn English within the EMI context, such as personal interest or enjoyment in learning English, the desire for better career opportunities or academic success, or the need to integrate into English-speaking academic environments or communities. Based on this definition, we included a wide range of motivational measurements, such as achievement goals, extrinsic motivation, instrumental motivation, international posture (i.e., orientation toward and interest in the international community and cultures, cf. Yashima, 2009), intrinsic motivation, components of the L2 motivational self system (i.e., ideal L2 self as mental representation of your future self as a skilled target language speaker, and ought-to L2 self as traits an individual feels compelled to develop in response to external expectations, cf. Dörnyei, 2009), sociocultural motivation, and task value.

Third, ‘Language anxiety’ involves the feelings of worry, nervousness, or apprehension that students experience about learning English in an EMI setting, resulting from fear of making

mistakes, low self-confidence in using English, or pressure to perform well in an academic environment where English is the primary language of instruction. Therefore, we included five measures of language anxiety: communication apprehension, English as a challenge, English language classroom anxiety, language anxiety, and language apprehension.

Fourth, 'English proficiency' encompasses students' overall ability to use English across a variety of contexts, including speaking, listening, reading, and writing. Furthermore, in EMI, this also includes students' competence in understanding and producing English, not only for academic purposes but also in everyday interactions. This reflects the broad language skills required to succeed in English-speaking academic environments. Six measures were included: English course grade before EMI, institutional standardised English test before EMI, researcher-developed English language test before EMI, self-rated English proficiency level before EMI, standardised English test (e.g., Oxford Placement Test, Cambridge Preliminary English Test, TOEIC, TOEFL, IELTS) before EMI, and validated English tests (e.g., Gates-MacGinitie tests, VST, VLT, GVT, RMQ-EFL) before EMI.

Fifth, 'EMI success in content learning' refers to students' performance and mastery of subject-specific content (e.g., science and mathematics) taught in English in the EMI context. This reflects their ability to comprehend and apply course materials despite the additional challenge of learning in a second language. Three measures emerged: achievement tests of content knowledge, final exam results or GPAs for EMI courses after taking EMI, and self-rated content learning achievement.

Sixth, 'EMI success in English learning' reflects students' progress in acquiring English language skills while participating in an EMI program. It includes their performance in English language courses or the development of academic English skills (e.g., reading academic texts and writing reports) as a result of learning in an English-medium environment. This variable was

measured using: final exam results or GPAs for English courses after taking EMI; an institutional standardised English test after EMI, researcher-developed English language test after EMI, self-rated English competency after EMI, standardized English test (e.g., Oxford Placement Test, TOEIC, IELTS) after EMI, and validated English tests (e.g., Gates-MacGinitie tests) after EMI.

4.3 Data Analysis 1 (RQ2): How are the key factors related and what structures do they form in contributing to the success of EMI?

First, to explore the relationships between these factors, we constructed a pooled correlation matrix by weighting each collected correlation coefficient according to the sample size. Table 3 presents the pooled correlation matrix for the baseline model across six variables. The 15 pooled correlation coefficients ranged from -0.34 to 0.47, all of which were statistically significant (ps < .05). Additionally, Egger's regression test indicated no significant evidence of publication bias (z = 1.64, p = 0.10).

Table 3

Pooled Correlation Matrix for the Baseline Model

Variable	(1)	(2)	(3)	(4)	(5)	(6)
(1) EMI Success in Content Learning	-					
(2) EMI Success in English Learning	0.47	-				
(3) Engagement in EMI	0.26	0.23	-			
(4) Language Anxiety	-0.24	-0.22	-0.13	-		
(5) Language Motivation	0.21	0.16	0.28	0.03	-	
(6) English Proficiency	0.35	0.42	0.17	-0.34	0.25	-

Note. All correlations (below the diagonal) were statistically significant, p < .05.

We construct a baseline SEM model based on a pooled correlation matrix, illustrated in Figure 3. The model fit indices indicated an overall good fit: (1) $\chi^2(5) = 6.30$, $p = .28$; (2) CFI = 0.99; (3) TLI = 0.99; (4) RMSEA = 0.01; and (5) SRMR = 0.04. EMI success in both content and English learning showed a significant positive correlation and was influenced by learners' engagement in EMI and English proficiency. Furthermore, the learners' English proficiency was significantly influenced by their language anxiety and motivation.

(Figure 3 near here)

When comparing the relative contributions of learners' engagement in EMI and English proficiency to EMI success (both for content and English learning), follow-up likelihood ratio (LR) test results revealed statistically significant differences in their impact on EMI success in English learning ($\chi^2(1) = 32.91$, $p < .001$). Specifically, learners' English proficiency ($\beta = 0.52$, SE = 0.06, $p < .001$) had a significantly greater influence than their engagement in EMI ($\beta = 0.15$, SE = 0.03, $p < .001$). However, no statistical significance was observed for their differential contributions to EMI success in content learning ($\chi^2(1) = 0.57$, $p = 0.45$).

In examining the two exogenous variables for English proficiency, the LR test results showed that language anxiety ($\beta = -0.36$, SE = 0.03, $p < .001$) had a significantly larger impact than language motivation ($\beta = 0.26$, SE = 0.05, $p < .001$), even when accounting for their opposite directional influences ($\chi^2(1) = 8.46$, $p = 0.004$).

4.4 Data Analysis 2 (RQ3): To what extent do the identified moderators influence the structural relationships among the key factors and the success of EMI?

From the final datasets, we coded two meaningful moderator variables with no missing values: (1) Full EMI vs. Partial EMI and (2) L1-English Related vs. L1-English Not Related. For

the first moderator variable, we observed significant variations across studies in terms of the institutional policies governing EMI implementation. For example, while some institutions offered all courses in English, others provided only selected courses. We categorised the former as Full EMI and the latter as Partial EMI, following a classification previously suggested by Macaro (2018). For the second moderator, L1-English relatedness was coded as 'related' (1–77) or 'not related' (78–100) based on the results of Beaufils and Tomin's (2020) genetic proximity calculator between the two languages (see Lee & Lee, 2024 for an example).

When we initially conducted moderator analyses, the baseline SEM with our final dataset of 50 studies failed to achieve convergence for goodness-of-fit because of insufficient data for certain parameters. Hence, we simplified the baseline SEM by dropping paths associated with fewer correlation coefficients, which required excluding 8 studies to ensure adequate statistical power (see Table 1). Consequently, only for the moderator analyses, we used a subset of 42 studies (k = 42, N = 13,934). Figure 4 presents the simplified SEM model used for the moderator analysis. The model fit indices indicated an overall acceptable fit (i.e., all indices met the criteria except for the chi-square test): (1) $\chi^2(1) = 5.86$, $p = .02$; (2) CFI = 0.99; (3) TLI = 0.98; (4) RMSEA = 0.02; and (5) SRMR = 0.07.

(Figure 4 near here)

Using this version of the SEM model, we conducted moderator analyses for two key variables: (1) Full EMI vs. Partial EMI, and (2) L1-English Related vs. L1-English Not Related. The results indicated that (1) Full EMI vs. Partial EMI had a statistically significant moderation effect ($\chi^2(1) = 4.38$, $p = 0.03$), whereas (2) L1-English Related vs. L1-English Not Related showed no significant effects. Specifically, for the Full EMI vs. Partial EMI moderator, learners'

engagement in EMI contributed more strongly to the success of EMI for English learning under partial EMI (β = 0.23, SE = 0.02, $p < .001$) compared to full EMI (β = -0.06).

5. Discussion

In this study, we employed a MASEM approach to identify the key factors contributing to successful EMI in HE and explore how these factors are interrelated in supporting both content and English learning. Based on the data from 50 studies (N = 15,032), we identified four key factors for successful EMI and their structural relationships. Specifically, our findings highlight the follow:

- the importance of learners' engagement and English proficiency in EMI success;
- the greater significance of general English proficiency for EMI success in terms of English language learning;
- the higher importance of engagement in partial EMI contexts than in full EMI contexts.

From a research perspective, our study highlights the theoretical and practical value of the MASEM approach and the importance of identifying key factors and their structural relationships to inform targeted educational interventions.

5.1 Significance of Engagement and English Proficiency for the EMI Success

One of our findings, that both learners' engagement and their English proficiency are critical for achieving success in EMI programs in HE, is grounded in the unique challenges that these programs present. This is because EMI requires students to learn complex subject content while using and developing their English language skills (Dafouz & Gray, 2022, Macaro, 2018). In HE, where the content is specialised and cognitively demanding, students need to engage deeply with the material. Simultaneously**,** they must be proficient in English to understand lectures, participate in discussions, and complete assignments. English proficiency and

engagement together ensure that students meet these demands (e.g., Le & Nguyen, 2023; Yuksel, Soruç, Horzum, et al., 2023).

The importance of this interaction lies in how engagement drives active learning, as suggested in education literature (Johnson & Sinatra, 2013; Reeve, 2012). Engaged learners are more likely to participate in discussions, ask questions, and collaborate with peers, which contributes not only to grasping academic content but also to improving their English through practice. In contrast, less actively engaged learners may not take full advantage of the opportunities to use English meaningfully, thereby limiting both their content understanding and language development. Likewise, learners with weak English proficiency may struggle to engage effectively because language barriers hinder their ability to process information and communicate ideas in this pedagogical context (e.g., Aizawa et al., 2023; Sultana, 2014).

In EMI programs, success in content learning and English development is intertwined. English speakers confident in their language competence may be able to engage in higher-order thinking tasks essential in HE (Zhou et al., 2023), such as critical analysis and problem-solving (Barrie, 2006). Simultaneously, students with active engagement in EMI are more likely to persevere through language challenges and gradually improve their language skills while mastering academic content. Without this dual focus, learners may either excel in content but struggle with English or improve their English but fail to grasp subject knowledge deeply.

This dual importance is especially relevant in HE, where students are prepared for global careers or academic pursuits in English-speaking environments (e.g., Lueg & Lueg, 2015; Pecorari et al., 2011). Proficiency in English is not just a language skill but a tool for communicating specialised knowledge. Engagement ensures that learners actively develop both their content expertise and language proficiency, equipping them to succeed in a competitive, globalised academic and professional landscape. Therefore, addressing both engagement and

English proficiency is essential for creating an equitable learning environment and ensuring that all students from diverse backgrounds thrive in EMI programs.

5.2 Greater Significance of English Proficiency for Successful English Learning in EMI

Another key finding of our study is that while both English proficiency and learners' engagement are essential for success in EMI, English proficiency has a greater impact on English language learning outcomes. More specifically, proficiency is more critical than engagement alone for mastering English in EMI. Theoretically, this finding is consistent with the developmental interdependence and threshold hypotheses (e.g., Cummins, 1979, 2000), in which the importance of a solid language foundation for further language development is always emphasised. Learners with higher L2 proficiency can engage with more demanding and complex input (e.g., Council of Europe, 2020), and thus incorporate new language structures into their existing knowledge. While engagement is valuable, it cannot easily compensate for a lack of language skills regarding advancing English (Cummins, 1979, 2000). For example, more proficient students can better understand academic texts, lectures, and discussions, allowing them to continue improving their language through practice and exposure in meaningful contexts. It should be noted that our MASEM is based on correlational data and explores predictive relationships between variables. Nonetheless, this interpretation of our findings concurs with previous experimental research on the medium of instruction, which found that more academically proficient learners may benefit from being taught in an L2 (Murphy et al., 2020).

We believe this finding is intuitive practically as well. In EMI, students must not only understand complex course content but also do so in an L2 (Macaro, 2018). If their English proficiency is too low, they may struggle to comprehend the material regardless of their level of engagement or motivation. Learners with lower proficiency often face challenges acquiring new vocabulary, understanding grammar, and using English in academic settings (Dalton-Puffer,

2007; Macaro, 2018). Even with high levels of engagement, they may lack the language tools necessary to participate fully in discussions or complete assignments. In contrast, students with stronger English skills are better positioned to use their engagement, enabling them to deepen their learning of both content and language. Moreover, higher English proficiency allows students to benefit more from EMI's immersive environment. Unlike traditional language classes, EMI typically provides limited explicit language instruction (e.g., An et al., 2019), requiring students to learn primarily through exposure and interaction. Proficient learners can engage more deeply with academic content while improving their English through practical use. This creates a positive cycle in which proficient students continue to enhance their language skills while grasping the subject material, whereas less proficient students may struggle with both.

This underscores the need for EMI programs to offer tailored support to students with lower proficiency (Pomat et al., 2022; Soruç et al., 2021), ensuring they have the linguistic foundation to succeed. This also highlights the importance of additional language resources (e.g., translanguaging) for students with weaker English skills to help them meet the demands of both content learning and English development (Lin & Lo, 2017; Yuan & Yang, 2023).

5.3 Higher Importance of Engagement in Partial EMI Contexts

Another key finding of our study is that learner engagement is more important in partial EMI contexts compared to full EMI contexts. While both factors are crucial for success in EMI overall, our results suggest that, in partial EMI, where only selected courses are delivered in English, student engagement plays a crucial role in their learning outcomes. In partial EMI contexts, students are exposed to fewer courses in English (Pecorari & Malmström, 2018); thus, they have limited opportunities to practice and develop their English skills during their coursework. Consequently, actively engaged students are more likely to make the most of the

English language exposure. As they alternate between courses taught in English and their native language, these students may be more motivated to stay actively engaged in EMI courses, taking advantage of every opportunity to practice English and apply what they are learning. In contrast, students with less active engagement may not put as much effort into using English during these limited opportunities, which can slow both their content learning and language development.

Practically, in partial EMI, learners may find it easier to rely on their native language or employ code-switching when they are not required to use English in all courses (Poon, 2013). In this setting, highly motivated and engaged students actively push themselves to use English despite the option of returning to their native language in other parts of their academic life. Their engagement drives them to interact in English during lectures, discussions, and assignments, helping them overcome the challenges of the bilingual environment. This is in contrast to full EMI, where all courses are delivered in English and students are constantly immersed in the language (Pecorari & Malmström, 2018), which naturally forces them to use English more frequently regardless of their engagement level. In full EMI, English becomes the default medium, reducing the need for learners to rely on personal motivation to use the language consistently; such a context likely allows learners to achieve higher levels of English proficiency and confidence in speaking (Chou, 2018).

Our findings highlight the importance of engagement in the context of partial EMI. In such settings, students must play an active role in ensuring that they benefit from the limited English exposure. EMI programs in partial contexts should place extra emphasis on fostering active student engagement to help students succeed. By encouraging a supportive learning environment and promoting active participation in English, institutions can help students thrive in partial EMI, ensuring that they make the most of the English language courses they take while still navigating a bilingual academic environment.

5.4 Research Implications

5.4.1 Theoretical and Practical Value of the MASEM in EMI

This study underscores the theoretical and practical value of applying the MASEM approach to EMI research. Theoretically, MASEM enables a comprehensive synthesis of findings from multiple studies (Jak, 2015), providing deeper insights into how key factors such as learners' engagement, English proficiency, language anxiety, and language motivation interact to influence EMI success. By leveraging this approach, we revealed complex structural relationships that would be difficult to capture using traditional meta-analytical techniques or a single SEM study. This highlights the potential of MASEM for refining and advancing theoretical models in the EMI field by providing a clearer understanding of factor interdependencies.

Practically, MASEM's ability to identify and map these structural relationships has significant implications for future EMI research. In empirical studies, researchers can use MASEM to identify critical factors and understand how they interact in diverse educational contexts. This approach enhances the relevance and applicability of the research findings, allowing for more precise recommendations for educational interventions for EMI in HE. Thus, this study positions MASEM as a valuable tool for advancing EMI research and providing more effective research-driven practices in HE.

5.4.2 Importance of Identifying Key Factors and Their Structural Relationships

Our study emphasises the importance of identifying key factors and their structural relationships in the case of EMI in HE, demonstrating its applicability in educational research and beyond. Rather than examining individual variables in isolation, understanding how these factors interact provides a more comprehensive perspective on the dynamics that influence target outcomes (Wilson et al., 2016). This approach allows researchers to move beyond simplistic

models, uncovering how various elements, such as learner engagement and skill proficiency, influence one another and contribute to overall success.

Identifying these structural relationships could be crucial for designing targeted interventions (Kline, 2005; Yin & Huang, 2021). Understanding how certain factors amplify or mitigate the effects of others allows researchers to provide more nuanced insights, guiding the development of more effective educational strategies through these identified mechanisms. Additionally, examining these interactions across different contexts or populations can offer valuable insights into the generalisability of the findings (Shadish et al., 2002), resulting in broader and more applicable conclusions. Future research should continue to explore these interconnections, as this holistic approach will strengthen the theoretical frameworks and lead to better-informed educational practices.

6. Conclusion

This study aimed to identify the key factors contributing to the academic success of tertiary-level EMI students and examine the structural relationships among these factors. Although we were unable to include some initially hypothesised factors, such as self-efficacy, self-regulation, and prior content knowledge, owing to the unavailability of correlation coefficients, we successfully developed and validated a structural model by synthesising data from 50 studies. The model demonstrated that language anxiety negatively and motivation positively influenced students' English proficiency, which predicted both content learning and English achievement. Furthermore, student engagement in EMI positively affected their overall academic success. To the best of our knowledge, this is the first MASEM study to explore these relationships, offering valuable insights into the complex mechanisms shaping EMI students' academic success in HE.

However, this study has some limitations. A major constraint was the limited availability of correlation coefficients for the variables of interest, which led to broader definitions during coding. For instance, English proficiency was operationalised differently across studies, with some focusing on general English proficiency (e.g., Rogier, 2012; Thompson et al., 2022), and others on local test results of English skills (e.g., Osam & Korun, 2016; Yang, 2015). Similarly, motivation was examined under different theoretical frameworks (Dörnyei & Ushioda, 2021), limiting our ability to explore specific types, such as socio-cultural motivation (e.g., Hengsadeekul et al., 2014), intrinsic and extrinsic motivation (e.g., Kim & Kim, 2024; Kim & Thompson, 2022), and instrumental motivation (e.g., Soruç et al., 2022). This led to challenging decisions about merging or excluding variables in our final model, which is a common issue in EMI meta-analyses (e.g., Lee et al., 2023; Lo & Lo, 2014). With larger samples, future research could better distinguish variations among constructs and more precisely assess their roles in predicting the academic success of EMI students.

Moreover, our decision to merge certain variables under the broader construct of 'Engagement in EMI' requires further justification, particularly regarding why these variables, such as 'attentiveness to EMI' and 'beliefs about skill development', were grouped within this construct. While we drew upon prior theoretical frameworks that define engagement as a multidimensional construct encompassing behavioural, emotional, and cognitive aspects (e.g., Fredricks et al., 2004; Kahu, 2013), we recognize that a more detailed and robust discussion of the interrelations among these variables could strengthen the validity of this approach. Future research could benefit from empirically examining whether these variables indeed converge into a single engagement factor, as we proposed, or if more refined distinctions should be made.

Given these limitations, we encourage future research to further investigate the key factors identified in this study along with additional factors that may influence the success of

EMI. The use of SEM approaches, as demonstrated by Soruç et al. (2022), could provide deeper insights. It is also important to expand EMI research across a broader range of geographical contexts, as existing studies have exhibited limited regional diversity. Finally, we urge researchers to offer more detailed descriptions of their EMI contexts, such as instructional duration, instructor qualifications, institutional policies, and availability of support for low-achieving students, and report the correlation coefficients for all relevant variables, which would facilitate future MASEM studies.

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