Journal of Research in Language & Translation
Issue No. 2 Vol. 6 (2026)

The Role of L1 Arabic in Student Learning Strategies: A Study of Undergraduate Coping Mechanisms in Saudi EMI Programs

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https://doi.org/10.33948/JRLT-KSU-6-2-2

Received: 15/04/2026; Revised: 15/07/2026; Accepted: 20/07/2026

الملخص

يشكل الانتشار العالمي السريع لنمط التعليم بالإنجليزية (EMI) تحدياً كبيراً للطلاب في السياقات غير الناطقة بالإنجليزية، مما يفرض الحاجة إلى البحث في استراتيجيات تعلم تكيفية. تبحث هذه الدراسة النوعية في الدور الاستراتيجي لِلُغة الأولى (L1)، وهي العربية، لدى طلاب البكالوريوس السعوديين في التخصصات العلمية والطبية التي تُدرَّس بالإنجليزية. وانطلاقاً من إطار نظري يجمع بين نظرية التعدد اللغوي التكاملي (Translanguaging) ونظرية التعلم المنظم ذاتيا (SRL)، اعتمدت الدراسة على مقابلات مقننة مع 28 طالبا، ونمط الاسترجاع المُستحَث، وتحليل المنتجات الطلابية، بالإضافة إلى استبانة شملت 315 مشاركا. وكشفت النتائج أن الطلاب يستخدمون العربية بشكل منهجي من خلال أربع آليات هي الشرح الهامشي لترسيخ الدلالات المفاهيمية، والتبديل اللغوي التوضيحي لفهم العمليات المعقدة، والترجمة التشخيصية لمراقبة الفهم والتقويم الذاتي، وكتابة الرموز التي تساعد على التذكر لتعزيز الاستبقاء والاسترجاع. كما أظهرت النتائج ثنائية عميقة: فبينما يُنظر إلى العربية على أنها أساسية لتحقيق فهم عميق (95.6%)، وتخفيف القلق الأكاديمي (91.4%)، وتعزيز التعاون بين الأقران (89.5%)؛ إلا أن الطلاب يعانون في الوقت ذاته مما يمكن تسميته "شعور الذنب اللغوي "الناجم عن تبني أيديولوجيات لغوية أحادية، خاصة بين ذوي الكفاءة المنخفضة في الإنجليزية. وتستنتج الدراسة أن الطلاب ليسوا متلقين سلبيين، بل هم متعلمون فاعلون ومستخدمون استراتيجيون لمواردهم اللغوية الثنائية، يديرونها ببراعة. كما تدعو هذه الدراسة إلى أعادة النظر في الافتراضات الأحادية السائدة في سياسات التعليم بالإنجليزية (EMI)، وتدعو إلى دمج الممارسات التعددية اللغوية الاستراتيجية في التصميم التعليمي، لخلق بيئات تعلم متعددة اللغات تكون أكثر إنصافاً واستدامة.

الكلمات المفتاحية :التعليم بالإنجليزية (EMI)، استخدام اللغة الأولى (L1)، استراتيجيات تعلم اللغة، التعددية اللغوية، التعليم العالي السعودي، التعلم الذاتي المنظم، التعدد اللغوي التكاملي (Translanguaging).

KSU-JRLT

Journal of Research in Language & Translation
Issue No. 2 Vol. 6 (2026)

جامعة الملك سعود
King Saud University

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Abstract

The rapid global expansion of English-medium instruction (EMI) challenges students in non-Anglophone contexts, necessitating research into adaptive learning strategies. A qualitatively driven mixed-methods multi-site case study explores the strategic role of L1 Arabic for Saudi undergraduate students in EMI science and medical majors. Grounded in translanguaging theory and self-regulated learning, it employed interviews (n=28), stimulated recall, artifact analysis, and a questionnaire (N=315). Findings show students systematically deploy Arabic through four mechanisms: (1) glossing for semantic anchoring, (2) explanatory translanguaging for processes, (3) diagnostic translation for monitoring, and (4) mnemonic bridging for retention. A profound duality emerged: while Arabic is deemed essential for deep understanding (95.6%), stress reduction (91.4%), and peer collaboration (89.5%), students concurrently experience significant "translanguaging guilt" due to internalized monolingual ideologies, especially those with lower English proficiency. The study concludes that students are active strategic translanguagers, expertly orchestrating their bilingual repertoires. It challenges monolingual EMI assumptions and advocates for pedagogically integrating strategic translanguaging to create equitable, sustainable multilingual learning environments.

Keywords: *English-medium Instruction (EMI), L1 Use, Language Learning Strategies, Multilingualism, Saudi Higher Education, Self-Regulated Learning, Translanguaging.*

Introduction

The relentless global expansion of English as a Medium of Instruction (EMI) has fundamentally reshaped the linguistic and pedagogical landscape of higher education, particularly in nations where English serves as a foreign or additional language. This shift, often driven by the intertwined imperatives of international academic prestige, student mobility, and graduate employability in a globalized knowledge economy, presents a profound paradox. While policymakers and institutional leaders frequently advocate for immersive, English-only environments to maximize language acquisition and align with international standards, the on-the-ground reality of the multilingual classroom tells a more complex story (Yacoub, 2025). Here, the learners' first language (L1) does not simply recede; instead, it persists as a vital, often strategic, cognitive and social resource for navigating the formidable dual challenge of mastering complex disciplinary content through a linguistically unfamiliar medium.

This tension between monolingual ideology and plurilingual practice is acutely visible in the Saudi higher education context, where the ambitious national Vision 2030 framework has accelerated the adoption of EMI across strategic, high-stakes fields such as medicine, health sciences, and engineering. As Saudi undergraduates in these programs engage with conceptually dense and terminologically specialized material, their mother tongue, Arabic - a language of deep cultural, religious, and intellectual heritage - inevitably enters the learning process, not as an interference to be eradicated but as a tool to be understood (Tai, 2025; Y. Zhang & Wei, 2021).

This persistent divergence between policy intent and learner behavior illuminates a critical and underexplored niche within the broader EMI research agenda. While scholarly attention has grown, existing investigations into L1 use in EMI often remain siloed, examining discrete facets of the phenomenon without capturing the integrated, strategic experience of the student. A significant portion of the literature, for example, concentrates on the agentive role of the instructor, scrutinizing lecturer attitudes toward L1 employment (Breeze & Roothooft, 2021), their strategic deployment of meta-discourse and code-switching during the shift from L1 to EMI teaching (Aguilar-Pérez & Khan, 2022; Sánchez, 2021), or their use of linguistic cues for assessment emphasis (Johnson, 2024).

A parallel research strand delves into student perceptions and attitudes, surveying general opinions on the acceptability and utility of L1 in EMI or EFL settings (Anindya et al., 2022; Kim et al., 2017; X. Zhang et al., 2024). Separately, a robust and long-standing body of work in applied linguistics focuses on language learning strategies and self-regulated learning, investigating the cross-linguistic transfer of strategic competence (Bai et al., 2025; Wach, 2016) or comparing metacognitive and cognitive processes across L1 and L2 tasks (Nikčević-Milković et al., 2022; Reyes et al., 2024). What remains conspicuously absent, however, is a holistic, qualitative inquiry that bridges these perspectives by placing the *student's strategic agency* at the center of analysis. There is a pressing need for research that moves beyond cataloguing perceptions or instructor practices to instead uncover *how learners themselves, as active strategists, consciously and selectively mobilize their full linguistic repertoire - specifically their L1 - to manage the specific cognitive, metacognitive, and social demands of content learning in an EMI environment*. This gap is especially salient in high-cognitive-load

disciplines like medicine and applied sciences, where the mastery of intricate concepts and vast terminologies may render strategic L1 use not merely a convenient option, but an indispensable cognitive scaffold for deep comprehension and academic success (Cui et al., 2024).

To address this gap, the present study adopts a qualitative case study design to conduct a fine-grained, student-centered exploration of the strategic learning ecology within Saudi EMI programs. It is conceptually anchored in the framework of translanguaging, a theoretical lens that rejects the notion of separate, bounded language systems and instead views an individual's linguistic repertoire as a dynamic, integrated resource for making meaning, constructing knowledge, and accomplishing tasks. From this perspective, the use of Arabic in an English-medium classroom is not a sign of deficit or a breach of policy, but a legitimate and potentially powerful semiotic strategy. Guided by this framework, the study is designed to answer the following three research questions:

1. What specific learning strategies do Saudi undergraduates employ in their EMI courses within health and science faculties?
2. How and under what conditions do they strategically utilize Arabic (L1) to facilitate comprehension, problem-solving, and task completion?
3. What are the perceived benefits and limitations of using L1 in this specific EMI context from the student perspective?

By concentrating on the underexplored context of Saudi Arabia and the high-pressure academic milieu of its medical and applied science faculties at Bisha University, this research seeks to provide a rich, contextualized account of strategic multilingual learning in action. Its findings aim to make a substantive contribution to the international discourse on multilingualism in higher education by challenging monolingual orthodoxies and offering empirical insights into the real-world coping mechanisms of EMI students. Ultimately, the study aspires to inform more pedagogically responsive, theoretically grounded, and linguistically inclusive approaches to EMI implementation, curriculum design, and faculty development - approaches that recognize and leverage, rather than ignore or suppress, the strategic value of students' complete linguistic resources for achieving profound and meaningful learning.

Literature Review

This literature review situates the present study within the evolving discourse on language use in tertiary education. It moves from the broad context of EMI to the specific strategic role of the L1, synthesizing existing research to delineate the conceptual space this study aims to occupy. The review is structured into three interrelated subsections: the first examines the complex landscape of EMI implementation and challenges, particularly in contexts similar to Saudi Arabia; the second investigates the documented functions and debates surrounding L1 use in multilingual learning environments; and the third explores the specific domain of language learning strategies, focusing on how strategic competence may transfer between languages and manifest in high-demand academic settings.

Global Trends and Contextual Challenges in EMI

The adoption of EMI is a widespread response to the forces of globalization in higher education, yet its implementation is far from uniform. While often promoted for enhancing

institutional internationalization and graduate competitiveness (Breeze & Roothooft, 2021; Y. Zhang & Wei, 2021), the on-the-ground reality reveals significant challenges, particularly for students operating in an additional language. Research consistently highlights issues of comprehension, participation, and academic load in EMI settings (Aguilar-Pérez & Khan, 2022; Y. Zhang & Wei, 2025). In the Arab Gulf context, including Saudi Arabia, these challenges are amplified by the significant linguistic distance between Arabic and English and the recent, rapid scale of EMI adoption post-Vision 2030.

Studies within analogous Asian contexts provide relevant insights. For instance, research on Chinese EMI programs notes students' struggles with technical vocabulary and lecture speed, often leading to reliance on compensatory strategies (Cui et al., 2024). Similarly, investigations into Korean engineering EMI programs reveal that student perceptions of learning efficacy are often mediated by their language proficiency, affecting engagement and satisfaction (Kim et al., 2017). These challenges underscore that EMI is not a linguistically neutral conduit for content but a setting that creates distinct cognitive and pedagogical demands. The focus then shifts from merely implementing EMI to understanding *how* students navigate it. This navigation is frequently facilitated by resources outside the official EMI paradigm, most notably the students' first language, making the examination of L1 use not peripheral but central to understanding EMI learning processes.

The Form and Function of L1 in Multilingual Learning Environments

The role of L1 in second language (L2) or additional-language learning has evolved from being viewed as an interfering source of error to being recognized as a potential cognitive resource (Yacoub, 2026). In EMI contexts, this recognition is growing, though it remains a point of pedagogical tension. Research can be categorized into studies focusing on instructor practices and those focusing on student behaviors and perceptions.

On the instructor side, studies reveal that lecturers, even in officially English-only programs, frequently and strategically employ the L1. This use ranges from meta-discursive functions like organizing lectures and emphasizing key points (Aguilar-Pérez & Khan, 2022; Deroey & Johnson, 2025) to providing explanations for complex concepts and building rapport (Breeze & Roothooft, 2021; Sánchez, 2021). Such practices suggest an implicit acknowledgement by educators that L1 can scaffold content delivery and enhance comprehension.

From the student perspective, research indicates a pragmatic, strategic approach to L1 use. Studies show students employ their L1 for core cognitive tasks such as glossing unfamiliar vocabulary (Hu et al., 2014), comprehending reading materials (Wang, 2019), facilitating group discussion and collaborative problem-solving (Anderson et al., 2010), and organizing ideas during writing (Hellystia & Hermawati, 2024). Further, studies indicate that students often view L1 as a necessary and beneficial support mechanism, especially in comprehension-checking and mastering difficult subject matter (Anindya et al., 2022; X. Zhang et al., 2024). However, this is often accompanied by anxiety about over-reliance and a sense that it contradicts the "English-only" ideal (Kim et al., 2017). This body of work confirms the presence and perceived utility of L1 but often treats it as a general phenomenon. A more precise investigation is needed into the *specific learning strategies* in which L1 is embedded and the *conditions* that trigger its strategic deployment by learners themselves.

Language Learning Strategies and Cross-Linguistic Transfer

The field of language learning strategies (LLS) provides a crucial framework for understanding how learners actively manage their learning. Strategies are defined as specific actions, behaviors, or techniques employed to improve the acquisition, storage, retrieval, and use of information (Reyes et al., 2024). Research has extensively catalogued strategies for L2 learning, but a key emerging area concerns the transfer of strategic competence from L1 to the L2 learning context.

Evidence suggests that learners do not develop entirely separate strategic repertoires for each language. Studies indicate that metacognitive and cognitive strategies, such as planning, self-monitoring, elaboration, and summarization, can transfer across languages (Bai et al., 2025; Reyes et al., 2024). For example, a student skilled at annotating texts in their L1 may apply a similar, albeit adapted, strategy to L2 texts (Wach, 2016). This transfer is moderated by factors like L2 proficiency and learning motivation (Bai et al., 2025). Furthermore, self-regulated learning (SRL), a broader construct encompassing strategy use, motivation, and metacognition, has been shown to correlate with proficiency in both L1 and L2 academic tasks, such as writing (Nikčević-Milković et al., 2022).

However, a significant gap persists in the LLS literature concerning EMI contexts. Most strategy research focuses on language *acquisition* contexts (e.g., EFL classes). Far less is known about the strategies students employ for *content learning through an L2*, where the primary goal is disciplinary mastery, not language proficiency per se. How do strategic translation, L1-mediated notetaking, or L1-based peer collaboration function as deliberate strategies for mastering biochemistry or physics in English? While studies like Hsu (2025) and Y. Zhang & Wei (2025) begin to explore strategic L1 use in EMI, detailed qualitative accounts of the strategy-by-strategy deployment of Arabic in Arab EMI contexts are scarce. This study directly addresses this gap by investigating the specific, strategy-based application of L1 Arabic within the high-stakes EMI environment of Saudi health and science education, thereby linking the literature on LLS transfer with the realities of EMI practice.

Theoretical Framework

This study is grounded in two complementary theoretical frameworks that together provide a robust lens for analyzing the complex, agentive, and cognitive dimensions of L1 use in EMI settings. The first**,** *Translanguaging Theory*, offers a sociolinguistic perspective that legitimizes and explains the natural deployment of a learner's full linguistic repertoire. The second, the theory of *Self-Regulated Learning (SRL)* within a strategic competence model, provides a cognitive-psychological framework for understanding the deliberate, goal-directed processes learners employ. Integrating these frameworks allows for a holistic analysis that views the use of Arabic (L1) not as random code-switching, but as a purposeful, self-regulated strategy within a translanguaging space.

Originating in bilingual education studies, translanguaging theory fundamentally challenges the traditional view of bilinguals as possessing two separate, compartmentalized language systems (Nambiar, 2009). Instead, it posits that multilingual individuals have a unified linguistic repertoire composed of diverse semiotic features that they select and deploy strategically to communicate and make meaning based on the specific context and

interlocutors. From this perspective, the boundaries between named languages like "Arabic" and "English" are social and political constructs, not cognitive realities.

In the context of this study, translanguaging theory provides a crucial foundation for reframing the research problem. It moves the analysis away from a deficit model that might frame L1 use as a failure to comply with an "English-only" EMI policy. Instead, it positions students' use of Arabic alongside English as a normative, intelligent, and resourceful practice - a *translanguaging instinct* (Tai, 2025; Y. Zhang & Wei, 2021) employed to maximize understanding and cognitive engagement. This framework guides the investigation of how students fluidly integrate Arabic resources (e.g., for metalinguistic comparison, conceptual glossing, intra-group discussion) into their English-medium academic tasks, thereby creating their own "translanguaging spaces" to negotiate challenging content. It directly informs Research Question 2 by providing theoretical vocabulary to describe the integrated *how* of L1 use, not merely its frequency.

While translanguaging explains the *nature* of the linguistic resource, the theory of Self-Regulated Learning (Nikčević-Milković et al., 2022; Reyes et al., 2024) explains the *agentive cognitive processes* behind its deployment. SRL is a cyclical process where learners proactively control their thoughts, behaviors, and motivations to achieve learning goals. This process typically involves three key phases:

1. Forethought (goal setting, strategic planning)
2. Performance (strategy implementation, self-monitoring)
3. Self-Reflection (self-evaluation, attribution)

Central to SRL is strategic competence - the ability to select, orchestrate, and monitor the effectiveness of specific learning strategies.

In this study, we posit that strategic L1 use is a manifestation of students' SRL in a multilingual context. When a student decides to write an Arabic summary of an English lecture (planning), uses an Arabic mnemonic to memorize English terminology (strategy implementation), or mentally translates a complex paragraph to check comprehension (self-monitoring), they are engaging in self-regulated, strategic action. It allows us to categorize the specific L1-involved actions as cognitive or metacognitive *strategies* (e.g., translation as a compensation strategy, L1 annotation as a cognitive strategy for organization) and to analyze students' perceptions of benefits/limitations as part of their *self-reflective evaluation* of strategy effectiveness. It moves beyond observing that L1 is used to analyzing it as a deliberate tactic within a broader plan for academic success.

The integration of these two frameworks is powerful and necessary. Translanguaging theory destigmatizes the practice and provides a macro sociolinguistic understanding, while SRL theory micro-analyzes it as a deliberate, goal-oriented cognitive process. Together, they form a cohesive lens for this study:

- *Translanguaging* explains *what* the linguistic resource is (an integrated repertoire) and justifies its use.
- *SRL* explains *why* and *when* specific features of that repertoire are activated (as a goal-directed strategy within the forethought-performance-reflection cycle).

This synthesis allows us to conceptualize "strategic translanguaging" (Tai, 2025) - the informed and agentive use of the multilingual repertoire to regulate learning. It posits that Saudi undergraduates in EMI programs are not passive recipients of language policy but active *strategic translanguagers* who self-regulate their learning by drawing on Arabic as a vital tool within their unitary repertoire to plan, execute, and evaluate their approach to mastering English-medium content. This theoretical integration directly supports the study's aim to uncover the sophisticated coping mechanisms students develop, providing a comprehensive explanation for the phenomena observed.

Methodology

This study adopts a qualitative, multi-site case study design to generate an in-depth, contextualized analysis of undergraduate learning strategies and the functional role of L1 Arabic within English-medium instruction (EMI). The case study approach is suited to investigating a complex, contemporary phenomenon in its authentic socio-educational context, where the focus is on understanding underlying processes and subjective meanings. This design facilitates a holistic exploration of the mechanisms, rationales, and perceived consequences of students' strategic translanguaging practices, aligning with the study's explanatory research aims.

Research Context and Case Delineation

The research was conducted at a major public university in southwestern Saudi Arabia, which has systematically implemented EMI across its STEM and health disciplines in response to national human capital development goals. Data were collected from four faculties operating under an EMI mandate: the College of Applied Medical Sciences, the College of Sciences, the College of Medicine, and the College of Applied Medical Sciences at a branch campus.

The study is bounded by a multi-site, instrumental case design. The case is defined as the phenomenon of strategic L1 deployment within the learning ecologies of undergraduate students across four distinct but related EMI disciplinary sites. This design enables the investigation of cross-site commonalities while capturing contextual variations shaped by specific disciplinary discourses (e.g., clinical medicine vs. pure sciences), thereby enhancing the analytical depth and transferability of the findings.

Participants and Sampling

Participants were Saudi national undergraduates formally enrolled in EMI-track programs within the targeted faculties. A purposive, maximum variation sampling strategy (Hoover & Patton, 2005) was employed to select a final qualitative cohort of 28 participants (n=28) from an initial pool of survey respondents (N=315), ensuring the inclusion of perspectives across key variables likely to influence strategy use. The distribution of the broader survey population by faculty is presented in the following table.

Table 1.

Sample Distribution by Faculty (N=315)

Faculty	n	%
College of Applied Medical Sciences	110	34.9%
College of Sciences	85	27.0%

Faculty	n	%
College of Medicine	78	24.8%
College of Applied Medical Sciences (Al-Namas)	42	13.3%
Total	315	100%

Inclusion criteria for the qualitative phase required participants to be: (a) in at least their second academic year, ensuring settled exposure to EMI; and (b) currently enrolled in one or more core disciplinary courses delivered entirely in English. The final qualitative sample (n=28) was structured to achieve proportional representation and variation across:

- *Discipline:* Medicine (n=7), Applied Medical Sciences - Main Campus (n=7), Sciences (n=7), Applied Medical Sciences - Branch Campus (n=7).
- *Academic Standing:* Second year (n=10), third year (n=10), fourth year (n=8).
- *Self-Assessed English Proficiency:* Distributed across intermediate (n=12), upper-intermediate (n=11), and advanced (n=5) levels, as preliminarily indicated in a background questionnaire.

Participants for the interview phase were recruited from the survey pool via purposive sampling based on the above criteria. Prior to data collection, all participants provided written informed consent, with protocols ensuring anonymity through pseudonyms (e.g., MED02, SCIA04) and the secure, confidential handling of all data.

Data Collection

A multi-method qualitative approach was utilized over one academic semester to triangulate data sources and construct a robust account of student experiences. This integrated semi-structured interviews, stimulated recall sessions, and artifact analysis.

Semi-Structured Interviews

The primary data source consisted of 28 in-depth, semi-structured interviews, conducted in Arabic by the principal researcher to optimize expressivity and minimize linguistic constraint. Interviews, averaging 58 minutes in length, were audio-recorded and transcribed verbatim. The interview protocol was designed to elicit rich, procedural narratives aligned with the research questions:

- *Strategy Mapping:* "Describe in detail the process you follow from attending an EMI lecture to being ready to be assessed on that material."
- *L1 Triggers and Functions:* "At which specific points in this process do you engage Arabic? What is the precise task or difficulty that prompts this?"
- *Metacognitive Evaluation:* "How do you judge the effectiveness of using Arabic in this way? What, if any, are the trade-offs?"

Stimulated Recall Sessions

To ground abstract descriptions in concrete practice, stimulated recall sessions were conducted with a purposively selected sub-sample of 12 participants. These sessions involved the joint examination of participants' personal learning artifacts - annotated textbooks, lecture notes, and problem sets. The researcher prompted participants to retrospectively articulate the reasoning behind specific instances of L1 use evident in the materials (e.g., "This marginal note

in Arabic - what cognitive task were you performing when you wrote it?"). Sessions were recorded and integrated into the analytical dataset.

Artifact Analysis

With participant consent, a corpus of 127 anonymized learning artifacts was collected for systematic document analysis. This corpus provided tangible evidence of the *form* and *frequency* of L1 use (e.g., dual-column notes, Arabic mnemonics, interlinear translations), serving to corroborate and elaborate upon claims made in interviews.

Data Analysis

The data were analyzed using a hybrid approach combining reflexive thematic analysis (Braun & Clarke, 2006) with framework analysis. This approach facilitated both inductive, data-driven coding and the deductive application of concepts from the theoretical framework. Analysis was conducted primarily on Arabic transcripts, with key excerpts translated into English for reporting purposes. The process was iterative and non-linear, supported by NVivo software for data management.

- *Phase 1: Immersion and Initial Coding.* Transcripts and field notes were reviewed repeatedly to ensure deep familiarity. An initial round of descriptive, data-driven coding was performed (e.g., "peer explanation in L1," "L1 glossing for new terminology," "mental translation during reading").
- *Phase 2: Developing a Thematic Framework.* Initial codes were clustered into provisional categories informed by research questions and theoretical lenses. A working analytical framework was developed, organizing codes under core themes such as "L1 as a Metacognitive Tool for Planning" and "L1 as a Semantic Anchoring Strategy."
- *Phase 3: Indexing and Charting.* The entire dataset was systematically indexed against this framework. Data were charted into thematic matrices, allowing for within-theme and cross-participant comparison. This phase was crucial for identifying patterns in *how* and *when* strategies were employed across different disciplines and proficiency levels.
- *Phase 4: Mapping, Interpretation,* and Theme Finalization. The charts were used to define the essence, boundaries, and relationships between themes. Through constant comparison, themes were refined, named, and structured into a coherent narrative that directly addressed the research questions. For instance, themes related to RQ2 coalesced into a core finding labelled "Selective L1 Mediation: Deploying Arabic for Conceptual Bridging and Cognitive Relief."

Trustworthiness and Ethical Rigor

The study's rigor was upheld through established qualitative validation strategies.

1. Credibility was ensured via method triangulation, prolonged engagement, and member checking, where preliminary interpretations were discussed with a participant sub-set.
2. Transferability is supported through the provision of "thick description" of the context, participants, and research process.

3. Dependability and Confirmability were addressed through maintaining a detailed audit trail of all methodological and analytical decisions, peer debriefing with qualitative research colleagues, and reflexive journaling to bracket researcher presuppositions.

Results

The analysis yielded a rich, multi-layered understanding of how Saudi undergraduates strategically navigate their EMI programmes. The findings are structured to sequentially address the three research questions, integrating quantitative insights from the questionnaire (N=315) with the rich qualitative depth of interviews, stimulated recall, and artifacts. This mixed-methods approach reveals that L1 use is not peripheral but integral to a self-regulated learning cycle, manifesting as a form of strategic translanguaging.

A Typology of Learning Strategies in EMI

The initial questionnaire (Cronbach's $\alpha = .91$; content and construct validity established through expert review and exploratory factor analysis) quantified the prevalence of broad strategic categories among the wider student population. Qualitative interviews and artifact analysis then provided granular detail on the specific mechanics and bilingual nature of these strategies. As shown in the following table, cognitive strategies involving direct L1 mediation were nearly ubiquitous, while metacognitive and social strategies were also widely reported.

Table 2.

Prevalence of Strategic L1 Use Categories (Questionnaire, N=315)

Strategic Category	Description	Frequency of Use	%
Cognitive & Mediation Strategies	Using Arabic to understand/process English material.	289	91.7%
Social & Collaborative Strategies	Using Arabic with peers to discuss EMI course content.	267	84.8%
Metacognitive & Self-Regulation Strategies	Using Arabic to plan, monitor, or evaluate own learning.	241	76.5%

Descriptive analysis of questionnaire data revealed meaningful disciplinary variation in strategy use. Students in the College of Medicine reported the highest frequency of Cognitive and Mediation Strategies ($M = 4.5$, $SD = 0.7$), followed by those in Applied Medical Sciences ($M = 4.3$, $SD = 0.8$), while students in the College of Sciences reported comparatively lower use ($M = 4.0$, $SD = 0.9$). This pattern aligns with the heavier terminological demand of medical studies and informed the purposeful sampling of participants for the qualitative phase. Interviews elaborated these categories into a concrete typology of bilingual learning strategies, as synthesised in the following table. Participants described highly adaptive, multimodal approaches where Arabic functioned as a systematic tool rather than a sporadic aid.

Table 3.

Typology of Bilingual Learning Strategies from Qualitative Data (n=28)

Strategy	Primary Modality	Qualitative Prevalence	Core Function & Illustrative Quote (Translated)
Bilingual Notetaking & Glossing	Written	26 (92.9%)	***Semantic Anchoring:*** *"My notes are a hybrid map. English is the official territory from the lecture; my Arabic annotations are*

Strategy	Primary Modality	Qualitative Prevalence	Core Function & Illustrative Quote (Translated)
			the personal landmarks I need to navigate it." (MED04)
Mental & Interlinear Translation	Mental/Written	28 (100%)	***Comprehension Monitoring:*** *"The mental switch to Arabic is automatic. It's my brain's way of asking, 'Do you really understand this, or just recognise the English words?'" (SCIA07)*
L1-Mediated Elaboration & Explanation	Verbal/Social	27 (96.4%)	***Conceptual Consolidation****: "In our study group, the rule is: explain it in Arabic first. If you can't simplify it in Arabic, you don't own the concept yet." (AMS11)*
Strategic Resource Sequencing	Digital/Textual	25 (89.3%)	***Cognitive Scaffolding:*** *"I use English resources for detail and Arabic resources for foundational clarity. It's a sequence: Arabic first for the 'what,' then English for the 'how.'" (AMS-N05)*
L1 Mnemonics & Encoding	Verbal/Written	24 (85.7%)	***Memory Bridging:*** *"I create stories or puns in Arabic that lock the English term in place. The English term is the key, but the Arabic story is the lock." (MED03)*

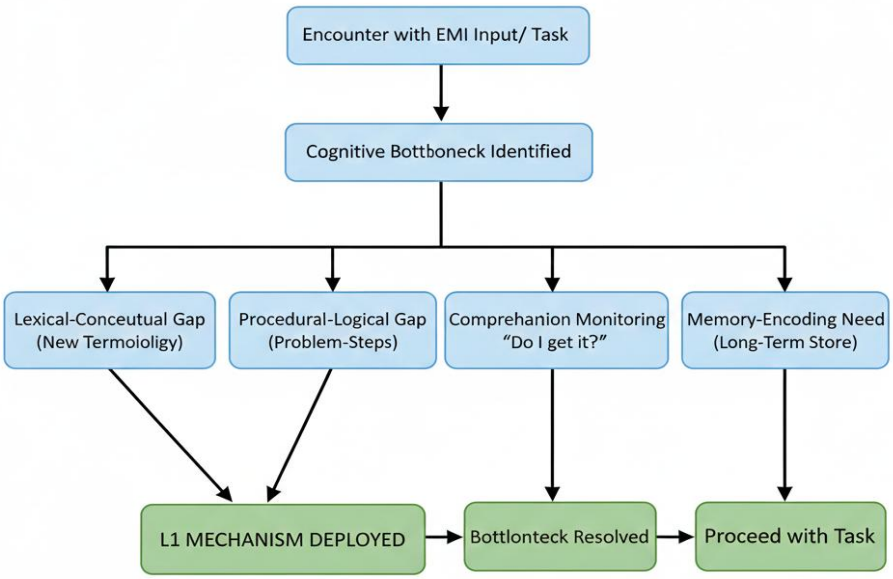
Artifact analysis provided material evidence for these strategies. Of the 127 artifacts analysed, 118 (92.9%) contained explicit Arabic annotations. The most common forms were marginal glosses (74%), interlinear translations within paragraphs (58%), and dual-column structures (41%).

Mechanisms, Triggers, and Contexts of Strategic L1 Deployment

The *how* and *when* of Arabic use were highly systematic, triggered by specific cognitive bottlenecks. Interview and stimulated recall data converged to model this process, as illustrated in Figure 1. The model identifies four primary cognitive triggers and the corresponding L1-mediated strategic mechanisms deployed to resolve them.

Figure 1.

Cognitive-Triggers Model of Strategic L1 Intervention



- ***Mechanism 1 (Glossing):*** Observed in 92% of artifacts, this was an immediate response to T1 (Lexical-Conceptual Gaps). Stimulated recall confirmed it was a deliberate act of semantic anchoring, not mere translation. *"I don't write the Arabic for 'cell,' but for 'apoptosis,' I must immediately link it to 'الموت المبرمج للخلية' [programmed cell death]. Without that anchor, the English term is just noise." (From stimulated recall with AMS14)*
- ***Mechanism 2 (Explanatory Translanguaging):*** Triggered by T2 (Procedural-Logical Gaps), students reconstructed processes in Arabic. *"Krebs cycle in English is a list of names. In my notes, I draw the cycle but narrate the steps in Arabic in the margins: 'هنا أ كو الأسيتيل يدخل...' [Here acetyl-CoA enters...]. The logic is in Arabic." (MED07)
- ***Mechanism 3 (Diagnostic Translation):*** A metacognitive strategy for T3, using L1 as a comprehension gauge. *"If my mental translation into Arabic is smooth and accurate, I move on. If it's jerky or impossible, that's the red flag to re-read." (SCIA03)
- ***Mechanism 4 (Mnemonic Bridging):*** The creative linking of English terms to Arabic schemas for T4. *"I remember 'artery' and 'vein' by linking them to 'أري' (I bring blood out) and 'ويد' (I bring blood in). It's my personal code." (MED03)*

Questionnaire data on perceived difficulty supported the qualitative triggers. A significant positive correlation was found between perceived course difficulty and reported frequency of L1 use for comprehension monitoring (M3), *r*s(313) = .61, $p < .001$.

The Duality of Perceptions: Efficacy versus Ideological Tension

Participants exhibited a sophisticated, dualistic awareness captured by the quantitative questionnaire and richly elaborated in interviews. They overwhelmingly affirmed the cognitive-pragmatic efficacy of L1 use while simultaneously grappling with sociolinguistic and developmental anxieties.

Table 4.

Perceived Benefits and Limitations: Quantitative Overview (Questionnaire, N=315)

Dimension	Statement	Agree/Strongly Agree	%
Perceived Benefits	Using Arabic helps me achieve a deeper conceptual understanding.	301	95.6%
	Using Arabic reduces my anxiety and cognitive load in EMI courses.	288	91.4%
	Using Arabic with peers is essential for collaborative learning.	282	89.5%
Perceived Limitations	I sometimes worry that relying on Arabic hinders my long-term English academic development.	231	73.3%
	Using Arabic in EMI contexts sometimes feels unprofessional or like a "crutch."	219	69.5%
	The process of mentally translating can be time-consuming.	187	59.4%

Interviews revealed the nuanced tension behind these statistics. The benefit of deep conceptual understanding was universal: *"Arabic is the language of my deep thought. To internalise a concept, it must pass through Arabic; English is often the surface layer." (AMS16)*

However, this pragmatic benefit was shadowed by "Translanguaging Guilt," a term emergent from the data describing the internal conflict between efficacy and ideology. *"There's a constant voice saying, 'You should be thinking in English by now.' My Arabic notes get me an A, but they also feel like a confession that I haven't truly mastered EMI." (SCIA06)* This guilt was quantified: a significant negative correlation existed between Self-Assessed English Proficiency and Agreement with the statement "Using Arabic feels like a crutch," r s(313) = -.68, $p < .001$. Higher proficiency students were more likely to frame L1 use as a powerful, conscious choice, whereas lower proficiency students viewed it as a necessary compensation.

Furthermore, artifact analysis provided an objective layer to this duality. While students expressed guilt, their materials showed highly systematic and sophisticated L1 use (e.g., colour-coded Arabic annotations for different functions: blue for definitions, red for process steps). This suggests that the practice is more expert-like than their self-perceptions sometimes acknowledge.

In summary, the results paint a picture of highly strategic, self-regulated learners who have developed a sophisticated, bilingual toolkit. Their use of Arabic is targeted, mechanism-driven, and context-sensitive, providing indispensable cognitive and affective support while simultaneously generating a complex set of metacognitive and sociolinguistic tensions rooted in the monolingual ideology often underpinning EMI policy.

Correlations and Interdependencies Across Findings

The analysis reveals not isolated findings, but a tightly interconnected system where strategy type, cognitive triggers, and learner perceptions are dynamically correlated, painting a coherent picture of strategic translanguaging as a core component of EMI learning. These interdependencies are summarized in the correlation matrix presented in the following table and elaborated below.

Table 5.

Correlation Matrix of Key Quantitative and Thematically Coded Variables

Variable		1	2	3	4	5	6
1	Perceived Course Difficulty	1					
2	Frequency of L1 Use (Cognitive)	.67**	1				
3	Depth of Conceptual Understanding (Self-Report)	.58**	.72**	1			
4	Anxiety Reduction via L1 (Self-Report)	-.61**	.55**	.49*	1		
5	"Translanguaging Guilt" Score	.52**	.31*	-.12	-.66**	1	
6	Self-Assessed English Proficiency	-.59**	-.45*	.08	.22	-.71**	1

Note. p < .05, ** p < .01. Correlations involve questionnaire data (N=315 for 1,2,4,5,6) and aggregated interview ratings (n=28 for Variable 3).

A strong positive pathway emerged between the challenges of EMI, the strategic deployment of L1, and perceived learning efficacy.

- Difficulty Drives Strategy: A significant positive correlation (r = .67, p < .01) was found between Perceived Course Difficulty and the Frequency of Cognitive L1 Use. Qualitative data elucidated this: students in more terminologically dense faculties (Medicine, Applied Medical Sciences) reported and demonstrated more systematic use

of Mechanisms 1 (Glossing) and 4 (Mnemonic Bridging). As MED04 stated, *"The density of new terms forces the system. In easier courses, I might try to stay in English, but here, Arabic annotation is non-negotiable from the first lecture."*

- Strategy Enables Understanding: In turn, the frequency and sophistication of L1 use strongly predicted students' self-reported Depth of Conceptual Understanding ($r = .72$, $p < .01$). This was not a superficial correlation. Stimulated recall sessions showed that students who employed M2 (Explanatory Translanguaging) - reconstructing processes in Arabic - could articulate more nuanced conceptual relationships. As evidenced by AMS11's artifact, a complex physiological process was accompanied by an Arabic flowchart that added causal links absent from the English textbook diagram.
- Strategy Mediates Affect: Crucially, strategic L1 use served as a critical mediator of learning affect. While course difficulty alone increased anxiety, the use of L1 strategies was significantly correlated with Anxiety Reduction ($r = .55$, $p < .01$). The negative correlation between difficulty and anxiety (-.61) becomes understandable through this mediation: difficulty prompts L1 use, which in turn mitigates the associated stress. This was captured in the phrase *"cognitive relief valve,"* used by multiple participants to describe glossing and L1 summarisation.

Running counter to the efficacy pathway is a second, conflict-laden pathway defined by language proficiency and internalised language ideologies.

- Proficiency as a Moderator: Self-Assessed English Proficiency was negatively correlated with both Perceived Course Difficulty ($r = -.59$, $p < .01$) and Frequency of Cognitive L1 Use ($r = -.45$, $p < .05$). Higher-proficiency students, while still using L1 strategically, reported doing so more selectively - often for M3 (Diagnostic Translation) or high-level summarisation - rather than as a frontline decoding tool.
- The Genesis of "Translanguaging Guilt": The most powerful relationship in the conflict pathway was the strong negative correlation between proficiency and "Translanguaging Guilt" ($r = -.71$, $p < .01$). Lower-proficiency students, who relied more heavily on L1, experienced significantly higher levels of guilt, anxiety, and a sense of using an "illegitimate crutch." Interview data revealed this guilt was externally reinforced by instructor comments or an implicit "English-only" classroom culture.
- Guilt vs. Efficacy: Notably, Translanguaging Guilt showed a *negative* correlation with Anxiety Reduction via L1 ($r = -.66$, $p < .01$). This statistical tension encapsulates the student dilemma: the very tool that effectively reduces cognitive anxiety (L1 use) simultaneously induces sociolinguistic anxiety (guilt). As SCIA06 articulated, *"It's a trade-off: calm my mind about the content or calm my conscience about my language ability."* Furthermore, Guilt showed no significant correlation with actual Depth of Understanding (-.12), indicating that feelings of illegitimacy are not tied to learning outcomes but to ideological positioning.

These overarching pathways appeared to be modulated by disciplinary context. Descriptive patterns suggested that students in medical and applied sciences faculties reported higher frequencies of L1 use, particularly for lexical-conceptual gaps, coupled with stronger pragmatic efficacy beliefs. In contrast, sciences students demonstrated more varied strategy

use with greater emphasis on explanatory translanguaging for logical and procedural knowledge. Guilt levels were present across contexts but were more pronounced among sciences students, frequently linked to perceived expectations of "symbolic fluency" in English for global scientific communication.

- Medical/Applied Sciences Context: Characterised by higher difficulty, higher L1 use (especially for lexical-conceptual gaps), and higher pragmatic efficacy. Guilt was present but often secondary to performance pressure.
- Sciences Context: Showed more varied strategy use, with greater emphasis on M2 (Explanatory Translanguaging) for mathematical or logical processes. Guilt levels were moderately high, frequently linked to a perceived need for "symbolic fluency" in English for global science.

Accordingly, the results depict a complex adaptive system. Students are not merely using L1; they are engaged in calculated translingual calculus, continuously weighing cognitive gains against sociolinguistic costs. Their strategic repertoire is a direct response to perceived task difficulty, its efficacy is confirmed by their own learning outcomes, yet its deployment is psychologically taxed by an internalised monolingual ideology. This system is not static but varies predictably with individual proficiency and disciplinary discourse, revealing strategic translanguaging as a context-contingent, self-regulated, and emotionally charged core of the EMI student experience.

Discussion

The present study aims to investigate the strategic role of L1 Arabic in Saudi undergraduate EMI programmes, asking how it is used, when it is deployed, and how students perceive its value. The findings reveal a complex, systematic practice of strategic translanguaging that is deeply integrated into students' self-regulated learning cycles. This discussion interprets these results through the dual theoretical lenses of translanguaging and self-regulated learning (SRL), situates them within the broader EMI literature, and elaborates their significant implications.

The most salient contribution of this study is its detailed mapping of *how* translanguaging operates as a deliberate, cognitive strategy rather than a mere communicative fallback. Prior research has established the presence and general acceptability of L1 in EMI (Breeze & Roothooft, 2021; Kim et al., 2017), and scholarship on language learning strategies has outlined their cross-linguistic transfer (Bai et al., 2025; Wach, 2016). This study bridges and significantly extends these lines of inquiry by demonstrating that students employ their L1 through a set of fine-grained, goal-directed mechanisms (M1-M4) triggered by specific cognitive bottlenecks.

This aligns with and concretises the concept of "strategic translanguaging" (Tai, 2025; Y. Zhang & Wei, 2025). For instance, M1 (Glossing) and M4 (Mnemonic Bridging) are not random code-mixing but are deployed during the *performance phase* of SRL to manage cognitive load and encode information. M3 (Diagnostic Translation) is a quintessential metacognitive strategy from the *monitoring phase*, using the L1 as a tool for comprehension checking. This finding refines our understanding of SRL in multilingual contexts; it shows that the learners' linguistic repertoire itself becomes a primary resource for strategy execution. The

learner's agency lies in selectively activating features from this repertoire - choosing Arabic for semantic anchoring and conceptual narration while using English for textual input and formal output - in a purposeful orchestration to master content.

The study's second major finding is the profound duality in student perceptions, quantitatively captured as the tension between high perceived efficacy and significant "translanguaging guilt." This duality is a critical addition to the literature on student perceptions in EMI (Anindya et al., 2022; X. Zhang et al., 2024), moving beyond general attitudes to expose an internal conflict rooted in language ideology.

On one hand, students are pragmatic strategists. Their near-universal reporting that Arabic enables deeper understanding (95.6%) corroborates and extends findings from other contexts where L1 is seen as a cognitive tool (Cui et al., 2024; Hsu, 2025). The strong positive correlation between L1 use and perceived understanding confirms its valued role in their learning economy.

On the other hand, they are subjects of a powerful monolingual EMI ideology that frames English as the sole legitimate vehicle for academic and professional success. The negative correlation between proficiency and guilt suggests that lower-proficiency students, who rely more on L1, internalise this ideology more acutely, feeling their necessary strategic adaptation is a personal failing rather than a rational response to an inequitable linguistic demand. This "guilt" is a form of *linguistic insecurity* (Y. Zhang & Wei, 2021) generated by the conflict between an officially monolingual policy and a cognitively multilingual practice. It echoes concerns in other settings about L1 as a "crutch" (Kim et al., 2017) but reveals the emotional and metacognitive toll of this framing.

The finding that strategic L1 use is significantly modulated by disciplinary context enriches the growing literature on disciplinary literacies in EMI. The heavier reliance on lexical-conceptual strategies (M1) in Medicine and Applied Sciences aligns with the extraordinary terminology load in these fields, supporting specialised studies on vocabulary challenges in EMI (Cui et al., 2024). Conversely, the greater emphasis on explanatory translanguaging (M2) in the Sciences points to the strategic use of L1 to unpack complex logical and procedural knowledge, a finding that nuances the generalised discussions of L1 use in prior survey-based studies.

This disciplinary variation underscores that "EMI" is not a monolith. The specific epistemic and discursive practices of a field shape *how* and *for what purpose* students' trans language. This calls for a more granular, discipline-sensitive approach in both EMI research and pedagogy, moving away from one-size-fits-all language support policies.

Theoretically, this study validates and operationalises the integration of translanguaging theory and SRL. It demonstrates that translanguaging can be analysed as a suite of concrete, observable strategies within the SRL cycle, providing a robust framework for future research on multilingual learning processes. The identified Cognitive-Triggers Model (Figure 1) offers a testable heuristic for understanding how language choice is cognitively motivated in learning tasks. Practically, the implications are substantial for EMI policy, pedagogy, and teacher training:

- Legitimising Strategic Translanguaging: University language and teaching policies should explicitly acknowledge the strategic value of L1. This can alleviate "translanguaging guilt" and validate students' effective coping mechanisms.
- Pedagogical Interventions: Instructors can be trained to foster "pedagogical translanguaging" (Tai, 2025). This could include designing tasks that strategically leverage the L1, such as comparative terminology analysis, L1 summarisation before L2 report writing, or structured bilingual peer explanation.
- Discipline-Specific Support: Language and academic support units should collaborate with faculty to develop resources tailored to disciplinary needs - for example, curated bilingual glossaries for medical programmes or workshops on using L1 for problem-solving in sciences.
- Reframing Teacher Attitudes: Professional development must address lecturer attitudes (Breeze & Roothooft, 2021; Sánchez, 2021), shifting the view of L1 from an interference to a scaffold. Seeing students' Arabic annotations not as a deficit but as evidence of active, strategic learning is a crucial mindset change.

This study has limitations. As a qualitative case study at a single institution, the findings, while analytically generalisable, are context-bound. The self-reported nature of some data (e.g., proficiency) is a constraint, though triangulation with artifacts mitigated this. Future research could employ longitudinal designs to trace the evolution of strategic translanguaging across university years. Experimental or quasi-experimental studies could measure the causal impact of training students in explicit "strategic translanguaging" techniques on both content mastery and English proficiency. Furthermore, research is needed to explore lecturer perspectives on the specific student strategies identified here, to bridge the gap between student practice and teacher perception.

Conclusion

This study set out to illuminate the nuanced, strategic, and essential role of L1 Arabic in the learning ecologies of Saudi undergraduate students navigating English-medium instruction. Through a rigorous, multi-method qualitative exploration, it has moved beyond cataloguing the mere presence of the L1 to reveal its systematic and agentive integration into a sophisticated bilingual toolkit for academic survival and success. The findings indicate that for students in high-stakes, terminology-dense disciplines such as medicine and applied sciences, Arabic is not a peripheral crutch but a central cognitive and metacognitive instrument. It is deployed through deliberate mechanisms - glossing, explanatory translanguaging, diagnostic translation, and mnemonic bridging - each activated by specific cognitive bottlenecks within the self-regulated learning cycle.

The research makes a substantive contribution to the fields of multilingualism and EMI by empirically demonstrating the concept of strategic translanguaging. It provides a detailed, context-rich map of *how* students orchestrate their linguistic repertoire to plan, execute, and monitor their learning, thereby bridging the theoretical gap between translanguaging as a social practice and self-regulated learning as a cognitive process. Furthermore, it uncovers the profound ideological-pragmatic duality at the heart of the student experience. While students pragmatically and effectively leverage Arabic to reduce cognitive load, enhance conceptual

depth, and foster collaborative learning, they simultaneously grapple with significant "translanguaging guilt" - a metacognitive anxiety rooted in the pervasive monolingual ideology that underpins many EMI policies.

These insights carry critical implications. For EMI policy and pedagogy, they argue compellingly for a paradigm shift from viewing multilingualism as a problem to be managed towards recognising it as a resource to be leveraged. Legitimising strategic translanguaging in the classroom and in institutional discourse can empower students, alleviate unnecessary guilt, and align pedagogical practice with cognitive reality. For instructors and curriculum designers, the findings underscore the need for discipline-sensitive approaches that support, rather than stigmatise, the bilingual strategies students naturally develop.

Ultimately, this study concludes that effective EMI cannot be premised on the fiction of a monolingual English environment. True educational equity and efficacy in multilingual settings require an embrace of translanguaging pedagogy - one that consciously integrates students' full linguistic repertoires as legitimate and powerful tools for deep, meaningful learning. The strategic use of L1 Arabic, as revealed in this context, is not a sign of deficiency but a hallmark of adaptive expertise. Recognising and building upon this expertise is the crucial next step in realising the promise of EMI as a vehicle for inclusive, high-quality global education.

Acknowledgements

The author would like to express sincere gratitude to the undergraduate students at the University of Bisha who participated in this study, as their time and valuable insights made this research possible.

Declaration of Funding

No funding was received for the research, authorship, or publication of this article.

Conflict of Interest

The author declares that there are no conflicts of interest regarding the publication of this paper.

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